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Current Policy Framework

Institutional Arrangements for Air Quality Management

2.1. Table 2.1 sets out current responsibilities for various aspects of air quality management in Bangkok. A wide variety of agencies are involved reflecting the multi-sectoral nature of air quality management. The functions of the most relevant agencies to DIESEL are mentioned in the text below.

Table 2.1: Agencies Involved in Air Quality Management in Bangkok

<i>Component</i>	<i>Main Agencies Involved</i>
Transport Source Control	<ul style="list-style-type: none">• Pollution Control Department (PCD), under Ministry of Natural Resources and Environment (MNRE)• Department of Land Transport (DLT), under Ministry of Transport & Communications (MOTC)• Bangkok Metropolitan Administration (BMA)• Energy Policy and Planning Office (EPPO), under the Department of Energy• Thai Industrial Standards Institute (TISI), under Ministry of Industry (MOI)• Bangkok Mass Transit Authority (BMTA), under Ministry of Transport (MOT)• Department of Commercial Registration, under Ministry of Commerce• Royal Thai Police (RTP), under Ministry of Energy
Road Dust and Other Sources Control	<ul style="list-style-type: none">• Bangkok Metropolitan Administration• PCD, under MNRE• Department of Industrial Works (DIW) under MOI
Air Quality Monitoring and Public Awareness	<ul style="list-style-type: none">• PCD, under MNRE• Office of Natural Resources, Environmental Policy and Planning (OEPP), under MNRE

Raising	<ul style="list-style-type: none"> • Bangkok Metropolitan Administration • Bureau of Environmental Health, under Ministry of Public Health (MOPH) • Non Government Organizations (NGOs)
Transport Management	<ul style="list-style-type: none"> • Bangkok Metropolitan Administration • Office of Transport and Traffic Policy and Planning (OTP), under the Minister of Transport • Metropolitan Rapid Transit Authority (MRTA), a State Owned Enterprise, under Ministry of Transport & Communications (MOTC) • Express and Rapid Transit Authority (ETA), a State-owned Enterprise, under Ministry of Transport & Communications (MOTC) • Department of Highway (DOH), under Ministry of Transport & Communications (MOTC) • State Railway of Thailand (SRT), under under Ministry of Transport & Communications (MOTC) • Department of Land Transport (LTD), under Ministry of Transport & Communications (MOTC) • Bangkok Mass Transit Authority, under Ministry of Transport & Communications (MOTC)

Diesel Vehicle Registration and Inspection

2.2. The Department of Land Transport's (DLT) main function is to administer the system of vehicle registration, set the standards for the fitness of drivers and vehicles and to then enforce those standards through its system of annual vehicle inspections as shown in Table 2.2. However, DLT's resources for proper inspection are lacking. The quality of the DLT data-bases on actual registered fleets in-use on the roads is questioned by their own staff and administrators.

2.3. DLT administers two key pieces of legislation:

- Motor Vehicle Act (MVA): smaller vehicles, including cars, pick ups, and motorcycles, taxis and so on.
- Land Transport Act (LTA): heavy-duty diesel vehicles, including buses and trucks.

Responsibilities for periodic inspection of in-use vehicles are divided as follows:

- DLT inspect buses and trucks regulated under the LTA; and
- Private inspection stations authorized by DLT carry out inspection of motorcycles and taxis ie vehicles registered under the MVA.

2.4. DLT established the privately operated system of inspection stations in 1994. There are at present 225 centers in the Bangkok Metropolitan Region (BMR). The distribution of centers is as follows: 169 centers in Bangkok with a further 56 in the surrounding provinces that make up the balance of the BMR. About 70% of the centers also do repair.

2.5. The Table 2.2 sets out details of vehicles that may be inspected by inspection stations in the BMR. The inspection covers safety and emissions of vehicles.

