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ALTERNATIVE POLICIES TO CONTROL PM_{10} EMISSIONS FROM MOTOR VEHICLES IN METRO MANILA[1]

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ALTERNATIVE POLICIES TO CONTROL PM_{10} EMISSIONS FROM MOTOR VEHICLES IN METRO MANILA[1]

ENRAP IV TECHNICAL PAPER

by

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Executive Summary

Particulate matter emissions, particularly those 10 microns in diameter or less (PM_{10}), have been found to cause various respiratory illnesses such as chronic bronchitis, asthma, chronic cough, and even death from prolonged exposure. In Metro Manila, motor vehicles account for 69 percent of the total PM_{10} emissions of which 16 percent directly comes from vehicle exhaust and 53 percent from paved road travel (EMB, 1990). From 1993 to 1996, PM_{10} emissions and ambient concentration in Metro Manila have been increasing due to the increase in size of vehicle fleet. Consequently, health damages associated with PM_{10} exposure have reached PhP906M in 1996. If vehicle stock will continue to grow at its current rate, PM_{10} emissions from motor vehicles could increase to 21,000 tons by year 2000 and could reach an ambient concentration of 164 μg/ncm which is more than four times the World Health Organization (WHO) Standard[3]. This translates to health damages worth PhP2.2B.

The Environmental and Natural Resources Accounting Project (ENRAP) analyzed the impact of three alternative approaches to reduce PM_{10} emissions from mobile sources. The first option evaluates the impact of revitalizing the current anti-smoke belching program of the government. The second option investigates the effect of diesel desulphurization. The last option examines how a higher tax differential between gasoline and diesel in favor of the former could affect PM_{10} emissions.

A successful anti-smoke belching program, which means 100 percent compliance to emission standards by motor vehicles, can reduce PM_{10} emissions by as much as 15,000 tons in 1998 and lower the ambient concentration to 24 μg/ncm which is below the WHO standard. If the program is implemented successfully, PM_{10} emissions should not pose any health damage. Assuming health benefits will be equivalent to health damages when no anti-smoke belching program is implemented, these benefits, estimated in 1998 amount to PhP1.5B. However, anti-smoke belching program is associated with very high administrative costs, estimated at PhP2.3B in 1998, resulting in a negative social net benefit that is expected to persist until 2001. Positive social net benefits are projected starting 2002 to 2006. Net present value of this alternative ranges from PhP1.2B to PhP1.9B.

The impact of diesel desulphurization on health may not be as significant compared to that of the smoke belching program but it is a more cost-effective option. By year 2000, desulphurization from 0.5 percent to 0.3 percent sulphur content can reduce PM_{10} emissions by 2000 tons, which in turn can be translated to health benefits amounting to PhP333M. Further reduction of sulphur by year 2005 will yield health benefits of PhP582M. Net social benefits are positive with PhP167M in year 2000 and PhP256M in 2006. Present value of social net benefits is around PhP1B.

Increasing the diesel-gasoline tax ratio starting year 2001 will decrease PM_{10} emissions by 6,000 and 8,000 tons in 2001 and 2006, respectively. Reduced health damages associated with this option is estimated at PhP0.9B in year 2001 and PhP2.5B by 2006. Moreover, incremental tax revenue is also expected to reach PhP255M by 2001 and PhP346M by 2006. Net social benefits are expected to be positive and the present value of the future stream of benefits ranges from PhP3.4B to PhP4.9B. This policy, however, is deemed regressive since a lot of the diesel-fueled vehicles are public-utility vehicles (i.e. jeepneys and busses) that serve the masses.

[3] WHO standard for total suspended particulates (TSP) is 75 μg/cu.m or about 37.46 μg/cu.m for PM_{10}.

In terms of reducing PM_{10} emissions, the anti-smoke belching program is the most effective among the three alternatives. However, it is the most expensive in terms of enforcement and monitoring resulting in negative net social benefits during the early stages of implementation. Health benefits from desulphurization and diesel tax restructuring are lower but entail less costs in terms of enforcement and monitoring. However, diesel tax restructuring is regressive in nature hence some support programs need to be simultaneously implemented to ease the burden of higher taxes to the poor.

1. INTRODUCTION

Particulate matter emissions, particularly those 10 microns in diameter or less, (PM_{10}) have long been associated with increased risk of various respiratory illnesses such as chronic bronchitis, asthma, chronic cough, and even death from prolonged exposure. Particulate matter is emitted through fuel combustion in vehicles and power plants or is generated by road and building construction. Ambient concentration is increased further by re-suspension of dust and other debris due to road travel. In Metro Manila, the primary contributor of particulate matter is area sources (*Table 1*). A big percentage is, however, transport-related: 16 percent comes directly from vehicle exhaust, and 53 percent from paved road travel.

