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## 3.7 Jakarta

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### Situational Analysis and Urban Air Quality Trends

Jakarta is located on Java Island and is the capital city of the Republic of Indonesia. It has the status of a special region in Indonesia and is classified as a province. Jakarta has gradually grown into one of the World's most populated cities – nearly 9.5 million people on 661.62 square kilometres – an average population density of around 14,500 per square kilometres.

As a megalopolis, Jakarta is inhabited by people from a variety of races and tribes, with different socio-cultural backgrounds. It is growing and developing continuously, both in the terms of population size and economic growth and development. Both factors exert powerful influences upon the environment. Because of city development and urbanisation, Jakarta has experienced serious air pollution problems associated with the use of energy in the transport and industrial sectors. Concentrations of street level air pollution along major roads in Jakarta have reached hazardous levels.

Air quality in Jakarta is severely degraded. The amount of pollutants emitted by motor vehicles, industry and domestic activities is increasing. The major transportation problems in Jakarta include increasing traffic congestion and the low quality of public transport. Private cars have contributed significantly to the traffic congestion and decline in air quality.

The level of dust in the air in several areas exceeds local and national standards. The main contributors to this airborne dust are motor vehicles, rubbish burning and industry. Motor vehicles contribute the major share, a relatively small number of appallingly smoky diesel buses, taxis and trucks, together with motor cycles and three-wheelers, contributing as much as all other sources put together.

Since 1990 the number of motor vehicles (a total of 1,649,037), has been increasing rapidly in Jakarta. The average rate of increase has been approximately 15 per cent per annum in the period 1997–2000. Almost 50 per cent of vehicles registered in Jakarta are motorcycles of which more than 60 per cent are two-stroke motorcycles. These are the worst offenders for suspended particulate matter (SPM) and

hydrocarbon (HC) emissions. Motorcycles became popular very rapidly because of their ability to move speedily around in the congested traffic. They are not very expensive and can be afforded by medium and low-income people. They are used not only for personal transportation but also for informal-commercial transportation and for the delivery of goods.

Most of the vehicles in Jakarta still use carburettors and there is no exhaust after-treatment. For most domestic vehicles, the old engine modes are conducive to high fuel consumption and emissions. The average level of emission control is still low. Until very recently, new cars could not use catalytic converters for exhaust-treatment because the fuels still contained lead.

Insufficient roadways and their poor condition contribute to increasing emissions of carbon monoxide (CO), HC and particulate matter (PM) and also exacerbate traffic congestion in Jakarta. This is due to both longer trip times and higher emissions from vehicles at low speed, deceleration, stopping and acceleration.

There are about 910 factories in Jakarta listed in the Indonesia Manufacturer Directory, 1993/1994. Their breakdown by industry type is shown in Table 3.7.1. The main industries by number in Jakarta are textiles/clothing/leather; plastic product and machinery/equipment. Except for the large-scale facilities (power plants, glass factories, steel smelting factories), most point source emissions come from boilers, generators, diesel engines, gas turbines, dryers and incinerators.

### Air Quality Monitoring

Regular measurement of air pollution started in Jakarta in 1985 with monitoring stations operated by the Jakarta Office of Environment (Bapedalda DKI Jakarta). There are currently nine stations that have been operating and this monitoring covers housing, industrial, recreation and mixed areas. The pollutants measured are sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and total suspended particulates (TSP). The

instruments are installed permanently and 24-hour measurements are recorded every eight days.

There are currently twelve (periodical) air quality monitoring stations and four continuous stations run by Indonesia's Ministry of Environment. Stations have been sited in recreational, industrial and mixed-use areas and a further five continuous monitoring. All the new equipment is funded by the Central Government through the Ministry of Environment. Data from continuous monitoring will be used to inform the public on a daily basis using the Pollution Standard Index (PSI) in order to increase awareness of air pollution and their participation in reducing the pollution.

Starting from 1992, continuous 1-hour average measurements have been made for SO<sub>2</sub>, nitrogen oxide (NO), nitrogen dioxide (NO<sub>2</sub>), CO and particulate matter with diameters less than 10 µm (PM<sub>10</sub>) at a single site in Central Jakarta which is situated in a location strongly influenced by heavy traffic (road site). In order to improve air quality monitoring information in Jakarta, Bapedalda has set-up three other continuous monitoring stations in residential areas.

The results of monitoring in 1999 for SO<sub>2</sub>, NO<sub>x</sub> and CO, showed no exceedences of the Ambient Air Quality Standard of DKI Jakarta. However, the 24-hour average concentrations of TSP exceed the standard occasionally at Tebet (a residential area) and Pulo gadung (an industrial area). Also, the annual PM<sub>10</sub> at Pulo Gadung (an industrial area) exceeded the National Standard. Total HCs at all stations exceed the standard.