Table 2.2: Private Inspection Centers and Authorized Vehicle Types

<i>Type of Inspection</i>	<i>Bangkok</i>	<i>Nonthaburi</i>	<i>Pathum Thani</i>	<i>Nakon Pathom</i>	<i>Samut Prakan</i>	<i>Total</i>
1) Motorcycle	25	4	1	1	6	37
2) Vehicle Weight up to 1,600 Kg.	46	5	4	2	7	64
3) Vehicle Weight more than 1,600 Kg	-	-	-	-	-	-
4) Vehicle Weight up to and more than 1,600 Kg	44	1	4	2	5	56
5) Motorcycle and Vehicle Weight up to 1,600 Kg	28	3	-	2	-	33
6) Motorcycle and Vehicle Weight more than 1,600 Kg	-	-	-	-	-	-
7) Motorcycle Vehicle Weight up to 1,600 kg and more than 1,600 kg	26	-	-	6	3	35
Total	169	13	9	13	21	225

Source: DLT, 2006

2.6. At present motorcycles and cars aged more than 5 and 7 years respectively must be inspected before their motorcycle registration can be renewed. The registration system relies on a log book is tied to the vehicle or motorcycle.

2.7. The inspections is intended to include the emission tests shown in Table 2.3 but these emission tests have often be ignored when equipment was malfunctioning. No measurements of PM are specified.

Table 2.3: In-Use Emission Test Procedures

<i>Vehicle Type</i>	<i>Emissions Test</i>	<i>Equipment Required</i>
Motorcycle And Tuk-Tuk	White Smoke Opacity	Opacity Meter
	HC And CO Concentration	NDIR Analyzer
	Noise	Sound Level Meter
		Tachometer
Gasoline Car/ Truck	HC And CO Concentration	NDIR Analyzer
LPG Car/ Truck		Tachometer
		Opacity Meter
Light Diesel Truck	Smoke Opacity	Opacity Meter
Heavy Diesel Truck	Noise	Sound Level Meter
Diesel Bus		Tachometer

Source: DLT, 2006

2.8. Parsons (2000) and SweRoad (2000) found the current inspection system to be ineffective due to shortages of equipment, poor maintenance of available equipment, lack of qualified staff, inadequate quality assurance and for the private inspection centers unrealistically low charges and low volumes of vehicles which predicated the perpetuation of a system of low effectiveness. Parsons (2000) reported the findings of a study commissioned by the BMA, which formed part of the Bangkok Air Quality Management Project, showed that with the exception of private buses, less than 1% of vehicles fail for emissions (approximately 3% of private buses fail for emissions)². Parsons (2000) concluded these failure rates are exceptionally low in comparison with failure rates observed in other comparable I/M programs where between 10% and 25% of vehicles would be expected to fail. A major contributory problem in the recent past is that equipment was malfunctioning or out of order with inadequate budgets for maintenance. PM is not measured even today DLT centers for inspection of trucks and buses and their licensed private inspection centers for inspection of other vehicles do not have the capability to measure particulate (PM) emissions from diesel vehicles, and lack crucial quality assurance measures.

On Road Enforcement of Emissions

2.9. Three organizations exercise responsibility for on-road enforcement of vehicle emissions standards. These are: the Police, under the Ministry of Interior; DLT under the MOTC and PCD. The authorizing legislation is different in each case, resulting in inconsistencies between the three agencies

² Chula Unisearch, Bangkok Air Quality Management Project, supplement Report Volume 1, Component 1, prepared by Chulalongkorn University, November, 1999.

New Vehicle Emission Standards

2.10. This section describes the existing vehicle emission regulations from mobile sources and emission factors based on some existing information. Emission regulations for diesel vehicles are divided into emission standards for Light Duty Diesel Vehicle (LDDV) and emission standard for Heavy Duty Diesel Vehicle (HDDV).

2.11. New diesel vehicle regulations are based on European standards and emission test procedures, as summarized in the following Table 2.4 for light- and heavy-duty diesel vehicles.

