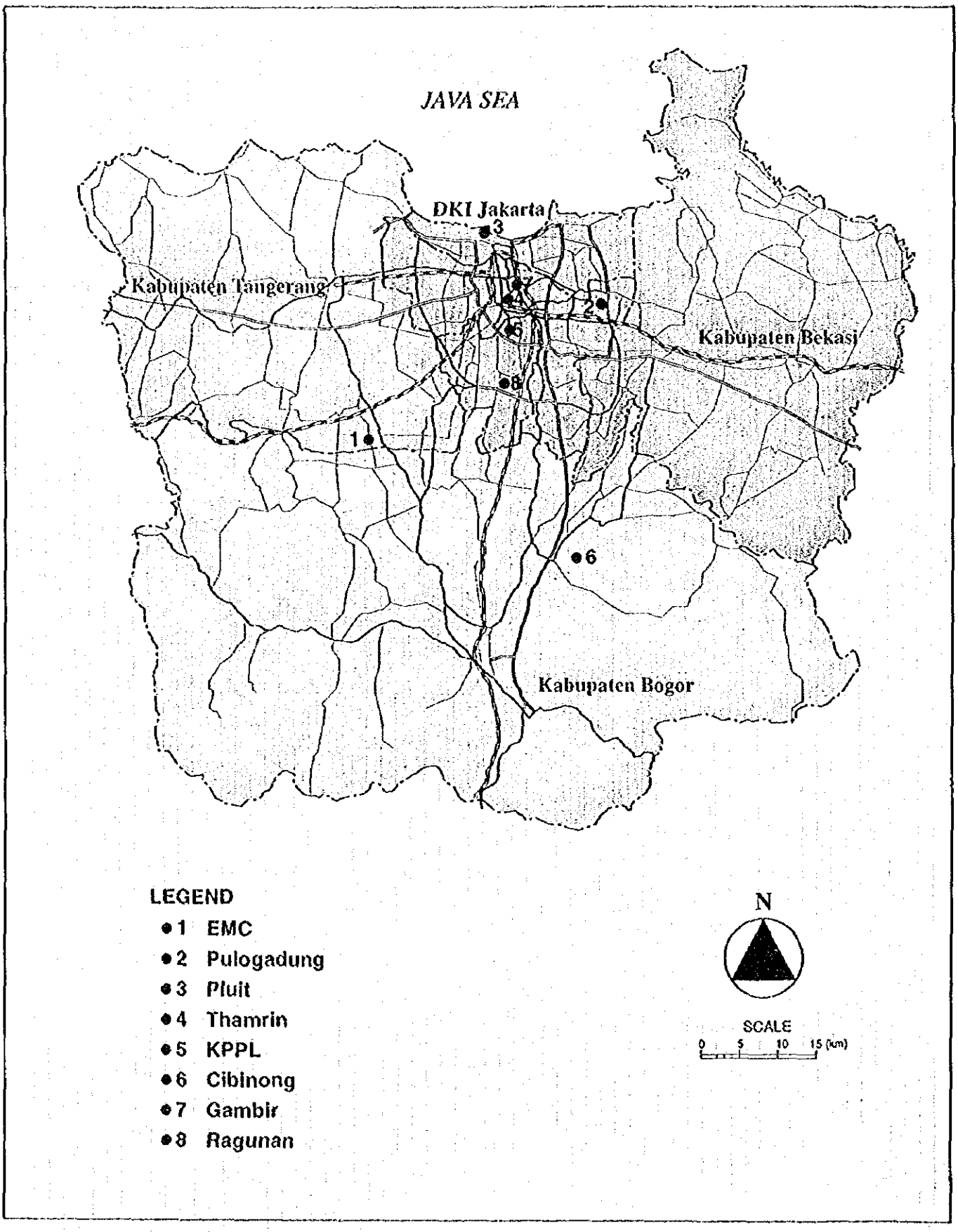

Figure 10.2.1 Existing Automated Continuous Monitoring Stations in Jabotabek

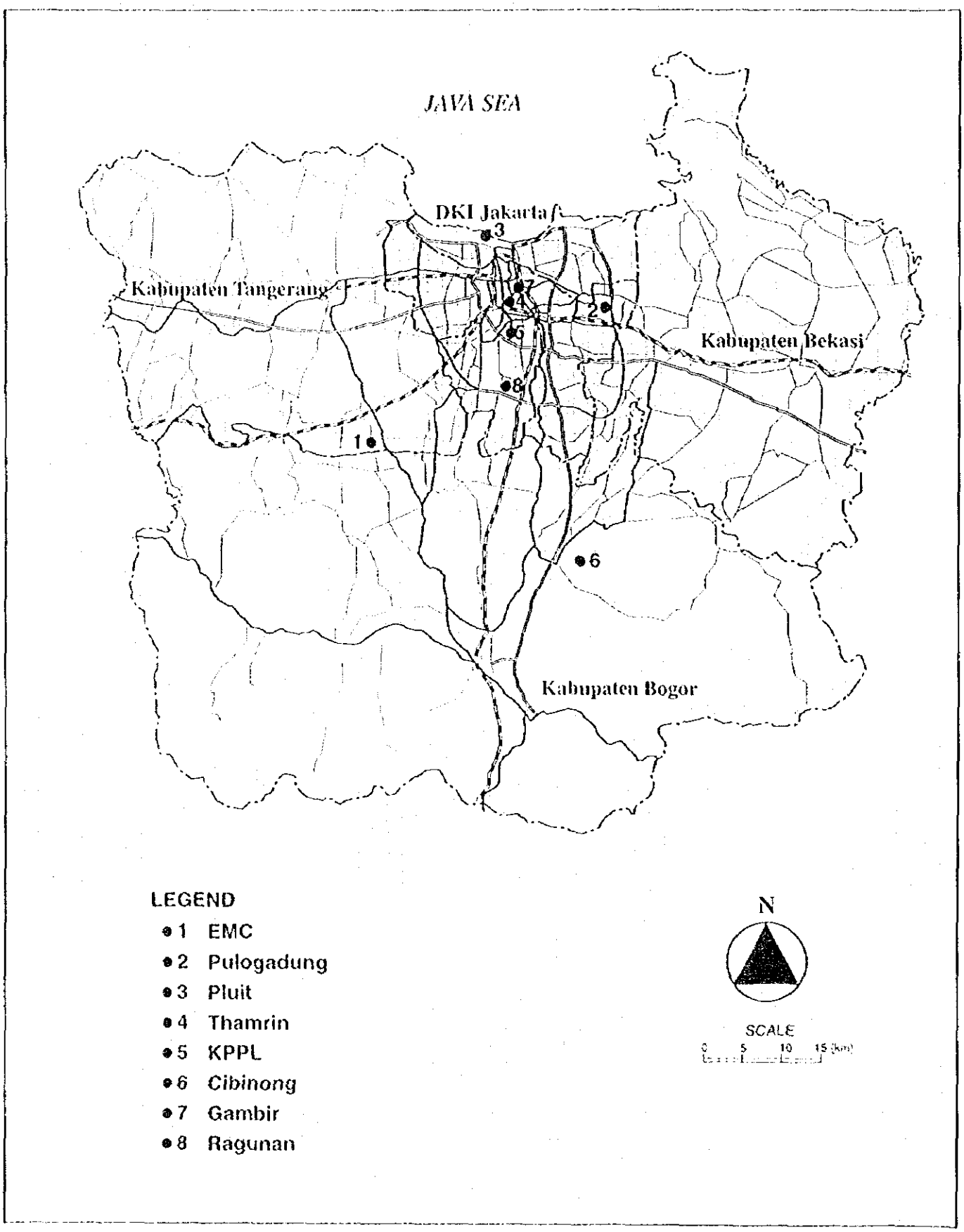

Figure 10.2.1 Existing Automated Continuous Monitoring Stations in Jabotabek

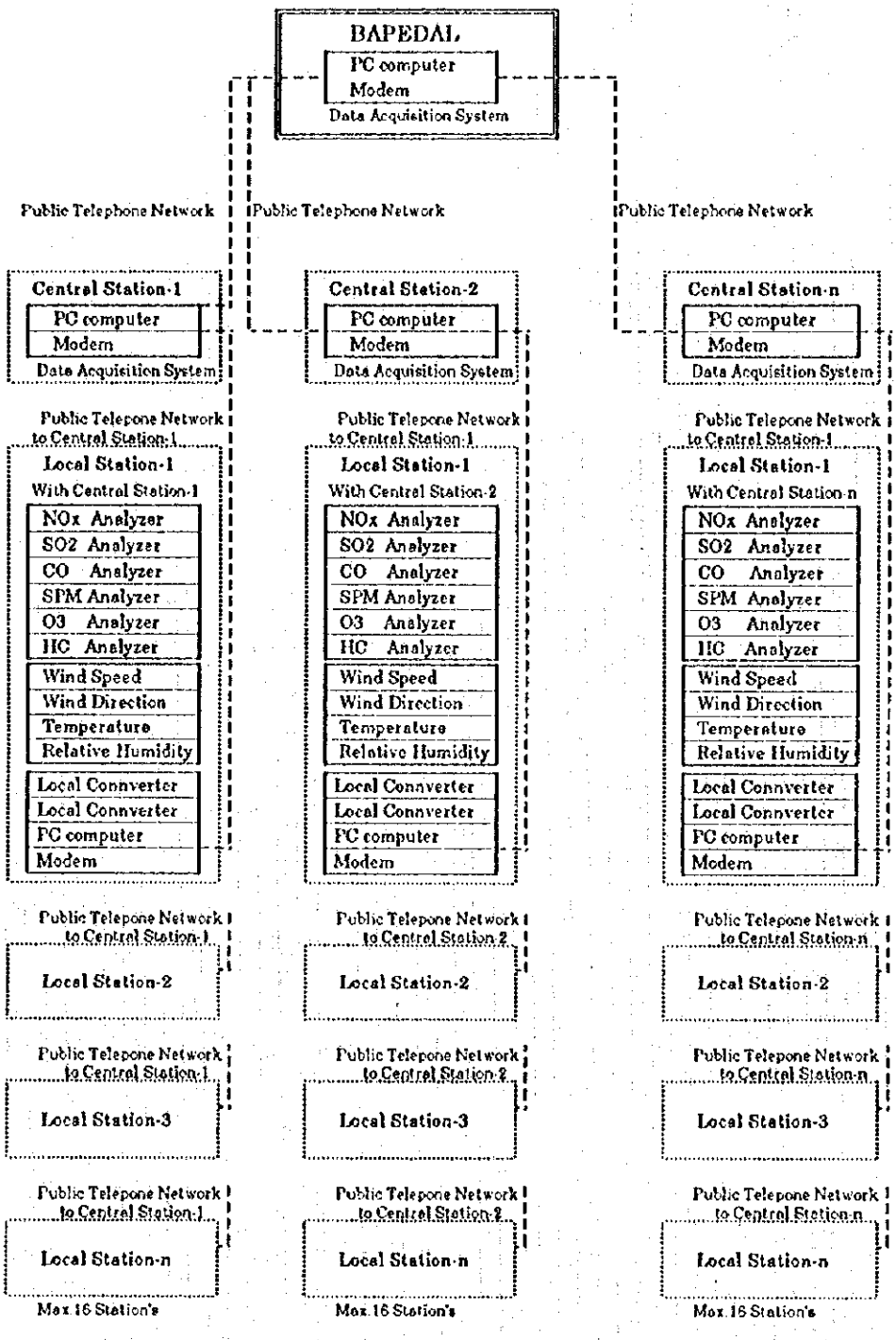

Figure 10.2.2 Configuration of Automated Continuous Monitoring System

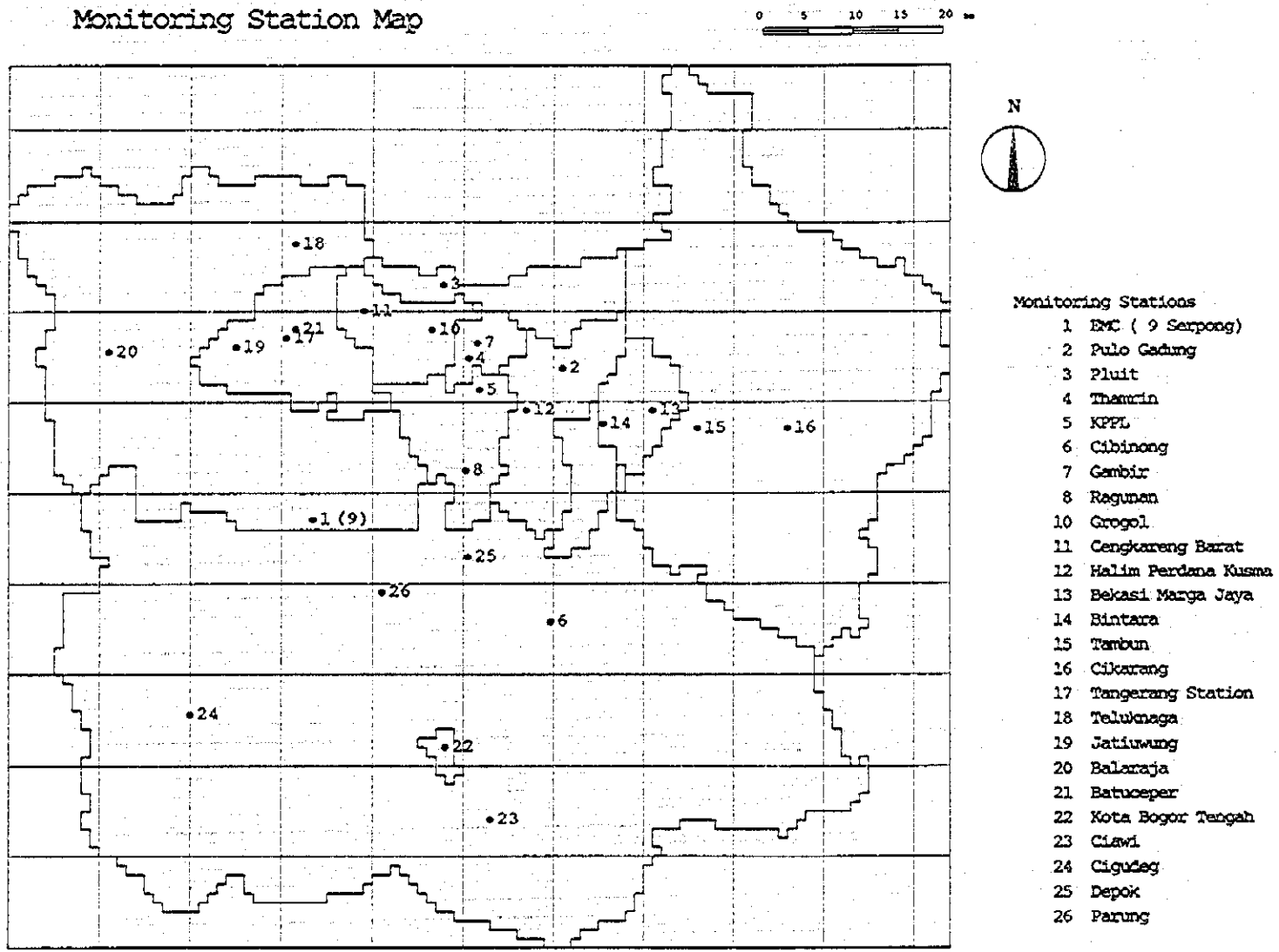

Figure 10.2.3 Locations of 25 Automated Continuous Stations in Jabotabek

Task 2 : Arrangement for Legal Support

The Ministry Decree (Ref. 191) listed recommended analytical methods for each air pollutants. However, some of those methods are not applicable for continuous monitoring. BAPEDAL has to issue supplementary decree for the suitable methods. As for reference, one copy of JIS for pollution was presented each to Air Pollution Control Directorate and EMC of BAPEDAL.

If necessary, also legal support shall be arranged for the combined efforts of DKI Jakarta and three Kabupatens with BAPEDAL.

Task 3 : Installation of Monitoring System

Analytical equipment of various principles are available in the market. The same type of equipment is preferable for monitoring of the same pollutant from the viewpoints of data conformity, operation, and maintenance. EMC has to prepare specification of each equipment with the cooperation of KPPL. BAPEDAL Headquarters is better to place order for purchasing instead of purchasing by individual Kabupatens and KPPL. Table 10.2.4 is a list of analytical equipment required in one monitoring station with a suggested monitoring method.

Table 10.2.4 Monitoring Equipment in One Station

Items	Monitoring Method
SO_2	Continuous UV fluorescent method
NOx	Continuous chemiluminescence method
O_3	Continuous UV absorptiometry method
CO	Non-dispersion infrared absorption method
SPM	ß ray absorption method
HC	Gas chromatograph(using FID) method
Wind Direction	Wind vane & Anemometer
Wind Velocity	Wind vane & Anemometer
Temperature	Electrical Resistance Thermometer
Humidity	Hair Hygrometer

The equipment should be placed in a container at a station. A small mobile type is better than a house type, since it occupies smaller space when located in public space like in a park and easier to borrow a land, and, if necessary, easier to relocate to better place. Table 10.2.5 shows a specification of the container.

Table 10.2.5 Specification of Station Container

Items	Specification
Dimensions	4.19 L × 2.13 W × 2.38 H (in meter)
Materials	Aluminum Sheet (walls), Steel (Flame)
Power Source	AC 220V 4500 VA
Facilities	Step-down Transformer
	Distribution Panel
	AVR
	Air Conditioner - Automatic start after black-out
	Ventilation Fan
	Gas Cylinder Rack
	Room Lighting
	Air Sampling System
	Pole for Wind vane & Anemometer

Table 10.2.6 explains required equipment at central (in KPPL and Kabupatens) and BAPEDAL data stations, and each of monitoring station for data transmittal and management. The central data acquisition stations in KPPL and agencies of Kabupatens should have function to inspect conditions of a monitoring station when it indicate mal-functioning by sending abnormal data.

The manufacturer should be mobilized for installation, initial calibration, and commissioning of the whole system. The manufacturer should have an authorized agent near Jabotabek in order to respond quickly to the requests of supplying spare or consumable parts, complicated maintenance, or repair. Almost all equipment will be imported from overseas.

Task 4 : Organization of Human Resources

Requirements of human resources to manage, operate, and maintain the system are tabulated in Table 10.2.7. KPPL which is going to have 10 monitoring stations may need one person for system management, two for data management, and 5 to operate and maintain monitoring stations. These people can do the same for 16 stations in the future. One Kabupaten agency may need one for system management, one for data management, and 3 for the stations.

Table 10.2.6 Requirement for Data Transmittal and Management

Station	Hard or Soft	Equipment, etc.	Remarks
Each at Central and BAPEDAL Data Acquisition Stations	Hardware	Telephone	
		Modem	
		Personal Computer	I B M Compatible (Operable on WINDOWS 3.1 or newer)
		Color Display	
		Laser Printer	Size A3
	Software	Data Transmittal	
		Data Management	Note *
Each at Monitoring Stations	Hardware	Telephone	
		Modem	
		Local Converter	
		Modem Adapter	
		Personal Computer	I B M Compatible

Note * - The software is operable on WINDOWS 3.1 or newer editions, having capability to plot and table data, and having following additional possibilities:

a) to refer and correct obtained data
b) to input data
c) to change color to display high concentration or different kinds of data
d) to input various specifications for data acquisition and compilation
e) to connect with maximum 16 monitoring stations
f) to convert a file to ASCII file and to a commercially available spreadsheet file

Table 10.2.7 Staff Requirement for the System

Station	Job Description	Number
BAPEDAL Data Acquisition	1. Whole System Management	1
	2. Whole Data Management	2
One Central Data Acquisition Station	1. System Management	1
	2. Data Management	2 or 1