Ambient concentration of PM_{10} has almost been constantly increasing with the size of the vehicle fleet since 1992 (*Tables 2 and 3*). As a result, health damages associated with exposure to PM_{10} have been increasing and have reached PhP906 million by 1996 (*Table 4*). This was true even after the tax restructuring scheme which raised the tax rates of many transport fuel was implemented. If the current rate of vehicle stock growth continues, total vehicles in Metro Manila alone can reach as high as 1.4 million this year (*Table 5*). This translates to almost 19,000 tons of PM_{10} emissions from the transport sector alone that can raise the ambient concentrations to as much as four times the WHO air quality standard[1] (*Table 6*). Consequently, health damages can reach PhP1.5 billion (*Table 7*). The value of premature mortality is estimated to be worth PhPp660 million, while cost of medication for the treatment of both chronic bronchitis and lower respiratory illness is predicted to be worth PhP854 million. Foregone earnings due to chronic bronchitis are estimated to be about PhP1 million.

The construction of the 16.9-km LRT 3 in EDSA by 2000 can be expected to reduce PM_{10} emissions by 4 percent (*Supporting Table 6.4*), assuming that this alternative mode of transport can displace all the buses in the region[2]. While said infrastructure is intended to improve traffic conditions in EDSA, it can also be a means to improve air quality through the reduction of congestion, and thus, emissions.

2. ALTERNTIVES TO REDUCE TRASNSPORT PM_{10}

Emissions from the transport sector, in general, can be reduced using regulatory instruments and market-based instruments. Except for the tax restructuring in 1996 that raised transport fuel taxes, most regulatory instruments are already in place to control vehicular PM_{10}. Examples of these are the anti-smoke belching program and regular inspection of utility vehicles upon registration.

2.1 The Anti-Smoke Belching Program

The anti-smoke belching program is a component of a comprehensive vehicular emission control program mandated under PD 1181. Said Decree designated the National Pollution Control Commission (NPCC, now Environmental Management Bureau [EMB]) as the lead agency that would promulgate rules and regulations addressing various vehicular emissions issues[3], and to set motor vehicles exhaust emission standards (*Table 8*)[4].

This function of the lead agency was later devolved to the local government units (LGUs) consistent with the provisions of the Local Government Code. Currently, only Quezon City, Manila, Muntinlupa, and the Metro Manila Development Authority (MMDA) out of the 18 implementing units[5] in Metro Manila, maintain antismoke belching teams under their respective anti-pollution control units.

Implementation of mobile emission standards is limited to visible smoke or opacity while the registration prerequisite of compliance is limited to for hire diesel-fueled vehicles. These limitations stem

from the lack of testing equipment. While there are only 8 smoke meters in Metro Manila, there are 1,168,134 registered vehicles in 1996, or a vehicle to smoke meter ratio of 146,016 to 1. *Table 9* presents the antismoke belching operation profiles of the implementing units in 1996.

Based on available data from MMDA and Quezon City, compliance rate[6] averages 63 percent (*Table 10*). Of the 20,265 vehicles tested by the Quezon City unit, 9,295 failed for a compliance rate of 60 percent, while the MMDA unit had a higher compliance rate of 66 percent from testing 33,708 vehicles. Enforcement[7] of the program yields a substantial amount of fines. *Table 11* reveals that for every vehicle apprehended, the average fine[8] collected is PhP183.26. In *Table 12*, it is shown that the average apprehension cost[9] per vehicle in Metro Manila is PhP135.45 per vehicle, implying an average net revenue of about PhP50 per vehicle.

A revitalized implementation of the antismoke belching campaign started in 1997 under the DENR's Blue Sky Program with the participation of the MMDA, LGUs and the Philippine National Construction Corporation (PNCC). Technical support is provided by FILCAR NGO and ZEXEL Philippines which trained the program's personnel to conduct the tests in their respective municipalities. LTO serves as the control agency that monitors vehicles and issues license plates. The revitalized program aims to provide consistency and uniformity in its implementation. Under this program, training sessions are being conducted among LGU representatives who will be deputized by DENR and accredited by MMDA to enforce the program in their respective municipalities. The costs of implementing the new program as well as the projected fine collections and health benefits were evaluated in this study.

In relation to this, DENR is currently revising emission standards for mobile sources. The formulation of an administrative order that attempts a two-pronged approach in controlling mobile source emissions is in its final stages. The first approach is to limit emissions from new vehicle types before they are registered at LTO. Thus, vehicles to be introduced into the market from January 1997 onwards are required to meet reduced emissions standards for carbon monoxide, particulate matter, combined hydrocarbons, and nitrogen oxides. From January 1, 2000, these new vehicles will be required to meet more stringent emission limits. The second approach deals with in-use vehicles whose emissions must be guaranteed to stay within limits. This can be done through the mandatory emission inspection for carbon monoxide, hydrocarbon and smoke emissions, prior to vehicle registration; intensification of road-side inspection; and accreditation of repair shops. In terms of particulate matter emission reduction, the revised implementing rules and regulations require engines that will be introduced into the market at the beginning of the year 2000 to meet the standards specified in *Table 13*.

Given both the limited enforcement and effectiveness of the anti-smoke belching program in reducing transport PM_{10}, other alternatives need to be explored. One is the reduction of sulphur in diesel and the other is the increase in diesel taxes.