Table 2.4: Light and Heavy Duty Diesel Vehicle Emission Standards

<i>Type</i>	<i>Level</i>	<i>Reference Standards</i>	<i>Standard No.</i>	<i>Enforced</i>
Light Duty Diesel Engine	4	94/12/EC - for Direct Injection	TIS1435-1997	Jan 1, 1999 Sep 30, 2001
	5	96/69/EC - Ref. Weight not more than 1,250 kg. - Ref. Weight more than 1,250 kg. - Direct Injection Engine	TIS1875-1999	Oct 1, 1999 Oct 1, 2000 Sep 30, 2001
	6	1999/102/EC(A)	TIS2155-2003	Jan 10, 2003
	2	95/542(A)/EEC (EURO 1)	TIS.1290-1995	May 12, 1998
	3	95/542(A)/EEC (EURO 2)	TIS.1295-1998	May 23, 2003
	4	1999/96/EC (EURO 3)	TIS.1295-1998	Jan 1, 2007
Heavy Duty Diesel Engine				

Source: PCD, 2007

Fuel Policy and Specifications

2.12. Prices for gasoline, diesel, LPG for automotive purposes have been free to float in a managed way since 1991. Prices (ex-refinery)³ are set with reference to international prices. Since government specified taxes and duties (which vary by type of fuel) use apply to the various stages of production and distribution and the retail price is not controlled for automotive fuels, including LPG for automotive purposes, what in effect happens is that the marketing margin is the only variable component of the price and is free to be set by the retailer according to conditions in the market to give a net

³ Domestically produced products are only considered here as at present LPG is mainly locally produced. There is some imported LPG but this is minor although it could increase in future with de-regulation.

retail price⁴. Thailand has a policy of encouraging use of CNG in transport and has guaranteed in the recent past to hold the CNG price at THB 12/ kg for the period 2005-2010 for application in Bangkok's urban bus fleet.

2.13. For over a decade, Thailand has been very pro-active in developing fuel specifications. Lead in gasoline was phased out by January 1996. Maximum sulfur content in diesel fuel is being lowered in the following years: 500 ppm sulfur was enacted on July 1998; 350 ppm sulfur was enacted on January 2004; and 50 ppm sulfur is currently proposed for 2010.

2.14. The consumption of different fuels in Bangkok and in Thailand in 2005 is shown in Table 2.5, which shows that 52% % of all fuel consumed in Thailand is diesel and that the BMR which consists of Bangkok and the five nearby provinces of Nonthaburi, Pathumthani, Samut Prakan, Samut Sakhon and Nakhon Pathom represented 44% of all diesel fuel use in Thailand. For fuels of all kinds the BMR represents 47% of all Thailand fuel use. An overview of Thai diesel fuel specifications is presented in Table 2.6

Table 2.5: Fuel consumption in Bangkok and Thailand in 2005

<i>Fuel Type</i>	<i>BMR</i>	<i>Thailand</i>
	<i>(million liter)</i>	<i>(million liter)</i>
LPG	2,201	4,364
ULG 91	1,849	4,333
ULG 95	1,230	2,240
Gasohol 91	29	29
Gasohol 95	420	645
High Speed Diesel	8,565	19,510
High Speed Diesel B5	4	5
Palm Diesel	5	5
Low Speed Diesel	50	77
Fuel Oil	3,168	6,227
Total	17,523	37,436

Source: Department of Alternative Energy and Efficiency

⁴ Thailand established an oil fund in 1974. The oil fund component is a positive levy when the government raises retail prices or oil import prices fall, and it is reduced when oil import prices increase. The oil fund provided the means to stabilize prices to some extent.