	3. Operation and Maintenance of Monitoring Stations	5 or 3

Roles of system and data management are better to be occupied by experienced officers in pollution problems. One chief engineer is required to lead a group composed of technicians for operation and maintenance of monitoring stations. The chief engineer should be trained in EMC or KPPL for longer, or possibly to

be trained in overseas.

Equipment used for monitoring ambient air quality is usually highly sophisticated and fragile to handle, although they are highly accurate and easily operable. Technicians who are going to handle the equipment have to be well accustomed to operate, inspect, maintain, and calibrate the equipment by training. Training courses are listed in Table 10.2.8. The training has to be carried out in a classroom and in a monitoring station with actual operation of the equipment. EMC and KPPL have similar stations and sufficient technologies to teach technicians from Kabupatens Bogor, Tangerang, and Bekasi. Outside consultants or manufacturer's agents may also be able to help the in-house teachers.

Teaching in a monitoring station will need five days for one group in addition to the classroom lectures for actual operation and maintenance of the corresponding equipment. The one group is better to be organized in small number with less than 3 trainees. Almost person to person training is recommendable.

During the Study, technologies related to maintenance and management of monitoring stations were transferred to the Indonesian Team from the JICA Team verbally and in writing, occasionally using manufacturers' manuals. Important items are recorded as Note on Management of Ambient Air Monitoring Stations in Supporting Volume.

Table 10.2.8 Ambient Air Monitoring Courses for Technicians (Classroom)

No.	Contents	Hours
1	Air pollution and air monitoring in general	4
2	Meteorology and pollutant dispersion	2
3	Instruments - principle, configuration, operation, maintenance, etc. - for meteorological observation	2
4	ditto - for Automatic SO_2 Analyzer	3
5	ditto - for Automatic Carbon Monoxide Analyzer	3
6	ditto - for Automatic NOx Analyzer	3
7	ditto - for Automatic Oxidant Analyzer	3
8	ditto - for High Volume Sampler	2
9	ditto - for Automatic SPM Load Analyzer	3
10	ditto - for Automatic Hydrocarbon Analyzer	3
11	ditto - for Data Management System (report preparation)	3

Task 5 : Preparation for Operation and Maintenance

Before the operation of the monitoring system, methods of data compilation and maintenance have to be established and to be understood in all agencies which participate in the system.

Data should be compiled for one hour, one day, and one year averages, and to some kinds of pollutants for three hours or eight hours as required by the ambient air standards. Hourly and daily average data can be compiled monthly as preparation to publish in the format included in the data volume of this Final Report.

Maintenance of analytical equipment is mandatory to acquire accurate data for longer period continuously. BAPEDAL has to prepare a maintenance program including maintenance and inspection methods, frequency of maintenance and calibration, timing of overhauls, timing of part renewals, etc. Manufacturer's manuals and Note on Management of Ambient Air Monitoring Stations in Supporting Volume are helpful for the preparation. Besides maintenance by operators, the monitoring analyzers are needed for periodical intensive maintenance (half yearly and annual) by manufacturers or their authorized local agents to keep the accuracy to be high and the integrity to be firm for longer period. Table 10.2.9 is a typical inspection and maintenance schedule. Annual maintenance overhauls each equipment. The right column is for annual working days of laboratory operators in the 10 monitoring stations, assuming one operator to witness the manufacturers work in the stations.

Table 10.2.9 Inspection and Maintenance of Automated Monitoring Station

Time Schedule	Frequency	Carried out by	Schedule for	Annual Operators Required/10 Stations
Weekly	27 times	2 Lab experts	3 stations/ 1 day	184 person-days
Biweekly	13 times	2 Lab experts	3 stations/ 1 day	88 person-days
Monthly	12 times	2 Lab experts	1 station / 1 day	240 person-days
Three Monthly	2 times	2 Lab experts	1 station / 2 days	80 person-days
Half yearly	1 time	Manufacture	1 station / 3 days	30 person-days
Annual	1 time	Manufacture	1 station / 6 days	60 person-days

When damaged, manufactures' agents shall be consulted for repair. A long term maintenance contract with the manufactures or their agents is recommendable.

There may be inadequacy of local agent for the services of the above at the moment, since the equipment is new and not so popular in Indonesia. However, the owners and the agents should cooperate to improve capability of both sides.

(4) Time Schedule

Table 10.2.10 is to show necessary time schedule targeting the year 2000 to start commissioning the monitoring system. The purchasing, including preparation of equipment specification and installation are critical for the schedule. One year is allocated to procure and ship analytical equipment from overseas.