2.2 Diesel Desulphurization

Sulphur in diesel is one of the main contributors of PM_{10} emissions. Approximately 25 percent of sulphur dioxide (SO_2) in diesel is emitted as sulfates in PM form (TEC, 1993). Other chemical reactions in the atmosphere between SO_2 and PM may also contribute to PM_{10}, with the rate of conversion depending on atmospheric conditions (ARB, 1988). Every pound of SO_2 reduced translates to a 0.6 lb. reduction of PM_{10}.

In 1996, the Bureau of Product Standards (BPS) of the Department of Trade and Industry (DTI) reduced the sulphur content of diesel from 0.7 percent to 0.5 percent[10]. Proposals to further reduce the current standards to 0.3 percent by year 2000, to 0.2 percent by the year 2005 have been made. The long-term target is 0.05 percent which is the current sulphur content of diesel in most OECD countries.

2.3 Diesel Taxes

Due to the tax restructuring scheme (RA 8184), diesel taxes and gasoline taxes increased; but the ratio of diesel to gasoline tax was reduced from 0.39 to 0.34. The rationale for the tax restructuring was to adjust the tax rates of various socially sensitive products such as LPG and kerosene. Cross-product subsidies, done through the Oil Price Stabilization Fund (OPSF) were also removed[11]. This resulted in a reduction in diesel and gasoline consumption. Some shifted from gasoline to diesel[12] due to the relatively lower diesel pump price. The dominance of the own-price effect over the cross-price effect resulted in an overall reduction in PM_{10} emissions and health damages. However, due to some amount of shifting from use of gasoline to diesel, the health benefits were lower than expected.

As is usually the case in most countries, fuel tax differentiation in the Philippines is also based on equity instead of efficiency grounds[13]. Hence, tax on diesel is lower than that of gasoline. However, the tax differential need not be too pronounced if environmental health issues are to be taken into consideration.

3. ANALYSIS OF THE ALTERNATIVES

This paper investigated three alternatives to PM_{10} emissions reduction. Two of the alternatives are command and control approaches and the other is an economic instrument. The first is the revitalization of the current anti-smoke belching program. This study explored the expected health benefits if the program will be successfully implemented. Both the costs of compliance and costs of enforcement were also assessed vis-à-vis the health benefits.

The clean fuel option was evaluated based on the expected reduction in health damages as well as refinery costs. The diesel tax was also assessed on the basis of health benefits and increased tax burden.

Evaluation of all options involved a comparison of the health benefits, as well as the costs, which include the tax burden and the corresponding administrative and technical adjustment costs. The present values of the net benefits of each alternative were also contrasted.

3.1 The Anti-Smoke Belching Program

Successful implementation[14] of the anti-smoke belching program can reduce transport emissions by as much as 15,000 tons in 1998 and ambient concentrations of 24 µg/cu.m., which is below the standard (*Table 14*). This means that if the program can be strictly implemented and if the emissions standards are rigorously enforced, the transport sector will no longer pose health risks to motorists and commuters. Hence, health damages from transport PM_{10} will be zero and, thus, health damages will be equal to the value of health damages in the baseline scenario, which is PhP1.8 billion. Private costs, which include costs of tune–up and foregone earnings, however, can reach PhP2.3 billion in 1998, an amount which far exceeds the benefits. Negative private net benefits are expected until 2000. By 2001, the benefits will have exceeded the costs (*Table 21*).

The high cost of compliance should not come as a surprise, however, given that most of the vehicles are old and very intensively used - some requiring two to eight tune-ups a year (*Supporting Tables 14.2.1 to 14.2.9*). This makes adherence to emission standards very costly.

For the implementing agencies, cost of enforcement are also expected to exceed fine collections resulting in PhP93 million worth of losses in 1998 and as much as PhP184 million by 2006 (*Table 22*). This is because average fine collected per vehicle do not even come close to the average health damage caused by each vehicle (about PhP1,097 per vehicle in 1998)[15]. Also, the enforcement costs could even

be higher than current estimates if a 100 percent success is targeted. The cost of additional smoke-meters and personnel would raise the administrative costs even further.

Under current assumptions, social net benefits from the program are expected to be positive in 2001. Nonetheless, the present value of net social benefits is expected to be PhP4.5 billion to PhP5.5 billion (*Table 23*).

3.2 *Diesel Sulphur Reduction*

Although the effect of diesel sulphur reduction on emissions and health damages may not be as significant as that of the anti-smoke belching program, this option certainly costs less (*Table 15*). Desulphurization of diesel from 0.5 percent sulphur to 0.3 percent in 2000 can reduce emissions by about 2,000 tons and health damages by PhP399 million (*Table 21*). Health benefits from further reduction to 0.2 percent by 2005 is approximately PhP677 million. Costs to consumers[16] will not be as high with diesel fuel refinery costing only P166 million in 2000 and PhP426 million in 2005. Lower costs can even be expected as most oil companies may opt to make the necessary technical adjustment in their equipment by 2000 to meet both the 0.3 percent and the much lower 0.2 percent sulphur content standard.