## Impacts of Air Pollution

A World Bank Study (1993) estimated that the costs of air pollution in Jakarta, mostly from motor vehicles, was approximately US \$500 million per year. The Local Government of Jakarta has implemented a Clean Air

Programme (PRODASIH/Programme Udara Bersih) in order to improve air quality. However, the Programme is predominantly run by the government without any broad participation or support of urban communities and has become expensive and beyond the capabilities of urban management resources. This situation has resulted in the local government of Jakarta to apply guidelines for urban development and promote an environmentally sound and sustainable development programme, which is simpler and gives greater attention to the formulation of urban environmental policies, enforcement, promotion of public participation and cooperation among various parties, and improves international cooperation.

No information on the impacts of air pollution on health was available from the local or national government.

## Enforcement and Control Strategies

Jakarta has carried out several efforts to improve the air quality. PRODASIH (Programme Udara Bersih = Clean Air Programme) is a recent programme that is aimed at improving the air quality of Jakarta. The Programme includes controlling and checking the road worthiness of motor vehicles including vehicle emissions and managing traffic to reduce traffic congestion, promoting the use of clean fuel including gas fuel, controlling industrial emissions, managing land use development and expanding the green space in the city. The activities that form part of the Programme are described below.

The local government of Jakarta, through the Governor's decrees, has adopted the following local regulations:

- a standard of ambient air quality and noise;
- a standard of mobile source emission; and

Table 3.7.1 Emission of pollutants in Jakarta, 1999

Pollutant	Stationary source * (tonne/yr)	Mobile source (tonne/yr)	Industry (tonne/yr)	Solid waste (tonne/yr)	Total (tonne/yr)
Particulate matter	16,777	6143	56,563	936	80,510
Sulphur dioxide	103,930	411,140	1354	57	516,483
Nitrogen dioxide	59,421	33,219	3	158	92,802
Hydrocarbon	3512	30,164	3398	771	37,844
Carbon monoxide	14,698	599,180	70,887	2100	686,864

Notes: (\*) Estimated pollutant emissions from electrical power generator, utilities industries and household

Source: NKLD Propinsi DKI Jakarta (2000)

- a standard of point source emission.

Although the use of motor vehicles brings increased mobility and access to employment it also results in air pollution and damage to human health and the environment. The Governor of Jakarta has begun to examine options to deal with vehicle pollution reduction by implementing a cleaner fuels programme.

In Jakarta, 90 buses use gas fuel and 1,377 taxis are equipped with liquid natural gas (LNG) or compressed natural gas (CNG) fuel converters. In 2001, another 1,208 taxis will be equipped with LNG/CNG fuel converters. There are 700 official local government cars equipped with LNG/CNG fuel converters.

In July 2001, the Government of Indonesia introduced and supplied unleaded gasoline to Jabotabek (Jakarta and its suburb) area through PERTAMINA (national oil enterprise). In order to increase the switch to unleaded gasoline the Government excluded unleaded gasoline from any increase in the price of fuel. Since practically all the lead in the urban air comes from the combustion of leaded gasoline in gasoline vehicles, the phasing out of lead gasoline has substantially reduced emissions of lead in the air.

With regard to the Blue Sky Programme implemented the Ministry of Environment in Jakarta, there are twenty industries under strict control. These industries are steel melting (7), power plant (3), glass melting (4) and textile (6). All the industries have signed an agreement with the Government of Jakarta that they will meet air emission standards by the end of 2004.

At present, the motor vehicles that are subject to a compulsory emission test are limited to public transportation, cargo, truck and buses. Because of the economic crisis in Indonesia, not all the vehicles undergo the test thus contributing to the deterioration in air quality. The institution responsible for vehicle emission testing has several duties such as strengthening the capabilities and facilities for roadworthiness and implementing and enforcing the law.

A recent study by JICA and Bapedal (1997) revealed that more than 50 per cent of CO was emitted from private motor vehicles and approximately 20 per cent from motorcycles. Private motor vehicles and motorcycles are responsible for approximately 40 per cent of HC emissions. More than 50 per cent of NO<sub>x</sub> are emitted from the private motor vehicles and approximately 30 per cent from buses. Private motor vehicles, buses and trucks are responsible for an equal share of SO<sub>x</sub> and PM<sub>10</sub> emissions.

In 1986, the Local Government of Jakarta

introduced an Inspection and Maintenance Programme (I&M), which was legalised by the Governor Decree Number 95 in the year 2000 and will be implemented in 2002. The objective of the I&M Programme is to protect the environment by reducing vehicle exhaust emissions by addressing the correct engine adjustment through regular testing and maintenance of the vehicle. The responsibility for implementing the I&M Programme will be given to privately registered workshops to ensure the delivery of a high standard of service. The privately registered workshops will be constantly monitored by private surveillance organisation. The high degree of involvement of the private sector shall ensure that I&M Programme is efficiently implemented with a minimal government investment. A Supervisory Commission, including members of all stakeholders will be established to oversee the implementation of the I&M Programme. Figure 3.7.1 illustrates the I&M system and relationship between the government, private sector, non-governmental organisations and the public. It can be seen that the I&M Programme largely depends on the involvement of the private sector. The development and regulation of the system will be the Government's task through the Management Team.