Table 10.2.10 Time Schedule for Strengthening of Ambient Air Monitoring System

	Task	1997			1998			1999			2000		
1	Sites			→									
2	Legal			→									
3	Equip.			—	—	—	—	—	→				
4	Training							—	→				
5	Prepar.				—	—	→		→				
	Operation								—	—	—	—	—

(5) Required Resources

A. Unit Prices

	(in 1,000 Rp.)
Monthly Wage - System Management	800
Data Management	300
Trainer at EMC or KPPL	300
Chief Engineer Data Acquisition	300
Lab Expert	200
Outside Work Allowance (one person per time)	25
One Data Acquisition Station	58,000
One Monitoring Station in a Container (without Data Transmittal System)	
SO_2 Analyzer	75,496
NOx Analyzer	63,540
O_3 Analyzer	122,000
SPM Analyzer	66,376

CO Analyzer	92,688
NMHC Analyzer	130,192
Meteorological Observation Equipment	70,800
Miscellaneous Equipment	45,280
Container	190,000
Total for One Monitoring Station	856,372
One Data Transmittal Unit	28,320
Monthly Electricity Cost (3000VA/One Station)	530
Annual Maintenance of One Monitoring Station	26,300
Daily Contract Service	600

The above equipment estimate is based on Japanese catalogue price, valid in early 1997, with conversion factor of Rps 20 per one Yen, and does not include various charges of customs clearance, taxes, transportation, etc. Annual maintenance cost of consumable and spare parts for one station given above is not required for the first year of the newly installed stations. Such cost for two years is included in the initial purchase price. However, existing stations in DKI Jakarta require the cost.

B. Budget Estimate

a) BAPEDAL

Items		1997	1998	1999	2000
Wage	Station Officers	1100×4 =4400	1100×12×0.5 =6600	1100×12 =13200	1100×12 =13200
	Clerks, 25% of above	1100	1650	3300	3300
	EMC Engineers	600×4 =2400	300×12×0.1 =360	600×8 =4800	0
	KPPL Engineers	300×4 =1200	300×12×0.1 =360	600× 8 =4800	0
	Subtotal	9,100,000	8,970,000	26,100,000	16,500,000
Office Expenses, 30% of above		2,730,000	2,691,000	7,830,000	4,950,000
Outside Work Allowance		250,000	250,000	250,000	

Equipment Initial Investment Cost (in million Rp.)

Location		Investment
Data Acquisition	5 sets	290
DKI Full Scale Station	4 sets	3,539
DKI Data Transmittal Unit	6 sets	170
Bogor Full Scale Station	6 sets	5,308
Tangerang Full Scale Station	5 sets	4,424
Bekasi Full Scale Station	4 sets	3,539
Total		17,270

Note: BAPEDAL's payment - 2/3 in 1998, 1/3 in 1999

(in million Rp.)

Contract Initial Setup, Tuning, Guidance, etc. in 1999	2 months	36

Total BAPEDAL's budget in million Rp.

1998	1997	1998	1999	2000
11,524.911	12.080	11,524.911	5,827.180	21.450

Grand total (BAPEDAL) 17,385.621

b) DKI Jakarta

Items	1997	1998	1999	2000
Wage	1400×4×0.2	1400×12×0.1	1400×12	1400×2
- Officers	=1,120	=1,680	=16,800	=16,800
- Clerks, 25% of the above	280	420	4,200	4,200
- Lab. Expert	0	0	1100×12 =13,200	1100×12 =13,200
Subtotal	1,400	2,100	34,200	34,200
Office Expenses, 30% above	330	495	8,910	8,910
Outside Work Allowance	250	250	8,525	17,050
Parts for maintenance, etc.	0	0	157,800	263,000
Electricity	0	0	21,200	63,600
Contract Services	0	0	0	54,000
Total	1,980,000	2,845,000	230,635,000	440,760,000

Grand total (DKI) 676,220,000

c) Kabupaten Bogor

Items	1997	1998	1999	2000
Wage	1100×4×0.2	1100×12×0.1	1100×12	1100×12
- Officers	=880	=1,320	=13,200	=13,200
- Clerks, 25% of the above	220	330	3,300	3,300
- Lab. Expert	0	0	700×12 =8,400	700×12 =8,400
Subtotal	1,100	1,650	24,900	24,900
Office Expenses, 30% above	330	495	7,470	7,470
Outside Work Allowance	140	140	5,075	10,150
Parts for maintenance, etc.	0	0	0	157,800
Electricity	0	0	12,720	38,160
Contract Services	0	0	0	32,400
Total	1,570,000	2,285,000	50,165,000	270,880,000

Grand total (Bogor) 324,900,000

d) Kabupaten Tangerang

Items	1997	1998	1999	2000
Wage	1100×4×0.2	1100×12×0.1	1100×12	1100×12
- Officers	=880	=1,320	=13,200	=13,200
- Clerks, 25% of the above	220	330	3,300	3,300
- Lab. Expert	0	0	700×12 =8,400	700×12 =8,400
Subtotal	1,100	1,650	24,900	24,900
Office Expenses, 30% above	330	495	7,470	7,470
Outside Work Allowance	140	140	4,088	8,175
Parts for maintenance, etc.	0	0	0	131,500
Electricity	0	0	10,600	31,800
Contract Services	0	0	0	27,000
Total	1,570,000	2,285,000	47,058,000	230,845,000

Grand total (Tangerang) 281,758,000

e) Kabupaten Bekasi

Items	1997	1998	1999	2000
Wage	1,100×4×0.2	1,100×12×0.1	1,100×12	1,100×12
- Officers	=880	=1,320	=13,200	=13,200
- Clerks, 25% of the above	220	330	3,300	3,300
- Lab. Expert	0	0	700×12 =8,400	700×12 =8,400
Subtotal	1,100	1,650	24,900	24,900
Office Expenses, 30% above	330	495	7,470	7,470
Outside Work Allowance	140	140	3,450	6,900
Parts for maintenance, etc.	0	0	0	105,200
Electricity	0	0	8,480	25,440
Contract Services	0	0	0	21,600
Total	1,570,000	2,285,000	44,300,000	191,510,000

Grand total (Bekasi) 239,665,000

(6) Strengthening of Institutions and Legislations

The present institutional/legislative framework is not enough to successfully carry out this countermeasures in the future. The following preparations are necessary :

- Reinforcement of staff in duty in BAPEDALDA, L-BLH, BLK, BPPI and L-PU, and
- Enactment of 'Air Pollution Control Law'

(7) Evaluation

Local agencies concerned including KPPL and MOH have experiences in ambient air monitoring and sample analysis, using the existing stations. BAPEDAL has also such kind of experiences for five years. Although these agencies' staff in charge of monitoring took technical training at the actual monitoring sites through the present JICA Study period, the staff should be trained continuously for technicians of monitoring and sample analysis to collect useful monitoring data. Necessary O&M materials of these countermeasures should be supplied locally and periodically.

Publication of the monitoring results through the electric board existing along the

main traffic roads or statistical books will appeal the atmospheric situations to and bring up incentives for air conservation to local people.

Major cost for this countermeasures is for investment of equipment and facilities to sample and analyze ambient air of the Jabotabek region under the proposed monitoring netwok and system. The cost is beyond BAPEDAL's and local goverments' regular budget for environmental conservation. Therefore their financial deficiency should be covered by raising the additional funds.

10.3 Preparation of Stationary Source Inventory (2-A)

(1) Action Justification

More than 80% of SOx, nearly 30% of NOx, and over than 50% of SPM are emitted from stationary pollution sources in Jabotabek. Although current air quality satisfies national and local standards, increases of industrial activities in the area promise that pollutant emissions will violate the standards in the future if no countermeasure is implemented.

In order to prepare stationary source inventory, stationary sources have to be identified with their locations at first. Stationary sources can be consisted of factories, office buildings, households, and so on. These have facilities which emit SOx, NOx and PM, including boilers, diesel engines, incinerators, furnaces, ovens, dryers, etc. Secondly, those emission rates have to be determined by measurement and/or calculation.

In the Study, 91 factories responded to the 300 questionnaires distributed, and pollutant emissions were actually measured at 36 facilities. There were 2000 factories identified by the JICA Team in Jabotabek. There must be multiple facilities to emit air pollutants in one factory. Also the 91 factories consumed less than 20 % of sales amounts of HSD, IDO, Kerosene, and LPG in Jabotabek. Emission rates of 36 facilities measured in the Study were only one spot data. Data on different capacity and on other facilities including non-combustion emission sources are needed to improve the inventory.

The reason of these small coverages were because of limits of time, manpower and budget in both Japan and Indonesian sides. More should be surveyed and their pollutant emissions be measured in order to improve the accuracy of emission

inventory from the stationary sources. Technologies and know-hows to prepare the inventory were well transferred in writing and through OJT during the Study period to the level that the counterparts of the Indonesian Team were able to carry out the related tasks by themselves.

The information for the preparation of stationary source inventory should include locations, kinds of pollutants, their emission rates and patterns. The information should be renewed yearly since it is varying frequently by increasing or reducing production capacity, converting a type of fuel, changing operation patterns, or else.

Air pollution is a wide spread phenomena. It can not be contained in one single region. Pollutants disperse tens of kilometers into far remote areas on weather conditions. Each Kabupaten or city in Jabotabek may individually have respective information on stationary sources or facilities. However, there is no single agency which keeps information on stationary sources or facilities as a whole in Jabotabek. It is under the jurisdictions of both governors of West Jawa Province and DKI Jakarta. As BAPEDAL is in the position above the both local governments and has function to implement pollution control measures (Ref. 141), BAPEDAL is the best agency to implement this action plan with the cooperation of Kabupatens of Bogor, Tangerang, and Bekasi, and DKI Jakarta.

This project can be a pilot of similar ones to be implemented in industrial and supposed-to-be polluted regions in Indonesia.

(2) Objectives

The main purpose of this action plan is to prepare the stationary source inventory by expanding the data generated by the joint efforts of the Indonesian and JICA Teams in the Study. The coverage rates of questionnaire survey, flue gas measurement and fuel consumption shall be increased. The inventory will be applied for comprehension of current air emissions, comparison with emission standards, planning of emergency counter measures and issuance of various reports.

By implementing the action plan, the project will accomplish following objectives:

- Strengthening of institutional capacity at both the central and local levels
- Development of environmental impact management process in BAPEDAL
- Development of the partnership of officials with the industrial community
- Centralization of the pollutant emission information possessed by other agencies
- Pilot project of similar ones needed for industrial regions in Indonesia

(3) Scope

The project is mainly to review the previous studies, to identify stationary sources, to carry out questionnaire survey, to arrange for legal support, to train technicians for measurement of flue gases, to purchase necessary equipment for the measurement, and to compile data for use. It is divided into eight tasks as described in below.

BAPEDAL which has related technologies and know-how shall spearhead the project with cooperation from DKI Jakarta, and Kabupatens of Bogor, Tangerang, and Bekasi in Jabotabek. EMC and Center for Information Development and Environmental Compliance, both of BAPEDAL, play critical roles in the project within their functions.

Task 1 : Review of Previous Studies

When authorized, BAPEDAL has to form a project team including member from Kabupatens and DKI Jakarta for implementation of this action plan. The JICA Team prepared and presented Air Pollution Control Directorate and EMC of BAPEDAL, each one copy of "Stationary Pollution Source Study Guideline - July, 1996". The Guideline and the results of the Study have to be reviewed by the project team and to be placed as the threshold of the project. Others studied by international or domestic consultants shall also be reviewed.

Task 2 : Identification of Stationary Sources

Stationary sources emitting SOx, NOx and PM into ambient in considerable amounts are factories and large buildings. Emission is caused by combustion of fuel or processing materials. Large buildings such as offices, hospitals, theaters, indoor sport arenas, etc. have substantially large boilers or generators.

The Study Team purchased and presented to Air Pollution Control Directorate of BAPEDAL the voluminous data book of Indonesian factories (Ref. 93). There were 2061 factories (910 in DKI Jakarta, 298 in Bogor, 566 in Tangerang, and 287 in Bekasi) listed in Jabotabek. The book contained name, address, date of establishment, category, line of business, production capacity, started year of operation, number of employees, etc. The JICA and Indonesian Teams of the Study found the information to be somewhat incorrect or obsolete in this 1993/1994 edition. However, the information contained in the book can be used for the time being by the project team. If the new edition is available, the project team has to purchase it from the publisher. The JICA Team also presented to Air

Pollution Control Directorate a list of starred hotels and buildings having floor space larger than 5000 m^2 in DKI Jakarta (Ref. 94).

The project team should make efforts to renew the above information. Member from Kabupatens and DKI Jakarta is in the position to contact factories and others locally. Each local agency needs to keep the local information and BAPEDAL has to keep it as the central planner in Jabotabek, always to be current. In the future, BAPEDAL has to keep current the information of whole Indonesia in the current governmental organization.

Task 3 : Arrangement for Legal Support

BAPEDAL's role is to assist the President of the Republic of Indonesia in environmental impact control which includes the prevention and control of environmental deterioration, and the rehabilitation of environmental quality, in accordance with the prevailing statutes and regulations (Ref. 141). BAPEDAL must draft regulations and decrees to make this principle more effective and to give protection to its activities. As for this action plan, following articles are better to be included in the drafts.