This alternative is cost-effective since private net benefits are positive throughout the specified time frame (*Table 21*). Enforcement costs are assumed to be zero. The present value of the expected net benefits is PhP1.3 billion to PhP1.5 billion.

The schedule for the compulsory reduction of sulphur to 0.05 percent, the long-term target, has not yet been set. Technical cost of this sulphur reduction is quite high at PhP0.43 per liter. ENRAP estimates for 1996 show that enforcement of this standard will result in negative net benefits[17].

3.3 *Diesel Tax Restructuring*

By raising the diesel-gasoline tax ratio to its pre-tax restructuring level, diesel tax is raised to PhP1.91 per liter (*Table 17*). Due to the regressive nature of this policy[18], it was recommended to be imposed only after an alternative mode of transport is available. Since the MRT is expected to be in full operation by 2000, the effect of an additional diesel tax was simulated only beginning 2001.

Emissions are expected to be reduced by 6,000 tons to 8,000 tons from 2001 to 2006 (*Table 18*). Consequently, health damages are also expected to decrease to as low as PhP1.8 billion in 2001 compared to PhP2.7 billion worth of health damages in the baseline level. Health benefits are expected to more than double in five years to PhP2.5 billion.

Aside from high health benefits, tax revenues are also expected to be high. Incremental tax collections are projected to range from PhP500 million to PhP700 million from 2001 to 2006 (*Table 22*). Net benefits are expected to be positive while the present value of all future stream of net benefits will range from PhP4.2 billion to PhP5.8 billion, higher than either of the two other alternatives, despite its late implementation.

The main issue arising from this policy is the relative bias it poses against the poor. It may be both cost effective and administratively easy to implement but the equity aspect begs the question of acceptance and actual enforcement.

4. Assessment of Alternatives

Among the three alternatives, the anti-smoke belching program is the most effective in terms of reducing emissions and health damages. It is, however, the most expensive in terms of both enforcement and monitoring, requiring many personnel and state-of-the-art equipment. Thus, it yields negative net benefits in the first four years of implementation.

Though the health benefits from both diesel desulphurization and diesel tax restructuring are much lower, they do not require much government enforcement and monitoring, especially the tax. For the former, monitoring of the fuel quality of the three main oil refineries can be undertaken by the Bureau of Product Standards, while for the tax scheme, additional implementation costs are zero.

The main drawback of the diesel tax restructuring is its regressive nature. Not all commuters using public forms of transport have the alternative of using the MRT, and thus, will be much affected by the higher diesel tax. The anti-smoke belching program, on the other hand, is burdened with high implementation and monitoring costs. But as it results in positive net benefits through time, the present value of these benefits will be higher. Desulphurization is a cost-effective option until more stringent standards are imposed. For that option to remain efficient, oil companies must make technical adjustments early on to avoid incurring more costs in the future.

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Department of Health
Department of Labor and Employment
Department of Transportation and Communication
Energy Regulatory Board.
Environmental Management Bureau
House of Representatives
Land Transportation Office
Light Railway Transit Authority
Metro Manila Development Authority
National Economic and Development Authority
National Statistical Coordination Board
National Statistics Office
National Tax Research Center - Department of Finance
Pilipinas Shell Corp.

Endnotes

[1] WHO standard for TSP is 75 □g/cu.m or about 37.46 □g/cu. m for PM_{10}

[2] This may be an over-estimate since buses can still ply other routes but a number of private vehicles can also be expected to be reduced, albeit slightly.

[3] Vehicle emissions issues include: a) maximum allowable emissions of specific pollutants for all vehicles registered and not yet registered; b) specification of pollution control devices; c) regulation of distribution, sale, registration and use of motor vehicles;'d) specification of correct motor fuels; and c) specification of the use of motor vehicles in any area to protect human health and public welfare.

[4] Compliance to the standards is a prerequisite to registration and to the introduction of new vehicles in the case of car manufacturers. Maximum imposable fines for non-compliance are ₱200 for first the offense, ₱500 for the second, and ₱1,000 and suspension of registration for the third.

[5] The implementing units are Caloocan, Manila, Pasay, Quezon City, Las Piñas, Makati, Malabon, Mandaluyong, Marikina, Muntinlupa, Navotas, Parañaque, Pasig, Pateros, San Juan, Taguig, Valenzuela and MMDA.

[6] Defined as the percentage of vehicles which pass the emissions test after roadside apprehension.

[7] Program enforcement refers to activities undertaken by the enforcement units covering the following: a) road side apprehension wherein vehicles emitting excessive black or white smoke (greater than 20 percent of the Ringelmann Chart) are apprehended; b) issuance of subpoena to owner/driver to bring apprehended vehicles to testing centers within 24 hours; and c) testing of apprehended vehicles using the standard 66 percent Hartridge Smoke Unit (for diesel-fed), and 5.5 percent carbon monoxide (CO) and 1,000 parts per million (ppm) of hydrocarbon (HC) (for gasoline-fed).