Table 2.6: Fuel Specifications of Diesel Fuel

<i>Specifications</i>	<i>High/ Low</i>	<i>Diesel Fuel</i>	
		<i>500 ppm S</i>	<i>350 ppm S</i>
Specific Gravity at 15.6/15.6 C	Not lower than	0.81	0.81
	Not higher than	0.87	0.87
Cetane Number or Calculated Cetane Index	Not lower than	47	47
Viscosity, CSt. at 40 C	Not lower than	1.8	1.8
	Not higher than	4.1	4.1
Pour Point, C	Not higher than	10	10
Sulphur Content, %wt	Not higher than	0.05	0.035
Corrosion	Not higher than	No.1	No.1
Carbon Residue, %wt	Not higher than	0.05	0.05
Water and Sediment, %vol	Not higher than	0.05	0.05
Ash, %wt	Not higher than	0.01	0.01
Flash Point, C	Not lower than	52	52
Distillation 90% recovered, C	Not higher than	357	357
Colour	Not higher than	4.0	4.0
Lubricity by HFRR, µm	Not higher than	460	460
Additives	Committed by Department of business of energy		

Source: OEPP, 2003

2.15. Thailand is almost self-sufficient in natural gas and coal (lignite) supplies, while being almost entirely dependent upon imports for petroleum products. To enhance the more widespread use of natural gas in industry and transport a gas pipeline has now been completed around Bangkok.

2.16. PTT is actively promoting the use of CNG in commercial transport. Being cash rich, PTT has financed CNG conversion in taxis and now commercial bus fleets. At the end of 2004, PTT estimated that there were about 1,800 VNG fuelled vehicles in Bangkok consisting of 1,500 taxis, 103 buses⁵, with the rest being passenger cars. There were 25 CNG refueling stations operating in Bangkok as at mid 2003 with a planned program of expansion of 30-50 CNG refueling stations for cars and other small vehicles to be developed in Bangkok each year for the near term.

2.17. PTT are aiming to convert most taxis to use CNG. PTT also are aiming to convert a large share of trucks to use CNG but due to the non-availability of CNG through much of Thailand are unlikely to penetrate much of the trucking industry.

⁵ 88 of these are CNG buses supplied to BMTA 10 years ago; BMTA's 44 MAN CNG buses are not presently operational.

2.18. Until recently it had been proposed to convert much of the Bangkok bus fleet operated by the State-enterprise the Bangkok Mass Transit Authority to CNG through purchase of 2,000 new CNG buses and refurbishment of another 1,600 older buses. With current high oil prices some private bus operators too have started to experiment with repowering their old buses with older diesel engines converted to also run on CNG, either in dual fuel mode or as a dedicated CNG engine.

2.19. High world fuel prices have led to renewed interest in converting cars and taxis to use LPG. In 2000, very few cars made use of LPG and around 30% of all taxis used LPG but anecdotal evidence is that several thousand cars and a probably a similar number of taxis have been recently converted. The quality of installed LPG equipment was particularly poor prior to 2001 but the large differential between LPG prices (around half of gasoline price on a per km basis) and current high gasoline prices means that better quality LPG installations are now being carried out at the owners' expense. The 7,400 tuk-tuks (motorized three-wheelers) have always used LPG but due to the use of 2-stroke engines are high emitting. All forklifts and similar equipment also make use of LPG. Despite LPG's attractive features for use in transport, Government policy is to favor CNG.

2.20. Liquefied Natural Gas (LNG) is a new solution. LNG is natural gas that has been condensed into liquid, and has been processed to remove impurities and valuable components. Purified LNG is cooled to a temperature of approximately -260°F (-160°C) at atmospheric pressure. Due to the lower fuel tank capacity there is a significant operating cost saving compared to use of CNG. The cost of constructing LNG filling stations are also lower than that that for CNG. In 2007 there were some LCNG stations which are suitable for both LNG and CNG, in the north of Thailand. Market understanding of LNG is currently low and the necessary infrastructure to distribute LNG throughout Thailand is inadequate. As an initial step to facilitating LNG use, the Ministry of Energy (MOE) is considering the construction of LNG receiving terminals.

2.21. Biodiesel has been promoted for reducing petroleum imports since 2003. The Ministry of Energy has specified a biodiesel blend consisting of 5% bio diesel and 95% high speed diesel fuel known as B5. As shown in Table 2.5, B5 use represented only 0.03% of high speed diesel fuel use in 2005.