1) Information flow to BAPEDAL

The information mentioned in Task 2 must be reported automatically to BAPEDAL without soliciting it from another agencies. For the large sized and new factories and buildings, BAPEDAL can obtain information through AMDAL (Environmental Impact Analyses) Committee in which Directorate Environmental Impact Analyses of BAPEDAL has a permanent membership.

2) Reporting duty of factory owners, etc.

Owners or operators of factories and buildings are not obliged to answer BAPEDAL's questionnaires currently. During the Study period, an officer or two of BAPEDAL had to visit a factory to ask for filling out the questionnaire with having a formally signed letter of the Directorate Head. If possible by a legal step, mailing may mitigate BAPEDAL's or local agency's load of this kind.

Task 4 : Questionnaire Survey

Questionnaire survey of the stationary sources is the most powerful method to know the current emission rate in Jabotabek, if the answering rate is high and accurate. The form sheet which BAPEDAL prepared in the Study can be used for the questionnaire survey. The necessary information includes name, address,

date of establishment, line of business, production capacity, started year of operation, number of employees, facility name of pollutant source, annual fuel consumption, kind of fuel, height and top section area of stack, emission rates of SOx, NOx, and PM, and flue gas temperature and volume, operational time pattern, etc.

Distribution and collection are the work to be carried out by the member from Kabupatens and DKI. The owners or operators should know all the answers, because of the BAPEDAL's Emission Standards Decree (Ref. 110). However, there are lack of engineering capability in some of factories to answer. The project team needs to assist them for filling out or confirming the answers by visits (a role of project member from Kabupatens and DKI Jakarta) or else. Also because of the costs and necessary expertise for flue gas measurement, it will be a burden to answer emission questions for smaller factories.

The project team has to review the answers and, if necessary, to confirm the answers by contacting answerers. For the review, the team member needs experience on industrial engineering. Compilation by US-EPA (Ref. 208) is the first to be referred by a reviewer if the answered facility is new to the reviewer. The JICA Study Team presented one copy each of the compilation to Air Pollution Control Directorate of BAPEDAL and EMC. Facilities not listed in the reference or burning un-common fuels have to be investigated further in details including flue gas measurement or/and fuel analysis.

When no flue gas measurement is planned at a facility burning un-common fuel, fuel analyses are necessary to calculate SOx emission and flue gas rate for the inventory, and to assume NOx and PM emissions. For commonly used fuels, the data analyzed in the Study and others available from fuel suppliers are applicable for estimation of SO_2 emission and flue gas rate, because of almost consistent properties of a respective kind of fuel.

Task 5 : Training Technicians for Emission Measurement

The Central Government of Indonesia has a policy to give powers to local governments. Agencies in Kabupatens other than KPPL in DKI Jakarta do not have enough capability to measure emissions from the stationary sources. Meanwhile in Jabotabek, many factories are going to be constructed outside of DKI Jakarta.

EMC has people well trained in the Study and in equipment handling, which is complied with the Indonesian Guideline for Air Pollution Control (Ref. 227) to measure rates of emissions from stationary sources. EMC as the reference laboratory is in the position to train technicians of the Kabupatens. And

technicians of KPPL have to visit EMC to make the measurement procedures to be uniform in the project. At least two technicians from each Kabupaten agency are required as trainees at EMC. They will be trainers in return at each Kabupaten and DKI Jakarta, if increased member of experts is foreseeable in the future.

The training is required in classroom and at site. Table 10. 3. 1 gives necessary courses in the classroom. BAPEDAL shall have an arrangement with an industrial sector for use of its facility as a training site. The site training - OJT - will require at least two full days at one facility for the start and two days for two other facilities (total three different facilities for measurement) in one Kabupaten.

This training may become quite useful when the decree for emission standards (Ref. 110) becomes widely observed by owners and operators of factories. Each local agency must back-check the data reported from the owners, etc. by measuring in spot using own equipment.

Table 10.3.1 List of Stack Gas Measurement Training Courses in Classroom

No.	Contents	Hours
1	Air pollution and stack gas measurement in general	4
2	Shortcut of fluid dynamics on gas flow	1
3	Requirements for measuring site - location, nozzles, safety, etc.	4
4	Explanation of standard procedures for measurements	8
5	Explanation of equipment for use (theory, operation, calibration, cleaning, maintenance, etc.)	12
6	How to make a report (calculation, etc.)	6

Task 6 : Procurement of Measurement Equipment

Table 10. 3. 2 shows the minimum requirement in each Kabupaten, DKI Jakarta, and EMC.

The same procedures and the same types of equipment which comply with BAPEDAL's Decree KEP-205 (Ref. 227) are preferable for the project in each local agency in Jabotabek. The project team has to prepare specification of each equipment with the help of EMC experts and to purchase those for EMC, DKI Jakarta, and three Kabupatens from reliable manufacturer who can supply consumable and spare parts during the life of the equipment and also can possibly mobilize local service personnel upon request.

Other than cars and laboratory space, major equipment may be needed to be

purchased from overseas venders.

Task 7 : Measurement of Pollutant Emissions at Sites

The Study found in Jabotabek 2061 factories within which 445 factories employ 500 or more people (First Grade) and around 1000 factories do between 100 to 499 people (Second Grade). Also the questionnaire survey of the Study found there were around 3.4 facilities in one factory to be the stationary sources in Jabotabek.

Measurement of actually operating facilities is mandatory to confirm emission rates and finally improve accuracy of the inventory. Emission rates of some facilities have been known already from the previous projects (such as the Study or the US-EPA Compilation (Ref. 208)). However, there are facilities not found in the reference, differently operated, or unique to Indonesia.

From the experience in the Study, measurement at two facilities in a week is possible in average. The trained four teams (one in each Kabupaten and DKI Jakarta) can measure flue gases from around 300 facilities (around 22 factories in one Kabupaten or DKI Jakarta) in a year. One team composes two field and two laboratory technicians.

Construction work for installation of sampling nozzles, measurement platforms, stairs, etc. may be additionally needed in some facilities. Because of the BAPEDAL's Decree for Emission Standards (Ref. 110), the owners and operators of the factories and buildings installed them voluntarily in the Study. They are expected for this matter to be the same in this project.

Table 10.3.2 Flue Gas Measurement Equipment in One Agency

Item	Equipment	Sets	Remarks
SOx	Turbidimetric Method	3	
NOx	Phenol Disulfonic Acid Absorptiometry	3	
PM	Manual and Auto Sampling Sets	-	each 1 set
H_2O	$CaCl_2$ Absorption	1	
Velocity	Pitot Tube Velocity Meter	1	
CO_2, O_2	Orsat Gas Analyzer	2	
Balance	Electronic	1	
Others	Thermometer, Pressure Gage, Chemicals, etc.	1	
Car	Motor vehicle to transport equipment to sites	1	
Laboratory	Photoelectric Spectrophotometer, Dryer, Preparation of reagents, etc.	1	

Task 8 : Compilation of Stationary Source Inventory

Local agencies have to file sheets of reviewed answers of the questionnaire and flue gas measurement data in one cabinet, and send copies to the core project team member in BAPEDAL. Finally, the project team has to compile the collected data for further use locally and centrally. It is recommendable to compile the collected data weekly as a routine work.

The compilation can be carried out using a commercially available spread sheet computer soft, such as Excel or 123. The local team member will input respective local information into own computer and send a copy of the floppy to the BAPEDAL member who input into the BAPEDAL's computer by combining four local files.

The results stored in the computer can apply for a) comprehension of emissions, locally and totally, b) comparison with emission standards and issuance of warning to individual factory, c) the planning of emergency countermeasures when air pollution exceed the national or local standards in some region, d) planning of emission reduction, factorywise and regionwise, and e) issuance of various reports as required.

(4) Time Schedule

Table 10. 3. 3 is composed to show necessary time schedule, assuming that core officers of the project team work exclusively for the above tasks, without having any other intensive assignment.

Table 10.3.3 Time Schedule for Preparation of Stationary Source Inventory

	Task	1998			1999			2000			2001		
1	Review	→											
2	Identif.	→	→	→	→	→	→	→					
3	Legal	→	→	→									
4	Question.			→	→	→	→	→	→				
5	Training							→	→				
6	Equip.				→	→	→						
7	Measure								→	→	→		
8	Compile				→	→	→	→	→	→	→	→	

(5) Required Resources

A. Manpower

BAPEDAL shall compose a project team to implement this action plan, when it is authorized. The team needs two core officers (including one project manager) and necessary clerks to manage the project. One of them should have experience in industrial engineering.

Two EMC engineers trained for flue gas measurement in the Study will teach two trainees each from respective Kabupatens and DKI Jakarta.

Twelve Kabupaten officers are estimated in the budget below. The breakdown of the twelve is 5 for DKI Jakarta, 3 for Tangerang, and two each for Bogor and Bekasi, from the number of existing factories. They need to work for the project 100% for the first one year and in average less than 30% of their loads in the remaining project period. Car drivers will be hired temporally.

B. Investment and Expenses (in 1,000 Rp.)

1) Wages:	Core Project Officers	$2\times400\times(12\times3+4)$		=	32,000
	Clerks	50 % of the above		=	16,000
	EMC Engineers	$2\times300\times4$		=	2,400
	Kabupaten Officers	$12\times300\times(12+30\times0.3)$		=	75,600
	Kabupaten Clerks	50 % of the above		=	37,800
	Kabupaten Technicians	$16\times 200\times16$		=	51,200
		Subtotal			215,000
2) Miscellaneous Office Expenses		30% of the wages		=	64,500
3) Allowance for Outside Work		2 x 100 x 25		=	5,000
4) Equipment		SOx	$5\times30,000$	=	150,000
		NOx	$5\times30,000$	=	150,000
		PM	$5\times30,000$	=	150,000
(manual)			$5\times60,000$	=	300,000
(auto)		Others	$5\times65,000$	=	325,000
		Car	$5\times70,000$	=	350,000
			Subtotal		1,425,000
5) Wages for car drivers		$4\times500\times16$		=	32,000
ditto of EMC's		$1\times500\times4$		=	2,000
Gasoline & others for cars		6000 (liters)$\times4$		=	24,000
		TOTAL			1,767,500

TOTAL	1,767,500

Equipment costs (except cars) include consumable and spare parts sufficient for 1.5 year training and measurement operation, and do not include taxes, custom clearance fees, nor overseas transportation costs. The costs are based on the catalogue prices in Japan, 1996. The conversion rate of Japanese Yen to Indonesian Rupee is Rp. 20 to one Yen. Rp. 4,000 per liter of gasoline are estimated including gasoline, insurance, compensation for small damages, parking tickets, highway tolls, etc.

(6) Strengthening of Institutions and Legislations

As for the institutional and legislative aspects, the following preparations are definitely essential in order to implement this countermeasures :

- Reinforcement of staff in duty in BAPEDAL and L-BLH, and
- Enactment of 'Air Pollution Control Law'

(7) Evaluation

A manual for the inventory survey was finalized and handed to the counterpart agency, BAPEDAL, during the Study. Besides, technical and analytical methods for the inventory survey were successfully transferred to some BAPEDAL staff. The techniques used for inventory is simple. Under these backgrounds, implementation of the preparation of stationary source inventory can be made by BAPEDAL staff technically. In addition, this countermeasures should be carried out continuously to revise the inventory. Because the number and/or kind of stationary sources will vary with the change of the times.

During implementation of the countermeasures, its financial burden on local governments in Jabotabek area is estimated to be very limited. On the other hand, BAPEDAL has to allocate over 1,400 million Rp. as the initial investment cost for implementation. This amount can be mostly recovered by fuel taxation, raising the additional funds, and so on.

10.4 Preparation of Mobile Source Inventory in Jabotabek (3-A)

(1) Action Justification

It was demonstrated that the mobile source had the substantial impact of NOx to the ambient air in Jabotabek by the Study. However, it was based on the published emission factors adjusted to Jabotabek conditions. The emission factors based on the actual Jabotabek driving characters are required to have better inventory and its distribution in the area.

The emission factor is variable with driving speed and carrying loads. The speed is always changing due to traffic conditions, second by second. A combination of the varied speeds typical to the city or country is called a vehicle drive cycle mode or simply a cycle mode. There are two kinds of the cycle mode. One is used to certify newly produced vehicles of their emission rates, and is not subjected to frequent changes. Indonesia intends to use the ECE mode, because it is widely accepted in countries where Indonesia plans to export the vehicles. The other is site specific local cycle mode in order to estimate realistic emission factors. In Jabotabek, idling stages seem to be predominant on the congested urban roads, because traffic signal intervals are so long, and the traffic is highly congested. The individual segmental patterns composing the Jabotabek cycle mode will be completely different from those of the ECE mode which BAPEDAL is planning to introduce for the certification. The local mode and inherent emission factors shall be established for the accurate emission inventory of mobile sources in Jabotabek.