[8] A better measure is the ratio between the number of vehicles tested and the fines collected. Unfortunately, there is very limited information on vehicle testing from enforcement units.

[9] Apprehension cost per vehicle was computed based on the enforcement cost for each unit (MMDA or LGU) divided by the total number of vehicles apprehended. Enforcement cost is the actual annual budgetary allocation of each unit for personal services and operation/maintenance and does not include the annualized cost of smoke meters.

[10] The sulphur content of diesel before 1996 was 0.7 percent in Metro Manila and 0.8 percent in other parts of the country.

[11] Under the full deregulation phase stipulated in RA 8180, the OPSF is abolished; RA 8184 was therefore also a response to the deregulation act in 1996.

[12] It was assumed that the cost of engine modification is negligible.

[13] Except in the US where diesel is taxed more due to its more pollutive nature.

[14] Successful implementation means 100 percent compliance to emission standards by in-use and newly manufactured vehicles, regular inspection and maintenance, and even roadside inspection.

[15] Computed as total health damages divided by number of vehicles.

[16] It is assumed that additional cost of refinery will be reflected in the diesel fuel pump price.

[17] delos Angeles et al. 1998. Assessment of Policies to Control Air Pollution from Motor Vehicles in Metro Manila.

[18] Diesel taxes are found to be regressive (Manasan et al, 1997). Use of Fuel tax Differentiation to Control Air Pollution from Motor Vehicles.

Table 1
Sectoral Sources of PM_{10} in Metro Manila
(In metric tons)

Source	Tons	Percent
Mobile	11,450	16.36
Area	51,042	72.90
Paved road travel	37,033	52.90
Road construction	5,426	7.75
Building construction	8,563	12.24
Others	17	0.02
Stationary	7,494	10.71

Source: EMB, 1990.

Table 2

Transport-Related PM_{10} Emissions and Airborne Ambient Concentrations NCR, 1992-1996

Year	PM_{10} Emissions [1/] (In tons)	Ambient level [2/] (In mg/cu. m)
1992	12,259	88.16
1993	15,096	75.07
1994	14,989	93.91
1995	16,116	104.6
1996 [3/]	13,017	102.9

Notes:

[1] ENRAP estimates.

[2] 1992 to 1995 figures: Based from TSP concentration readings from EMB and DENR-NCR .

[3] Refers to the simulated post-deregulation and post-tax restructuring scenario as cited in Manasan, et al. 1997. Use of Fuel Tax Differentiation in Vehicular Pollution Control in Metro Man

Table 3
Number of Registered Vehicles
NCR, 1992-1996

Type of Vehicle and Fuel	1992	1993	1994	1995	1996
Gasoline					
Cars	311,674	344,191	369,928	414,074	468,275
UV	157,240	169,675	177,907	184,817	202,046
Bus	513	148	167	52	90
Trucks	5,132	5,675	7,713	4,085	5,464
MC/TC	79,850	96,576	101,964	107,492	131,768
Diesel					
Cars	21,359	26,198	27,086	24,043	22,338
UV	155,946	186,267	211,278	236,547	260,935
Bus	9,693	6,652	8,409	8,263	8,678
Trucks	47,030	53,340	54,347	59,843	68,540
MC/TC	529	446	706		
Total					
Cars	333,033	370,389	397,014	438,117	490,613
UV	313,186	355,942	389,185	421,364	462,981
Bus	10,206	6,800	8,576	8,315	8,768
Trucks	52,162	59,015	62,060	63,928	74,004
MC/TC	80,379	97,022	102,670	107,492	131,768
GRAND TOTAL	788,966	889,168	959,505	1,039,216	1,168,134

Notes:
UV = utility vehicles
MC = motorcycles
TC = tricycles

Source of data:
Land Transportation Office.

Table 4
Value of Health Damages Associated with Exposure to PM_{10}
NCR, 1992-1996
(In million pesos)

Year	Value of Health Damages
1993 [1/]	520
1994 [1/]	648
1995 [1/]	837
1996 [2/]	906

Sources:
[1/] Based from ENRAP 4 estimates.
[2/] Manasan, et al. 1997. Use of Fuel Tax Differentiation in Vehicular Pollution Control in Metro Manila.