The workshops that deliver the services have to be registered and need to employ at least two registered operators. They will then be licensed to measure the vehicle exhaust emissions before and after the maintenance/service. The result of the measurement will be stored together with the vehicle and owner data on a computer and all the data will be transferred to the I&M Centre. All registered private cars owners in DKI Jakarta will be required have an annual inspection and maintenance of their car. All the data at the I&M Centre will be analysed and distributed to relevant institutions. The data will be also available to the public to ensure transparency.

Under the I&M System the car owner is treated as a client. A private firm will supervise the procedures and the quality of service. The car owner will have the choice of a number of registered workshops implementing the I&M Programme. The I&M will be organised as a one-stop service. The market will regulate the price of these services with exemption of a minimal fee for a sticker and recommendation letter. Car owners will be responsible for ensuring that their car meet the I&M regulation each year. Additional checks should help to identify misuse.

A Publicity campaign has been used to encourage people awareness and increase public participation on the Clean Air Programme. The activities are emission

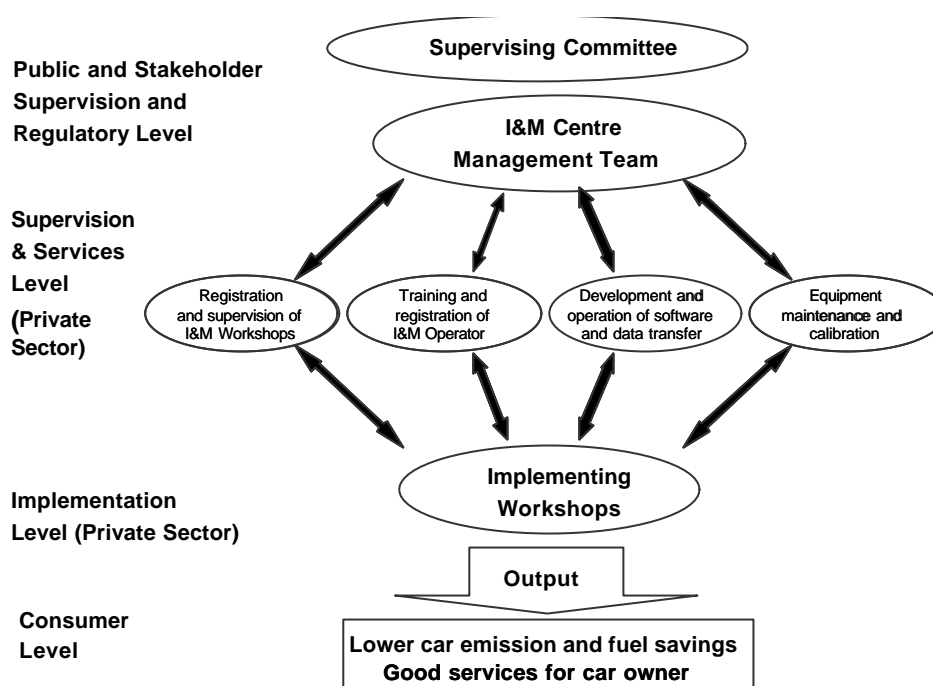


Figure 3.7.1 The Inspection and Maintenance System in DKI Jakarta and relationship between the government, private sector, NGO's and public

test for private cars under the I&M Programme and dissemination information through all media.

During the period 1992–1997, 21,000 cars in total have followed the emission test campaign. This campaign was conducted collaboratively between local government agencies, state enterprise (PT Sucofindo), the Police Department, universities and non-governmental organisations (NGOs).

As pilot project, Swisscontact has implemented the I&M Programme on buses (1,850 units) and taxis (700 units). Results show that after I&M, the emissions reduced by nearly 90 per cent and fuel consumption was reduced by 10 per cent. An NGO programme called “Segar Jakarta – ku” is also increasing public awareness about air pollution.

## Conclusions

Along with the city development and urbanisation, Jakarta has experienced a serious air pollution problem associated with the use of energy in the transport and industrial sectors. Street level concentrations of air pollution along major roads in Jakarta have reached hazardous level and at several locations TSP concentrations exceed air quality standards.

The local Government of DKI Jakarta has implemented the Clean Air Programme/Prodasi to improve air quality in Jakarta. The Programme has adopted a “command and control” approach and uses economic instruments to ensure the polluter pays.

The overall design and implementation of the Clean Air programme is normally a government function but the private sector has played a major role in the provision and operation the necessary facilities. The implementation and enforcement of the programme is not yet fully effective and has been restricted due to inadequate expertise; funding; equipment; political will; limited public support and participation; and uncoordinated institutional responsibilities.

Local institutions will require substantial strengthening in terms of human resources, organisational structure, facilities and financial resources based on cooperation among various parties (e.g. private sectors, NGOs, international cooperation) if the Programme is to be implemented successfully.

Finally, public awareness and information dissemination need to be continued to ensure implementation of the whole Programme and to make the public aware of their role (e.g. use of cleaner fuels and I&M of vehicles) in improving air quality in Jakarta.