BAPEDAL and EMC obtained the Mobile Source Inventory Study Guidelines prepared by the JICA Team during the Study. The Guidelines illustrated tasks needed to prepare the inventory by using published emission factors. The Team prepared the mobile source emission inventory of Jabotabek following to the Guidelines and explained how to estimate the inventory to the Indonesian counterparts at various occasions. Therefore, BAPEDAL has the necessary technologies to do so more accurately and realisticly, if the emission factors are known for Jabotabek.

Ministry of Communication (HUB) has a chassis dynamometer system which can measure pollutants in exhaust gas of light duty vehicles such as taxis, passenger cars and motor cycles. This system will be applied for the ECE cycles to issue certificates of newly produced vehicles. From the viewpoint of emission inventory study,

another system of the chassis dynamometer system is required under the control of BAPEDAL. BAPEDAL should have a support from EMC to implement this project using the chassis dynamometer system.

(2) Objectives

The main purpose of this project is to prepare the inventory of mobile source emissions in Jabotabek. By implementing the action plan, the project will accomplish following objectives;

- Strengthening of relationship between BAPEDAL and Ministry of Communication, and local transportation agencies
- Development of partnership with GAIKINDO and PASMI
- Centralization of pollutant emission information

(3) Scope

The project is mainly divided into five components; a) collection of traffic data in each Kabupaten, b) establishment of drive cycles suitable to Jabotabek, c) establishment of a chassis dynamometer system in BAPEDAL, e) generation of emission factors of each car types suitable local traffic conditions, and f) preparation of the inventory.

Task 1: Organization of Task Force Team

BAPEDAL should organize a task force team for the project implementation. Its member will be composed of representatives of HUB, local governments, GAIKINDO and PASMI; total around ten people. BAPEDAL should lead the project and assign individual tasks to all the team member. Also BAPEDAL should find in 1999 a consultant who may be a foreigner capable of the tasks to be followed.

Task 2: Vehicle Market

BAPEDAL shall keep vehicle production and sales amounts in Jabotabek updated with the help of GAIKINDO and PASMI, by using ten categories such as 1) motorcycles and three wheeler, 2) passenger cars, 3) Taxis, 4) microbuses, 5) buses, 6) vans, 7) pick-up trucks, 8) 2-axle trucks, 9) 3-axle or more trucks and trailers, and 10) others.

Task 3: Investigation of Traffic Volume

Each traffic agency of the Kabupatens should monitor traffic volume by vehicle categories, time zones, and days. This must be a routine work for the local agency in charge. Therefore, the task itself is eliminated from the estimation of resources.

Task 4: Preparation of Cycle Mode Test Plan

BAPEDAL should prepare a test plan of drive cycle mode for individual local agencies. The drive cycle modes should be representative of a) highly congested traffic roads, b) relatively un-congested roads, and c) expressways, in each Kabupaten. The test plan will include 1) numbers of vehicle classes to be tested - (in the highly congested roads, some classes will move in the same mode, because unable to disturb the general traffic flow), 2) routes to be measured, days, and time zones, 3) items to be measured and recorded - speed changes in time under different modes of engine operation (idling, acceleration, cruising and deceleration), rpm and torque of diesels, and fuel consumption.

Task 5: Road Tests

BAPEDAL should carry out road tests for the preparation of the cycle modes. BAPEDAL has to rend a 4 wheel vehicle and two motorcycles, and has to purchase a set of test equipment. The 4 wheel vehicle carries the test equipment with a recorder of the data. One officer will instruct the driver the direction and voice to the recorder any road conditions to be noted for the data analysis. One motor cycle will drive through freely on the selected roads to the direction instructed by one officer on the back (the Ojih style). The other motorcycle will carry the test equipment and chase it as much as in the same driving patterns of the forerunner.

The test may need 2 categories (motor cycles and others) on the highly congested roads, 5 categories (motor cycles, taxis, passenger cars, large buses, and slow moving trucks) on relatively uncongested roads and expressways. The tests shall be carried out in rush hours and day time, on week days and holidays. Five routes of one hour drive will be set up for the tests in each Kabupaten. Total 240 tests (60 by the motor cycle and 160 by the 4 wheel car) shall be accomplished in each

Kabupaten. Two tests a day may be possible.

Task 6: Establishment of Cycle Modes

BAPEDAL should analyze the data and develop the Jabotabek test cycle modes. There are two methods for analysis; time segmental method and elemental statistical method. The first one is to divide the data into one time span (for example 10 minutes). And the combination of the several typical segments will be selected for the mode. The second one is to divide the data into each element of modes (idling, acceleration, cruising and deceleration) and statistically predominant elements will be combined to establish the cycle mode. A computer BAPEDAL in possession has to mobilize for the analyses.

Task 7: Purchase of Chassis Dynamometer System

BAPEDAL should specify the chassis dynamometer system with an emission gas analyzer unit, issue a bid package, analyze the bid, and issue purchase order which should include installation guidance, attendance for commissioning, and operators training. The specification will be prepared with the help of HUB, because of their hands-on experiences. As 65% of vehicles produced in Indonesia is the light duty one (taxis, passenger cars, microbus, and vans, under 3500 cc) and new environment-friendly motorcycles and buses are going to be introduced, the light duty gasoline vehicle group is recommended to be targeted for generation of emission factors by BAPEDAL at first.

The chassis dynamometer system is composed of the following:

Chassis Dynamometer - power absorption: 90 kw
maximum allowable speed: 150km/hr
maximum weight: 3500 kg

Emission Analyser (CO/CO_2, THC/O_2, NOx) Unit for gasoline engines
direct sampling and constant volume sampling

Accessories for calibration, adjustment, data recording, etc.

Task 8: Installation and Commissioning

BAPEDAL shall supervise the construction work carried out by subcontractors. Installation of the imported chassis dynamometer system shall be carried out under

the guidance of manufacture's representatives. Commissioning needs for checking the performance of the repaired or newly purchased equipment, also under the attendance and according to the specification of the manufacturers.

Task 9: Operator Training

Before commissioning, key operators shall be recruited and trained in somewhere where the similar unit is available for. The manufacturer can usually receive them for basic training and can introduce one such owner willing to receive and train them. The key operators will operate during the commissioning and simultaneously train other operators under the guidance of the representatives of the manufacturer. The training should include operation, inspection, and maintenance procedures.

Task 10: Generation of Emission Factors

BAPEDAL shall generate emission factors of the light duty vehicles using its now installed chassis dynamometer system under the Jabotabek test cycle and ECE cycle for comparison. The test shall be carried out using vehicles with different types and production years (producers × different engines × age spans) in different categories of light duty and gasoline engine.

Task 11: Collection of Emission Factors of Other Categories

BAPEDAL should ask manufacturers and importers of vehicles in other categories than the light duty gasoline vehicles through GAIKINDO and PASMI to generate or estimate related emission factors using the Jabotabek cycle modes.

Task 12: Determination of Average Emission Factor

BAPEDAL should analyze the emission test data and determine average emission factors for HC, CO, and NOx from each categorized vehicles and for each mode. SOx emissions can be estimated from the fuel consumption and fuel analyses.

Task 13: Compilation of mobile Source Inventory

BAPEDAL should calculate and compile the mobile source inventory in Jabotabek using the emission factors and following the JICA Team's Mobile Source Study Guidelines.

(4) Time Schedule

Table 10. 4. 1 is composed to show necessary time schedule for each task.

Table 10.4.1 Time Schedule for Preparation of Mobile Source Inventory in Jabotabek

Task	1997	1998	1999	2000	2001	2002	2003	2004
①								
②								
③								
④								
⑤								
⑥								
⑦								
⑧								
⑨								
⑩								
⑪								
⑫								
⑬								

(5) Required Resources

A. Initial Investment of Chassis Dynamometer System

One dynamometer for gasoline light duty vehicles:	Rp. 1,400,000,000
One emission test units:	Rp. 2,450,000,000
Subtotal	Rp. 3,850,000,000

The above cost estimate does not include tax, transportation, custom clearance fee, etc. At the site, needed are for construction and fabrication of all components including local purchase items of housing 400m^2 of 2 floors, laboratory facilities, foundation, air conditioning, etc. for one dynamometer and emission-test system.

Subtotal	Rp. 5,000,000,000
Total investment of BAPEDAL	Rp. 8,850,000,000

B. Operation and Maintenance of Chassis Dynamometer System

Two chief engineers, one gas analysis chief engineer, and six operators may need to operate the systems.

Wages: 3 engineers and 6 operators, 10 % of clerical support and 30 % of office expenses

3×450,000×1.3×1.1×12 =	Rp. 23,166,000
6×300,000×1.3×1.1×12 =	Rp. 30,888,000
Manpower Cost / Year	Rp. 54,054,000/year

Maintenance is very important for keeping the system to generate accurate and reliable data. Once a year heavy maintenance is required possibly including overhaul for whole of the chassis dynamometer and gas analysis units. Since there is no capable agent in Indonesia, BAPEDAL has to invite experts from overseas. The actual cost for this type of maintenance incurred by the Japanese owners is given below as a reference. The period required for this maintenance is one to two weeks annually for one system.

Water requirement 3,600 liters/day/system : cost negligible	
Electricity 50 kw/system (6 hours, 150 days)	
50×243.3×6×150 =	Rp. 10,950,000
Annual maintenance and spare parts (cost in Japan)	
	Rp. 96,000,000
Annual maintenance by contractors (cost in Japan)	
¥10,000,000/one system×20Rp./yen	Rp. 200,000,000
Utility and Maintenance Cost / Year	Rp. 306,950,000
Total Operation Cost / Year	Rp. 361,004,000

C. Road Test Costs in 1999 and 2000

One 4 wheel car rental with a driver	Rp.150,000/day
One motor cycle rental with a driver	Rp.70,000/day
One set of equipment for road tests	Rp. 4,000,000
One 'Recorder and Writer'	Rp. 4,000,000
Soft wares to decode the obtained data	Rp.20,000,000
Subtotal in 1999	Rp.28,000,000
2 Officers (wage, out of office allowance, expences)	
2×12×450,000×1.3 =	Rp.14,040,000
Rental vehicles 80×150,000+30×70,000 =	Rp.14,100,000

Subtotal in 2000 Rp.28,140,000

Total Rp.56,140,000

D. Foreign Consultant

BAPEDAL should contract at the middle of 2000 with a qualified consultant and retain him or her to the middle of 2002. The work load of the consultant will be 100% in 2001 and 50% in 2000 and 2002 in Jabotabek.

One consultant, monthly fee	Rp.	40,000,000/Month
One consultant, expenses in Jabotabek	Rp.	15,000,000/Month
One round airfare of a overseas trip	Rp.	7,000,000

E. BAPEDAL's Other Expences

BAPEDAL needs two officers, one 100% and the other 50% of work load from 1998 to 2001, and one officer with 25% work load in 2002 and 2003. In 2004, two full time officers will be needed in BAPEDAL. Two officers in 2000 for the road tests, and 3 officers and 6 operators of the chassis dynamometer system operation have been counted in the above respective section.

The task force member (10 for the estimate) will meet monthly until the end of the project.

One officer wage with supporting clerk and office expenses

Rp.7,020,000/year

	1998	1999	2000	2001	2002	2003	2004
Officer Wage	10.53	10.53	10.53	10.53	1.76	1.75	14.04
Task meetings	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Chassis Dynamo.		3,850	2,500	2,554.05	361.00	361.00	--
Road test	--	28	28.14		--	--	--
Consult's M. Fee	--		240	480	240	--	--
C. in Jabotabek	--		90	180	90	--	--
Consultant's Trip	--		14	14	7	--	--
Total	11.13	3,889.13	2,883.27	3,239.18	700.36	363.35	14.64

in million Rp.

(6) Strengthening of Institutions and Legislations

Institutionally this project will expand BAPEDAL's power over the mobile industry drastically and increase its capability to point out .

(7) Evaluation

BAPEDAL has little technical experience in running chassisdynamometer system. However, there has existed in Bekasi a set of the system owned by the Ministry of Communication (HUB) for about 15 years. So HUB has technical experiences in running chassisdynamometer system. Accordingly, it is necessary that BAPEDAL obtain a technical cooperation concerning chassisdynamometer system from HUB.