Table 5
Projected Fuel Consumption, and Vehicle Stock in Metro Manila
1998-2006 - BASELINE LEVEL

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Fuel Cosumption [1]									
(In million liters)									
Gasoline	1,467	1,611	1,769	1,942	2,133	2,342	2,571	2,823	3,100
Leaded premium	1,128	1,238	1,359	1,493	1,639	1,800	1,976	2,170	2,382
Unleaded premium	309	339	372	409	449	493	541	594	652
Regular gasoline	31	34	37	41	45	49	54	59	65
Diesel	1,635	1,738	1,848	1,964	2,088	2,219	2,359	2,508	2,666
Vehicle stock [2]									
Gasoline									
Cars	564,554	619,881	680,629	747,330	820,569	900,985	989,281	1,086,231	1,192,681
Utility vehicles	243,587	267,459	293,670	322,450	354,050	388,747	426,844	468,674	514,605
Buses	109	119	131	144	158	173	190	209	229
Trucks	6,587	7,233	7,942	8,720	9,575	10,513	11,543	12,675	13,917
MC/TC	158,860	174,428	191,522	210,291	230,900	253,528	278,374	305,655	335,609
Diesel									
Cars	25,241	26,831	28,522	30,319	32,229	34,259	36,418	38,712	41,151
Utility vehicles	294,848	313,424	333,170	354,159	376,471	400,189	425,401	452,201	480,690
Buses	9,806	10,424	11,080	11,778	12,520	13,309	14,148	15,039	15,986
Trucks	77,448	82,327	87,514	93,027	98,888	105,118	111,740	118,780	126,263
MC/TC	-	-	-	-	-	-	-	-	-
GRAND TOTAL	1,381,041	1,502,126	1,634,179	1,778,219	1,935,360	2,106,821	2,293,939	2,498,175	2,721,131

Notes:

[1] 1996 gasoline consumption was projected to 2006 using average growth of gasoline-fed vehicle stock from 1992-1996
1996 diesel consumption was projected to 2006 using average growth of diesel-fed vehicle stock from 1992-1996

[2] Projections are based on the 9.8% average increase in gasoline-fed vehicles and 6.3% average increase in diesel-fed engines from 1992 to 1996

Table 6

Projected PM_{10} Emissions, Ambient Levels, Health Damages and Tax Burden

NCR, 1998-2006 BASELINE LEVEL

	1998	1999	2000	2001	2002	2003	2004	2005	2006
PM_{10} Emissions [1] (In tons)	18,777	20,125	20,729	22,234	23,854	25,597	27,473	29,493	31,669
Ambient Concentration [2] (In mg/cu.m)	148.4	159.1	163.9	175.8	188.6	202.3	217.2	233.1	250.3
Health Damages [3] (In million pesos)	1,838	2,261	2,644	3,263	4,034	4,992	6,187	7,678	9,540
Tax Burden [4] (In million pesos)	10,189	11,095	12,083	13,161	14,339	15,625	17,030	18,564	20,240

Notes:

[1] See Supporting Table 6.4.

[2] Based on average ratio of PM_{10} emissions to ambient concentration in 1996.

[3] See Table 7 and its Supporting Tables.

[4] See Supporting Table 6.1.

Supporting Table 6.1
Projected Tax Revenues
NCR, 1998 to 2006 - BASELINE LEVEL

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Fuel consumption [1]									
(In million liters)									
Gasoline	1,467	1,611	1,769	1,942	2,133	2,342	2,571	2,823	3,100
Leaded premium	1,128	1,238	1,359	1,493	1,639	1,800	1,976	2,170	2,382
Unleaded premium	309	339	372	409	449	493	541	594	652
Regular	31	34	37	41	45	49	54	59	65
Diesel	1,635	1,738	1,848	1,964	2,088	2,219	2,359	2,508	2,666
Tax rates [2]									
(In pesos per liter)									
Leaded premium	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35
Unleaded premium	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35	4.35
Regular	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80	4.80
Diesel	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63
Tax revenues [3]	10,189	11,095	12,083	13,161	14,339	15,625	17,030	18,564	20,240
(In million pesos)									
Leaded premium	6,033	6,624	7,273	7,986	8,768	9,628	10,571	11,607	12,745
Unleaded premium	1,343	1,475	1,620	1,778	1,952	2,144	2,354	2,585	2,838
Regular	148	163	178	196	215	236	259	285	313
Diesel	2,665	2,833	3,012	3,201	3,403	3,617	3,845	4,088	4,345

Notes:

[1] See Table 5.

[2] Tax rates are those stipulated under R.A. 8184: Fuel Tax Restructuring Act of 1996. See Supporting Table 6.2.

[3] Tax rate * fuel consumption

Sources of basic data:

Department of Energy.
Energy Regulatory Board.
Land Transportation Office.

Supporting Table 6.2
Fuel Tax Rates Before and After Tax Restructuring
NCR, 1996

Products	Previous Tax Rates	Restructured Specific Taxes	Increase/ Decrease
Premium Gasoline	3.80	5.35	1.55
Unleaded Premium	3.24	4.35	1.11
Regular Gasoilne	4.00	4.80	0.80
AV Turbo	3.67	3.67	0
Kerosene	1.79	0.60	(1.19)
Diesel Oil	1.47	1.63	0.16
Fuel Oil	1.17	0.30	(0.87)
LPG	1.30	0	(1.30)

Source:

Energy Regulatory Board.

Supporting Table 6.3
Summary of Process Rates for Computation of PM_{10} Emissions

	Emission factor (g/li)	Average distance travelled (km/year)	Fuel Efficiency (km/li)
Gasoline			
Cars	0.1	12,000	13.67
UV	0.12	30,000	10.79
Buses	0.05	50,000	3.60
Trucks	0.05	50,000	3.60
MC/TC	2	10,000	35.23
Diesel			
Cars	0.60	12,000	17.49
UV	0.90	40,000	12.02
Buses	1.52	50,000	3.76
Trucks	1.52	50,000	3.76

Sources:
Air Emission Inventory for Motor Vehicles in Metro Manila. 1991. ADB.
Environmental Management Bureau, 1990.

Supporting Table 6.4
Estimation of PM_{10} Emissions
NCR, 1998-2006 -BASELINE LEVEL

Type of Vehicle and Fuel	Average distance travelled [3] (km/year)	Emission factor [1] (g/lt)	Vehicle stock [2] 1998	1999	2000	2001	2002	2003	2004	2005	2006	Emissions [3] (tons) 1998	1999	2000	2001	2002	2003	2004	2005	2006
Gasoline												4,748	5,214	5,725	6,286	6,902	7,578	8,321	9,136	10,031
Cars	12,000	0.1	564,554	619,881	680,629	747,330	820,569	900,985	989,281	1,086,231	1,192,681	677	744	817	897	985	1,081	1,187	1,303	1,431
UV	30,000	0.12	243,587	267,459	293,670	322,450	354,050	388,747	426,844	468,674	514,605	877	963	1,057	1,161	1,275	1,399	1,537	1,687	1,853
Buses	50,000	0.05	109	119	131	144	158	173	190	209	229	0.27	0.30	0.33	0.36	0.39	0.43	0.48	0.52	0.57
Trucks	50,000	0.05	6,587	7,233	7,942	8,720	9,575	10,513	11,543	12,675	13,917	16	18	20	22	24	26	29	32	35
MC TC	1[illegible],000	2	158,860	174,428	191,522	210,291	230,900	253,528	278,374	305,655	335,609	3,177	3,489	3,830	4,206	4,618	5,071	5,567	6,113	6,712
											Adjusted [4]	4,720	5,182	5,690	6,248	6,860	7,532	8,271	9,081	9,971
Diesel												17,613	18,723	19,902	21,156	22,489	23,906	25,412	27,013	28,715
Cars	12,000	0.63	25,241	26,831	28,522	30,319	32,229	34,259	36,418	38,712	41,151	189	201	214	228	242	257	273	291	309
UV	30,000	0.91	294,848	313,424	333,170	354,159	376,471	400,189	425,401	452,201	480,693	10,775	11,454	12,175	12,942	13,758	14,625	15,546	16,525	17,566
Buses	50,000	1.52	9,806	10,424	11,080	11,778	12,520	13,309	14,148	15,039	15,986	747	794	844	898	954	1,014	1,078	1,146	1,218
Trucks	50,000	1.52	77,448	82,327	87,514	93,027	98,888	105,118	111,740	118,780	126,263	5,902	6,273	6,669	7,089	7,535	8,010	8,515	9,051	9,621
											Adjusted [4]	14,057	14,942	15,884	16,884	17,948	19,079	20,281	21,559	22,917
											TOTAL	18,777	20,125	21,574	23,132	24,808	26,611	28,552	30,640	32,888
											Adjusted for MRT [5]	**18,777**	**20,125**	**20,729**	**22,234**	**23,854**	**25,597**	**27,473**	**29,493**	**31,669**

Notes:

[1] From Supporting Table 6.3.

[2] From Table 5.

[3] SS (vehicle stock* average distance* emission factor) ; i=vehicle type, j=fuel type

[4] 0.994 of gasoline PM is PM_{10}.
Lower diesel consumption also means less SO_2. 25% of SO_2 is sulfates, which are in the form of particulate matter. (See Supporting Table 6.5)

[5] MRT is expected to displace all buses, hence reduce emissions by the buses' contribution.

Sources of basic data:

Air Emission Inventory for Motor Vehicles in Metro Manila. 1991. ADB.

Environmental Management Bureau.

Land Transportation Office.

Supporting Table 6.5
Computation of Change in Sulfates
NCR, 1998-2006 - BASELINE LEVEL

Year	Sulphur Content [1/] (% weight)	Density [2/] (kg/li)	Volume of diesel sales [3/] (liters)	SO_2 emissions [4/] (tons)	Sulfates [5/] (tons)	PM_{10} emissions [6/] (tons)	PM_{10} emissions less sulfates (tons)
1998	0.5	0.87	1,635	14,225	3,556	17,613	14,057
1999	0.5	0.87	1,738	15,122	3,780	18,723	14,942
2000	0.5	0.87	1,848	16,074	4,019	19,902	15,884
2001	0.5	0.87	1,964	17,087	4,272	21,156	16,884
2002	0.5	0.87	2,088	18,163	4,541	22,489	17,948
2003	0.5	0.87	2,219	19,308	4,827	23,906	19,079
2004	0.5	0.87	2,359	20,524	5,131	25,412	20,281
2005	0.5	0.87	2,508	21,817	5,454	27,013	21,559
2006	0.5	0.87	2,666	23,192	5,798	28,715	22,917

Notes:

1/ Sulphur content of diesel has been lowered starting 1996 from 0.7% (in Metro Manila, 0.8% in other areas) to 0.5%.