Major cost of these countermeasures is for investment of chassisdynamometer system installation. The initial investment cost and the foreign consultant fee for this countermeasures is beyond BAPEDAL's regular budget for environmental consrevation. Thus this financial deficiency should be covered by raising the additional funds.

As in the time schedule of table 10.4.1, mobile source inventory would be prepared within 2004. Therefore, no budget is given from 2005 for the operation of the chassisdynamometer system. However, such kind of the emission measurement should be continued to the future to obtain more accurate data for each engine type, production year, and age span. For example, compilation of emission factors by Japan Environment Agency show more than 900 samples for one regulation category of gasoline passenger car. When new type of emission control device or low emission vehicle are introduced in the market, new investigation will be necessary with the chassisdynamometer system. The mobile source inventory will be also revised according to the change of vehicle compositions of Jabotabek in the future, probably in 3 to 5 years interval.

References

REFERENCES

01 to 38: Collected in April, 1994 by the Preparatory Study Team
41 to 59: Collected in December, 1994 by the JICA Study Team
61 to 100: Collected in February, 1995 by ditto
101 to 121: Collected in August, 1995 by ditto
130 to 142 : Collected in December, 1995 by ditto
148 to 184 : Collected in January to March, 1996 by ditto
188 to 224 : Collected in June to August, 1996 by ditto
225 to 258 : Collected in November 1996 to February, 1997 by ditto

01
Author: OECC (Japan)
Title: Kankyou hozen gijutsu iten sokushin chousa houkokusho (Indonesia Chukan Hokoku) (J)
Source: OECC, 3/1993

02
Author: Mott MacDonald Environmental Consultants, et al.
Title: 3rd JABOTABEK Urban Development Project (JUDP III), Environmental Component 2, Part B, Phase 1
Source: BAPEDAL, 10/1993

03
Author: ditto
Title: ditto, Phase 2
Source: ditto, 2/1994

04
Author: Institut Teknologi Bandung, Lembaga Pengabdian Pada Masyarakat
Title: LLAJR Air Pollution Monitoring and Control, Executive Summary
Source: Ministry of Communications, Year

05
Author: ditto
Title: ditto, Final Report
Source: ditto, after 10/1993

06
Author: ditto
Title: ditto, Appendix
Source: ditto, Year:ditto

07
Author: NILU and Inst. for Environmental Studies
Title: URBAIR - Urban Air Quality Management in Jakarta: Draft of AQM Guidelines (Part A)
Source: Author, 4/1993

08
Author: ditto
Title: ditto: (Part B)
Source: ditto, Year:ditto

09
Author: J.H.Kozak, et al
Title: An Overview of Air Pollution in Indonesia
Source: EMDI Publications, 7/1992

10
Author: ditto
Title: Environmental Management Development in Indonesia - Air Quality Monitoring Networks in Indonesia 1991
Source: CIDA, 6/1992

11
Author: Environmental Manpower Development in Indonesia
Title: Environmental Linkages
Source: The Inst. for Resources and Envir. Studies, 10/1984

12
Author: World Bank Country Department III
Title: Indonesia - Energy and the Environment: Making Polluters Pay and other Remedies
Source: World Bank, 5/1993

13
Author: ditto
Title: ditto: A Plan of Action for Pollution Control
Source: World Bank, 6/1993

14
Author: Supat Wangwongwatana, et al.
Title: Megacity Strategies to Reduce Emissions from Vehicles, Vol II
Source: World Environment Center, 8/1992

15
Author: PT. Innerindo Dinamika
Title: Konsep Laporan Akhir - Studi Evaluasi Lingkungan Proyek Pembangunan Jalan Kranji Fly Over
Source: Departemen Pekerjaan Umum, 11/1992

16
Author: R.D. Tamin et al.
Title: Air Pollution Control Strategy in Indonesia
Source: BAPEDAL, 12/1993

17
Author: RTM. Sutamiardja
Title: Policy and Strategy on Air Quality Management in Indonesia
Source: Proceedings (The expert meet. on acid prepicitation--10/1993

18
Author: S.M. Lubis
Title: Acid Precipitation in Indonesia
Source: ditto, 10/1993

19
Author: S. Sastromijoyo
Title: Implementation of the Environmental Impact Assessment Process in the Ministry of Public Works
Source: Workshop on EIA in Indonesia, 4/1990

20
Author: Muhammad Yusuf
Title: Policies Concerning Performance, and Equipment, Related Requirement in Exhaust Gas Regulations
Source: Directorate General of Land Transportation, M. of Communications, 6/1993

21
Author: Department of Information
Title: Indonesia 1994 - An Official Handbook
Source: Department of Information, 12/1993

22
Author:
Title: Jakarta in Figures
Source: Jakarta Statistical Office, 1992

23
Author:
Title: Vehicles and Length of Road Statistics
Source: Biro Pusat Staistik, 1989

24
Author:
Title: Environmental Management Center - catalogue
Source: EMC, 8/1993

25
Author: EMC
Title: Indonesia Kankyoukanri Senter Gaiyou (J)
Source: EMC, 4/1994

26
Author: JICA Team for Project Type Technical Cooperation on EMC
Title: Facilities of EMC
Source:

27
Author: Catalogue
Title: Urban and Environmental Aspect in DKI Jakarta
Source: KPPL, 12/1993

28
Author: Catalogue
Title: Department of Communication, Directorate General of Land Transportation
Source: Board Motor Vehicle for Road Worthiness and Certification

29
Author:
Title: Environmental Guidelines for D.G. Bina Marga Road Projects
Source: Departemen Pekerjaan Umum, 10/1989

30
Author: BAPEDAL
Title: TOR for the Staff Acquisition and Human Resources Development and Management
Source: BAPEDAL Development Technical Assistance Project, 1993

31
Author: ditto
Title: TOR for the BAPEDAL Training Program
Source: ditto, year: ditto

32
Author: Biro Bina Lingkungan Hidup, et al.
Title: Program Udara Bersih (Clean Air Program) (draft)
Source: Pemerintah Daerah Khusus Ibukota Jakarta, 1993

33
Author: K.E.Gronskei, et al.
Title: URBAIR Jakarta City Specific Report
Source: NILU, 5/1994

34
Author: Steiner Larssen
Title: Project Proposal
Source: NILU, 6/1994

35
Author: ditto
Title: TELEFAX
Source: NILU, 9/1994

36
Author: F. Gram and T. Bohler
Title: User's Guide for the KILDER Supporting Program (Draft Report)
Source: NILU, 6/1992

37
Author: ditto
Title: User's Guide for the KILDER Dispersion Modelling System
Source: NILU, 5/1992

38
Author: T.Bohler, et al.
Title: Model Calculations of Long Term Average Concentrations of SO2, NOx, and SPM in Delhi
Source: NILU, 12/1992

39
Author: F.Gram
Title: WINDFREC, STABFREC and METFREC Meteorological Programs Users Guide
Source: NILU, 12/1992

41
Author: R.I Mann
Title: 1995 Guide to INDUSTRIAL ESTATES in Indonesia
Source: Gateway Books, Toronto

42
Author: G.W. Holterf
Title: JAKARTA - 10. Edition '93/94
Source: Falk-verlag Gmbh, 1993

43
Author: C. Brandon et al.
Title: Toward an Environmental Strategy for Asia
Source: World Bank, 1993

44
Author: A World Bank Country Study
Title: Indonesia - Environment and Development
Source: World Bank, 1994

45
Author: Country Department III
Title: Indonesia - Energy and the Environment: A Plan of Action for Pollution Control (draft)
Source: World Bank, 1994

46
Author: Environment & Natural Resources Div.
Title: Environmental Considerations for Cleaner Transport Fuels: Technical Options (draft)
Source: World Bank, 11/1994

47
Author: ASEAN Heads of Governments Meetings
Title: Energy in Asia
Source: AEEMTRC, 8/1993

48
Author: AEEMTRC
Title: Our Mission:
Source: AEEMTRC, 9/1993

49
Author: Institute Technology Bandung
Title: Draft Final Report - URBAIR Development of an Action Plan for Jakarta
Source: Draft NILU, 1994

50
Author: GAIKINDO
Title: Profile of GAIKINDO
Source: GAIKINDO, 1992

51
Author:
Title: Lokasi Industri Dasar/Kunci Yang Dapat
Source: Departemen Perindustrian, 7/1988

52
Author: EMC
Title: 1. Main Equipment Used for Air Quality Analysis and Monitoring
Source: EMC

53
Author: G.M. Johnson, et al.
Title: A Univeral Monitor for Photochemical Smog
Source: Air & Waste Management, Proceedings, 6/1989

54
Author: G.M. Johnson
Title: Airtrak and the IER Model
Source: Third US/FRG/CEC Workshop, 7/1992

55
Author: Catalogue
Title: AIRTRAK 2000
Source: Airtrak

56
Author: BMG
Title: List of Air Pollution Station in Indonesia and the Monitored Parameter
Source: BMG

57
Author: LEMIGAS
Title: Analysis of Crude oil, Petroleum Product and Others - Price Schedule (Effective 1/1/1993)
Source: LEMIGAS

58
Author: Yang Dilakukan Oleh
Title: Daftar Jenis Uji
Source: LEMIGAS

59
Author:
Title: Jenis Tanah (Kabuputen - Bekasi, Dati II Bogor, DKI Jakarta, Dati II Tangerang)
Source:

60
Author:
Title: Statistik Lingkungan Hidup Indonesia 1993 (equel to No. 112)
Source: Biro Pusat Statistik, 1994

61
Author:
Title: Statistics Indonesia 1993
Source: Biro Pusat Statistik, 1/1994

62
Author:
Title: Jakarta Dalam Angka 1994
Source: Kantor Statistik Propinci: DKI Jakarta, 11/1994

63
Author:
Title: Kotamadya Bogor Dalam Angka 1992
Source: Kantor Statistik Kotamadya Bogor

64
Author:
Title: Kabupaten Bogor Dalam Angka 1992
Source: Kantor Statistik Kabupaten Bogor

65
Author:
Title: Kabupaten Bekasi Dalam Angka 1992
Source: Kantor Statistik Kabupaten Bekasi

66
Author:
Title: Tangerang Dalam Angka 1992
Source: Kantor Statistik Kabupaten Tangerang

67
Author:
Title: Repelita VI
Source: Bappenas

68
Author:
Title: Jakarta Map (1/20,000)
Source: C.V. Indo Buwana, 1995

69
Author:
Title: DKI Jakarta Map (1/20,000)
Source: C.V. Prandika, 1994

70
Author:
Title: JABOTABEK Map (1/70,000)
Source: C.V. Indo Buwana, 1995

71
Author:
Title: JAWA Barat Map (1/500,000)
Source: C.V. Pradika, 1995

72
Author:
Title: Average Daily Traffic
Source: Bipran, Bina Marga, PU, 1994

73
Author:
Title: Petunjuk Survai Permitungan Lalu Lintas
Source: Bipran, Bina Marga, PU

74
Author:
Title: Data Capture and Processing, Verification and Control
Source: Bipran, Bina Marga, PU, 1986

75
Author:
Title: Survai Jaringan Jl. Perkotaan, Laporan Kompilasi Data
Source: Binkot, Bina Marga, PU, 1993

76
Author:
Title: ditto, Laporan Kompilasi Data Primer, Kotamadya Jakarta Pusat
Source: Binkot, Bina Marga, PU, 1993

77
Author:
Title: ditto, Kotamadya Jakarta Timur
Source: Binkot, Bina Marga, PU, 1993

78
Author:
Title: ditto, Kotamadya Jakarta Barat
Source: Binkot, Bina Marga, PU, 1993

79
Author:
Title: ditto, Kotamadya Jakarta Selatan
Source: Binkot, Bina Marga, PU, 1993

80
Author:
Title: ditto, Kotamadya Jakarta Utara
Source: Binkot, Bina Marga, PU, 1993

81
Author:
Title: ditto, Laporan Data Mentah, Wilayah Jakarta Pusat
Source: Binkot, Bina Marga, PU, 1993

82
Author:
Title: Survai Jaringan Jl. Perkataan, Laporan Data Mentah, Wilayah Jakarta Timur
Source: Binkot, Bina Marga, PU, 1993

83
Author:
Title: ditto, Wilayah Jakarta Barat
Source: Binkot, Bina Marga, PU, 1993

84
Author:
Title: ditto, Wilayah Jakarta Selatan
Source: Binkot, Bina Marga, PU, 1993

85
Author:
Title: ditto, Wilayah Jakarta Utara
Source: Binkot, Bina Marga, PU, 1993

86
Author:
Title: Informasi Perhubungan Udara dan Potensi Wilayah
Source: Ditjen Perhubungan Udara, HUB, 12/1994

87
Author:
Title: Aerodrome Chart - ICAO
Source: Ditjen Perhubungan Udara, HUB, 1/1991

88
Author:
Title: Instrument Approach Chart - ICAO
Source: Ditjen Perhubungan Udara, HUB, 1/1991

89
Author:
Title: Standard Instrument Arrival (STAR)
Source: Ditjen Perhubungan Udara, HUB, 1/1991

90
Author:
Title: Laporan Survey dan Penelitian Traffic Count
Source: Subdis Bina Program, DLLAJ-DKI,1993

91
Author:
Title: Studi Travel Time, Laporan Akhir
Source: DLLAJ-DKI, 1/1994

92
Author:
Title: Survai dan Penelitian Travel Time, Laporankedua
Source: ditto, 1994

93
Author: PT Capricorn Indonesia Consult Inc.
Title: Indonesian Manufacturer Directory, 1993/1994
Source: PT C.I.C.

94
Author: ditto
Title: Office Building in Central Jakarta
Source: ditto

95
Author: EMC Air Quality Laboratory in Indonesia
Title: Annual Report on Air Quality Monitoring and Studies
Source: EMC, 1994

96
Author: EMC
Title: Environmental Monitoring Data
Source: EMC, 1/1995

97
Author: Environment Impact Control Committee
Title: Langit Biru (1) Pollution Control of Smoke from Motorized Vehicles
Source: 6/1992

98
Author: ditto
Title: ditto (2) Smoke Pollution Control from Immobile Sources
Source: 6/1992

99
Author: Urbair
Title: Proposed Air Poll. Control Strategy & Measures for Jakarta
Source: for Jakarta 3/95, World Bank

100
Author: Ridwan D Tamin et. al.
Title: Air Pollution Control Strategy in Indonesia
Source: 12/1993

101
Author: Departmen Perindustrian
Title: Pengendalian Pencemaran Udara Pada Sektor Industri
Source: Pudlitang Sumber Daya, Parasarana & Wilaya Industri Badan Litbang Industri (5/1994)

102
Author: ditto
Title: Tinjauan Umum Terhadap Pelaksanaan Pencemaran Industri Di Indonesia
Source: Ministry of Industry, IPCAJ/MITI Japan Workshop (11/1992)

103
Author: KPPL
Title: Urban & Environmental Aspect in DKI Jakarta
Source: DKI KPPL (12/1993)

104
Author: Menteri Negara Ligkungan Hidup
Title: Ambang Batas Emisi Gas Buang Kendaraan Bermotor
Source: BAPEDAL KEP-35/MENLH10 (1993)

105
Author: Kepala BAPEDAL
Title: Organization & work procedures of the agency for Environmental impact control (English Edition)
Source: BAPEDAL KEP-01 (1990)

106
Author: World Bank
Title: Indonesia Energy and the Environment: A Plan of Action for Pollution Control
Source: WB Country Dept. III, East Asia and Pacific Region (3/1994)

107
Author:
Title: Third JABOTABEK Urban Development Project (JUDP III), Summary Report
Source: (6/1994)

108
Author: EMC Air Quality Laboratory in Indonesia
Title: Annual Report on Air Quality Monitoring and Studies
Source: EMC, 1994

109
Author: K.E.Gronskei, et al.
Title: URBAIR Jakarta City Specific Report
Source: NILU, 5/1994

110
Author: Decree of the State Minister for Environment
Title: Emission Standards for Stationary Sources
Source: BAPEDAL KEP-13/MENLH/3 (1995)

111
Author: Ministry of Health
Title: National Mechanism for Health Research Coodination and Management in Indonesia
Source: MOH National Institute of Health Research and Development (1986)

112
Author: Biro Pusat Statistik
Title: Statistik Lingkungan Hidup Indonesia (equel to No. 60)
Source: BPS (1994)

113
Author: Motokazu Iwata
Title: Indonesia No Kankyou Mondai (J)
Source: Koshu Eisei Kenkyu Vol.44, No.1, p28-33 (1995)

114
Author: Presidential Decree 77 of 1994
Title: The Environmental Impact Management Agency (English Ed.)
Source: Nov, 22(1994)

115
Author: A. Tri Tugasawati, Sukar & Athena Anwar
Title: Monitoring Pencemaran Udara Di Jakarta 1993/1994
Source: BPDPK, Pusat Penelitan Ekologi Kesehatan (1994)

116
Author: Sarwono Kusamaatmadja
Title: Relevansi ISO Seri 14000 Dengan Dunia Usaha Di Indonesia
Source: Kerjasama BAPEDAL-PCI Project-DSN (8/1995)

117
Author: MSX International Ltd.
Title: Jap. Firms, Businesses and Representatives in Indonesia
Source: MSX International Ltd. (12/1995)

118
Author: Motto MacDonald Environmental Consultants, etc.,
Title: The Third JUDP III, Environmental Component 2, p1-p31
Source: BAPEDAL, June 1994

119
Author: ditto
Title: ditto, Chapter 4, p56-p88
Source: ditto

120
Author: ditto
Title: ditto, Chapter 6, p108-p118
Source: ditto

121
Author: Statistics Indonesia 1994
Title:
Source: 1/1995

131
Author: Motto MacDonald Environmental Consultants, etc.,
Title: The Third JUDP III, Environmental Component 2, p89-p107
Source: BAPEDAL, June 1994

132
Author: Motto MacDonald Environmental Consultants, etc.,
Title: The Third JUDP III, Environmental Component 2, p140-p166
Source: BAPEDAL, June 1994

133
Author: Agus Nurrohim, st. al.
Title: Technological options of air pollution abatement, cost, and benefits
Source: BPPT, >5/1993

134
Author:
Title: Jabotabek Metropolitan Development Plan Review(JMDPR), Development Features and Trends in Jabotabek-1990-2000-2010
Source: MOPW, 1993

135
Author: David D. Cohen
Title: Environmental Pollutants Monitoring Network Using Nuclear Techniques
Source: 9th Pacific Basin Nuclear Conference, Sydney 5/1994

136
Author: Michael G Mowle, et. al.
Title: Study of Atmospheric Particles in the Jakarta Region
Source: Seminar at BAPEDAL, 10/1995

137
Author: BAPEDAL PCI Project
Title: Six Monthly Progress Report to 12/1994
Source: PCI

138
Author: ditto
Title: ditto to 6/1995
Source: ditto

139
Author: Mike Mowle
Title: Air Pollution and the Vehicle Emission Control Program - Internal Report for Discussion
Source: BAPEDAL & PCI, 8/1994

140
Author: Indonesia-Australia Pollution Control Cooperation
Title: BAPEDAL and East Java Pollution Control Implementaation (PCI) Project
Source: PCI, Catalogue

141
Author: BAPEDAL
Title: BAPEDAL
Source: 10/1995, Catalogue

142
Author:
Title: Bahn Bakar Minyak - untuk Kendaraan Bennoto Diesel, Industri dan Perkapalan
Source: PERTAMINA, 1991

148
Author:
Title: Mining Statistics of Petroleum and Natural Gas of Indonesia, 1993
Source: Biro Pusat Statistik, Jakarta

149
Author:
Title: Mining Statistics Excluding Petroleum & Natural Gas of Indonesia, 1993
Source: Biro Pusat Statistik, Jakarta

150
Author:
Title: Electricity and City Gas Statistics, 1993
Source: Biro Pusat Statistik, Jakarta

151
Author:
Title: Statistik Wilayah DKI 1994
Source: Kantor Statistik Propinci DKI Jakarta

152
Author:
Title: Kotamadya Bogor Dalam Angka 1993
Source: Kantor Statistik Kotamadya Bogor

153
Author:
Title: Kabupaten Bogor Dalam Angka 1994
Source: Kantor Statistik Kabupaten Bogor

154
Author:
Title: Kabupaten Bekasi Dalam Angka 1994
Source: Kantor Statistik Kabupaten Bekasi

155
Author:
Title: Kotamadya Tangerang Dalam Angka 1993
Source: Kantor Statistik Kotamadya Tangerang

156
Author:
Title: Kabupaten Tangerang Dalam Angka Tahun 1994
Source: Kantor Statistik Kabupaten Tangerang

157
Author:
Title: Jakarta 2005
Source: Pemerintah Daerah Khusus Ibukota Jakarta

158
Author:
Title: Program Pembangunan Jalan Tol, Dalam Repelita 6
Source: Bina Marga, PU

159
Author:
Title: Blok M - Kota Mass Rapid Transit Project
Source: City Government of DKI Jakarta, Joint Working Group

160
Author:
Title: JABOTABEK Urban Mass Transit Preparation Program, Consolidated Network Proposal
Source: Ministry of Communications, Inter-Departmental Working Group(2/1993)

161
Author:
Title: Jumlah Kendaraan Taksi, Mikrolet & Bus PPD Di DKI Jakarta
Source:

162
Author:
Title: Realisasi Penjualan BBM,LPG dan BBG Tahun 1985/86 S/D 1994/95
Source: PERTAMINA

163
Author:
Title: Spesifikasi
Source: PERTAMINA

164
Author:
Title: Bahan Bakar Minyak
Source: Untuk Kenderaan Bermotor Diesel, Industri dan Perkapalan

165
Author:
Title: Bahan Bakar Gas
Source: Produk PERTAMINA

166
Author:
Title: Board Motor Vehicle for Certification, Catalogue
Source: Department of Communication, Directorate General of Land Transportation

167
Author:
Title: Petunjuk Cara Menguji Kendaraan Bermotor
Source: Balai Pengujian Laik Jalan dan Sertifikasi Kendaraan Bermotor

168
Author:
Title: Peta Penggunaan Tanah Daerah Khusus Ibukota Jakarta (1/50,000)
Source:

169
Author:
Title: Pemerintan Daerah Khusus Ibukota Jakarta, Data Pokok Pembangunan Daerah
Source: Kantor Wilayah Badan Pertanahan Nasional (1993)

170
Author:
Title: Kaihatsu Tojyoukoku Koutuu Kougai Taisaku Kyouryoku Keikaku Ni Tsuite (Eco-transport Keikaku) (J)
Source: Unyu-Seisaku-Kyoku, Kokusai-Gyoumu, Dai-Ni-Ka, 1993.9

171
Author:
Title: List of Publications' December 1995
Source: Biro Pusat Statistik(BPS)

172
Author:
Title: Study on Solid Waste Management System Improvement Project in the City of Jakarta in Indonesia : Final Report
Source: JICA, Nov.1987

173
Author:
Title: Feasibility Study on Urban Arterial Road System Development Project in Jakarta Metropolitan Area
Source: JICA, January 1995

174
Author:
Title: Summary of Economic Statistics
Source: BPS,Aug.1995

175
Author:
Title: The Study on Comprehensive River Water Management Plan in Jabotabek, Interim Report
Source: JICA, March 1996

176
Author: H.A.D.Lamey
Title: Evaluasi Dan Prospek Pengembangan Jabotabek Nilai Dari Potensi Sukses Faktor Bisnis Dan Manajemen
Source: Badan Kerja Sama Pembangunan Jabotabek,Oct.1995

177
Author: H.A.D.Lamey
Title: Strategi Perencanaan Transportasi Makro Wilayah Jabotabek
Source: Badan Kerja Sama Pembangunan Jabotabek,Nov.1995

178
Author:
Title: Estimating the Health Effects of Air Pollutants:A Method with an Application to Jakarta,Policy Research Working Paper 1301
Source: WB,May 1994

179
Author:
Title: Indonesia Demographic and Health Survey 1994
Source: Ministry of Health(MOH) et al.,Oct.1995

180
Author:
Title: Indonesia Demographic and Health Survey 1994 : Summary Report
Source: Ministry of Health(MOH)et al.,Oct.1995

181
Author:
Title: Perencanaan Strategi Sama Antar Kota Dalam Rangka Pengembangan Kota Di Negara Kesatuan Republik Indonesia : Implemantasinya Di Wilayah Jabotabek
Source: Badan Kerja Sama Pembangunan Jabotabek, July 1994

182
Author:
Title: Indonesia Environment and Development : Challenges for the Future
Source: WB,March 1994

183
Author:
Title: Indonesia Health Planning and Budgeting
Source: WB,1989

184
Author:
Title: Republic Indonesia 6th 5years development plan(reference) FY1994-1998 Repelita VI
Source: Indonesia - Japan Bussiness Service, 1994.8

188
Author: Y.Kiryu, et.al.
Title: Effects of Health of Atmospheric Lead in Roadside Exposure in Jakarta
Source: Environmental Health and Preventive Medicine,p.9 Vol.1, No.1, 4/96

189
Author: Agustiah Tri-Tugaswati, et.al.
Title: Automotive air pollution in Jakarta with spicial emphasis on lead,particulate,and nitrogen dioxide
Source: J.of Health and Human Ecology (J),p.261,Vol.61,No.5,9/1995

190
Author: Rob Crooks,et. al.
Title: Review of environmental assessment and management experience in Indonesia
Source: World Bank, Environment Dept. Paper N0.025

191
Author: BAPEDAL
Title: KEPUTUSAN - MENTERI NEGARA KEPENDUDUKAN DAN LINGKUNGAN HIDUP ; NOMOR : KEP-02/MENKLH/1/1988 (p34 Air quality standards)
Source: BAPEDAL,1991

192
Author: KPPL
Title: LOKAKARYA-BAKU MUKU UDARA AMBIEN DAN KEBISINGAN DI WILAYAH DKI JAKARTA (Proposed air quality standards)
Source: KPPL,Aug/24/1995

193
Author: DKI Jakarta
Title: KEPUTUSAN GUBERNUR KEPALA DAERAH KHUSUS IBUKOTO JAKARTA-No.587, Tahun 1980 (DKI Jakarta air quality standards)
Source: DKI Jakarta, June,1980

194
Author: Hideo Ohuchi
Title: TOR-Promotion for harmonized production system with environment(Original proposal)
Source: Ministry of Industry and Trade,Jan./1996

195
Author: BAKOREN(Badan Koordinasi Energi Nasional)
Title: Rencana Induk Konservasi Energi Nacional
Source: BAKOREN,Feb/1995;

196
Author: BAKOREN
Title: National Energy Policy
Source: BAKOREN,SEPT/1991;

197
Author: Proyek pengembangan Briket Batubara
Title: Memasak Dengan Briket Batubara (promotion of briqutte coal)
Source: Depart.Pertambangan dan Energi,year?

198
Author: Mott MacDonald Envionmental Consultants,et al.
Title: JUDP III Environmental Componetnt 2,Phase II Report
Source: BAPEDAL,Feb/1994;

199
Author: URBAIR
Title: Proposed Air Pollution Control Strategy and Measures for Jakarta
Source: World Bank, June/1995

200
Author:
Title: Statistik Kendaraan Bermotor dan Paniang Jalan (vehicles and Length of Road statistics)
Source: BPS,1994

201
Author:
Title: Statistik Angkutan Udara (Air Transport Statistics)
Source: BPS,1994

202
Author:
Title: Initial Report-Study of fine atmospheric particles and gases in the Jakarta region
Source: Physics Division-ANSTO,Atmospheric Reseach-CSIRO; 3/96

203
Author:
Title: Interim Report 2-ditto
Source: ditto,July/1996

204
Author:
Title: Tangerang map (1/60,000)
Source: C.V. Prodika

205
Author:
Title: Bekasi map (1/72,500)
Source: C.V. Prodika

206
Author:
Title: Bogor map (1/100,000)
Source: PT. Fitratama Sempana Takerta

207
Author:
Title: PETA PENGGUNAAN TANAH Daerah Khusus Ibukota (1/50,000)
Source: Dimes Pemetaan dan Pengukuran Tanah P.K.I

208
Author:
Title: COMPILATION OF AIR POLLUTANT EMISSION FACTORS Volume I : Stationary Point And Area Sources
Source: U.S. Environmental Protection Agency September 1985

209
Author:
Title: Proyksi Penduduk Indonesia per kabupaten/kotamadya 1990-2000
Source: BPS, 1994

210
Author:
Title: Power Generation of Muarakaran and Priok 1990～1994
Source: BAPEDAL

211
Author:
Title: Jumlah Pemakai Batubara di Wilayah Jabotabek 94/95～95/96
Source: Directorat Batubara

212
Author:
Title: Average Quality of Coal
Source: Directorat Batubara

213
Author:
Title: Realisasi Pemanfastan Gas Bumi Di Jakarta, Bogor, Bekasi dan Tangerang Periode 1986/87 S/D 1995/96
Source: BAPEDAL

214
Author:
Title: Data Pemakaian Gas Untuk Wilayah Jakarta, Bekasi Dan Tangerang Rentang Waktu 10 Tahun Terakhir
Source: BAPEDAL

215
Author:
Title: Data Pemakaian Gas Dari Tahun 1986 s/d 1996
Source: Perusahaan Umum Gas Negara Cabang Bogor

216
Author;
Title: Specifikasi Bahan Bakar Gas
Source: BAPEDAL

217
Author: Japan Environment Agency
Title: Total Emission Control Manual for Nitrogen Oxides (revised) (J)
Source: Japan Environment Agency, 1993

218
Author:
Title: Study on Air Pollutant Emission Factors of Stationary Combustion Facilities (J)
Source: Japan Environment Agency July 1976

219
Author:
Title: Annual Cement Production in JABOTABEK 1986~1995
Source: BAPEDAL

220
Author: Francois Raillon
Title: INDONESIA 2000, The industrial and technological challenge
Source: CNPF-ETP & Cipta Kreatif

221
Author:
Title: Yearly Cement Production in Jabotabek
Source: BAPEDAL

222
Author: Japan Environment Agency
Title: Study on Air Pollutant Emission Factors of Stationary Combustion Facilities, March 1978
Source: Japan Environment Agency

223
Author:
Title: General Energy Statistics, 1995
Source: Agency of Natural Resources and Energy of Japan

224
Author:
Title: Handbook on Economy, 1995
Source: Economic Planning Agency of Japan

225
Author: Decree of the State Minister for Environment
Title: Blue Sky Program Implementation
Source: BAPEDAL KEP-15/MENLH/4/1996

226
Author: Decree of the State Minister for Environment
Title: Stipulation of the Priority Province Region Level I as the Implementer of Blue Sky Program
Source: BAPEDAL KEP-16/MENLH/4/1996

227
Author: Keputusan Kepala Badan Pengendalian Dampak Lingkungan
Title: Pedoman teknis Pengendalian Pencemaran Udara
Source: KEP.205/BAPEDAL/07/1996

228
Author: BAPEDAL
Title: Strategy and Program Directorate for Air Pollution Control
Source: BAPEDAL/1996

229
Author: Dra. A. Tri Tugaswati, et al.
Title: Penelitian Monitoring Pencemaran Udara Di Jakarta 1994/1995
Source: Pusat Penelitian Ekologi Kesehatan

230
Author:
Title: Laporan Pemantauan Kualitas Udara Di Wilayah DKI Jakarta 1994/1995
Source: Kantor Pengkajian Perkotaan Dan Lingkungan DKI Jakarta

231
Author:
Title: Laporan Lingkungan Jakarta 1995-1996 Udara Dan Kebisingan
Source: Kantor Pengkajian Perkotaan Dan Lingkungan DKI Jakarta

232
Author: G.J.Atihuta
Title: Rencana Meniadakan Timbal Dalam Mogas
Source: PERTAMINA

233
Author: UNEP&WHO
Title: Urban Air Pollution in Megacities of the World
Source: UNEP&WHO, 1992

234
Author: Department of Environment, Ministry of Science
Title: MALAYSIA ENVIRONMENTAL QUALITY REPORT 1995
Source: Technology and the Environment Malaysia

235
Author: Japan Environment Agency
Title: Measurement Report of Ambient Air Monitoring Stations
Source: Japan Environment Agency, 1996

236
Author: N.Fukuzaki
Title: Mercury in Atmospheric Environment
Source: Journal of Japan Society of Air Pollution, 1988

237
Author: H.Matsushita et al.
Title: Comparison of Carcinogenic Polyaromatic Hydrocarbon Concentrations in Suspended Particulate of Tokyo, Bangkok, and Chiang Mai
Source: Journal of Japan Society of Air Pollution, 1988

238
Author: Japan Environment Agency
Title: Automobile Emission Factors under Actual Driving Condition
Source: Japan Environment Agency, 1994

239
Author: Japan Environment Agency
Title: Report on Emission Condition Study from Uncontrolled Vehicle
Source: Japan Environment Agency, 1995

240
Author: U.S. Environmental Protection Agency
Title: COMPILATION OF AIR POLLUTANT EMISSION FACTORS Volume II : Mobile Sources
Source: U.S. Environmental Protection Agency, September 1985

241
Author: S.M. Lubis, Bapedal
Title: State of Urban Pollution and the Emission Control Strategies in Indonesia
Source: Symposium on Motorisation and the Environment in Asian Countries, 1992

242
Author: Japan Automobile Promotion Association
Title: Japanese Motor Vehicle Guidebook
Source: Japan Automobile Promotion Association, 1994-1995

243
Author: F.Gram and S.Larssen
Title: Transfer of the URBAIR Jakarta model and data base to the Integrated Air Pollution Study in Jakarta
Source: NILU 1995

244
Author: BPPT and KFA
Title: Environmental Impacts of Energy Strategies for Indonesia
Air Quality Model for the Traffic Sector Data, Modeling and Results
Source: BPPT, 1992

245
Author: ANGKASA PURA II
Title: STATISTIK ANGKUTAN UDARA TAHUN 1995
Source: ANGKASA PURA II, 1995

246
Author: Japan Environment Agency
Title: Analysis and Simulation of SPM Pollution (J)
Source: Japan Environment Agency, 1987

247
Author: Tokyo Metropolitan Government
Title: Estimation of Vehicle Exhaust Gas Emission in Tokyo Metropolitan Area (J)
Source: Tokyo Metropolitan Government, 1987

248
Author: Japan Gas Association
Title: To Spread CNG Vehicle (J)
Source: Japan Gas Association, 1996

249
Author: UNDP
Title: DEVELOPMENT CO-OPERATION INDONESIA 1994 REPORT
Source: UNDP, December 1995

250
Author: Culpin Planning Ltd., Huszar Brammah and Associates Ltd., PT. LENGGOGENI, Lembaga Penelitian Perencanaan Wilayah dan Kota (LPP-ITB)
Title: JMDPR(Jabotabek Metropolitan Development Plan Review), Development Features and Trends in Jabotabek -1990-2000-2010, Economy Technical Report
Source: Government of the Reublic Indonesia, Ministry of Public Works, Directorate General of Human Settlements, January 1993

251
Author: Culpin Planning Ltd., Huszar Brammah and Associates Ltd., PT. LENGGOGENI, Lembaga Penelitian Perencanaan Wilayah dan Kota (LPP-ITB)
Title: JMDPR(Jabotabek Metropolitan Development Plan Review), Environmental Concerns for Jabotabek, Second Planning Report
Source: Government of the Reublic Indonesia, Ministry of Public Works, Directorate General of Human Settlements, April 1993

252
Author: Culpin Planning Ltd., Huszar Brammah and Associates Ltd., PT. LENGGOGENI, Lembaga Penelitian Perencanaan Wilayah dan Kota (LPP-ITB)
Title: JMDPR(Jabotabek Metropolitan Development Plan Review), Environmental Concerns for Jabotabek, Environment Technical Report
Source: Government of the Reublic Indonesia, Ministry of Public Works, Directorate General of Human Settlements, June 1993

253
Author: Culpin Planning Ltd., Huszar Brammah and Associates Ltd., PT. LENGGOGENI, Lembaga Penelitian Perencanaan Wilayah dan Kota (LPP-ITB)
Title: Jabotabek Metropolitan Development Plan Review (and the context of PANTURA)
Source: Government of the Repblic Indonesia, Ministry of Public Works, Directorate General of Human Settlements, September 1993

254
Author: BPS (Biro Pusat Statistik, Jakarta)
Title: Statistik Keuangan Pemerintah Daerah Tingkat I (Financial Statistics of the First Level Local Government) 1991/1992 - 1994/1995
Source: BPS, 1996

255
Author: BPS (Biro Pusat Statistik, Jakarta)
Title: Statistik Keuangan Pemerintah Pusat (Central Government Financial Statistics) 1994/1995
Source: BPS, 1996

256
Author:
Title: E/ECE/324, Addendum 82: Regulation No. 83
Source: United Nations

257
Author: Air & Waste Technology Co., Ltd.
Title: Executive Summary - Action Plan for Controlling of Air Pollution and Noise from Vehicles in Thailand
Source: Ministry of Science, Technology and Environment, 3/1996

258
Author: Austrian Energy and Environment
Title: Executive Summary - The Integrated Air Quality Management for Metropolitan Area of Indonesia
Source: BAPEDAL, early 1997