2/ Diesel density is 7.05 lbs/gallon

3/ From Table 5.

4/ Formula: fuel consumption * density * sulphur content (in%) * 2

5/ 0.25 of SO_2 = sulfates (TEC 1993)

6/ From Supporting Table 6.4.

Sources of basic data:

Energy Regulatory Board

Orbeta and Indab. 1995. ENRAP III. Volume 5. Refinement of Accounts.

Table 7 Projected Health Damages Associated with PM10 Exposure (in million Philippine Pesos)
National Capital Region, 1998-2006 - Baseline Level

Health Effect	1998	1999	2000	2001	2002	2003	2004	2005	2006
Mortality	660	755	820	937	1,070	1,219	1,388	1,579	1,794
Morbidity									
Cost of work loss days	1.26	1.40	1.47	1.63	1.80	1.99	2.19	2.41	2.65
Cost of medication	854	1,120	1,388	1,805	2,341	3,026	3,902	5,019	6,442
Chronic Bronchitis	44	58	72	93	121	156	201	259	332
Lower Respiratory Illness	810	1,063	1,316	1,712	2,220	2,870	3,701	4,760	6,110
TOTAL	1,515	1,877	2,209	2,744	3,412	4,247	5,292	6,600	8,239

Notes:
1998 estimate assumes the following:
1) 9.8 percent and 6.3 percent annual growth rate of gasoline-and diesel-fed vehicle stock since 1996.
2) 1.12 percent growth rate of income.
3) 3.3 percent NCR population growth rate.
4) Post deregulation and post- tax restructuring fuel tax rates.
5) No other pollution control policy.
6) Imperfect substitution between leaded and unleaded gasoline.
See Supporting Tables 7.1 to 7.9 for the breakdown of health effects by income decile.

Table 7.1 Value of Health Damages from PM_{10} Exposure by Income Decile (in million Philippine Pesos), National Capital Region, 1998 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	21	30	36	42	50	59	70	85	60	208	660
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.04	0.06	0.07	0.08	0.10	0.11	0.13	0.16	0.11	0.40	1.265
Cost of medication											
Total (3)	94	94	94	94	94	94	94	94	50	50	854
Chronic bronchitis	5	5	5	5	5	5	5	5	3	3	44
Lower respiratory illness	89	89	89	89	89	89	89	89	48	48	810
Respiratory symptom days	6.19	6.20	6.19	6.19	6.19	6.19	6.20	6.19	3.30	3.30	56
TOTAL = (1) + (2) + (3)	115	124	130	136	144	153	164	180	110	259	**1,515**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.1.1 to 7.1.6.

Supporting Table 7.1.1
Value of Foregone Earnings Due to Mortality
NCR, 1998 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	41.22	41.22	41.22	41.22	41.22	41.22	41.22	41.22	21.98	21.98
Change in Pr(M) due to red'n in	c	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.029	0.029
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	922,067	923,697	922,447	922,253	921,910	922,427	923,086	922,315	922,208	922,877
Excess mortality cases	f	301	302	301	301	301	301	302	301	161	161
Estimated present value of future average earnings [5]	g	70,502	97,958	118,564	140,077	165,540	194,181	231,433	282,701	370,770	1,293,061
Estimated value of productivity l	h	21,246,834	29,573,386	35,745,999	42,222,915	49,879,506	58,542,564	69,823,275	85,219,300	59,602,435	208,014,244

Notes:

[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).

[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.

[4] Population at risk is total NCR population (See Supporting Table 7.13d).

[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:

(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:

Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.4.7

Value of Work Loss Days Due to Chronic Bronchitis
NCR, 1998 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	41.22	41.22	41.22	41.22	41.22	41.22	41.22	41.22	21.98	21.98
Change in RAD per person per year	c	0.0372	0.0372	0.0372	0.0372	0.0372	0.0372	0.0372	0.0372	0.0198	0.0198
RAD per person per chronic bronchitis episod	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total popul	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cas	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	983	983	983	983	983	983	983	983	524	524
WLD [7]	l	773	773	773	773	773	773	773	773	412	412
Estimated average daily earnings [8]	m	53	73	89	105	124	145	173	211	277	967
Estimated value of WLD	n	40,748	56,617	68,528	80,961	95,678	112,233	133,762	163,393	114,291	398,591

Notes.

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10)

[3] The average RAD due to chrone bronchitis is 14 days (Supporting Table 7.11).

[4] NCR figure.

[5] 1992 figure.

[6] Supporting Table 7.17.

[7] WLD = RAD * (5.5/7)

[8] See Supporting Table 7.14.

Formula

(e) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data

Current Labor Statistics, December 1996, DOLE
DENR-NCR Office
Integrated Survey of Households, October 1995, NSO
Philippine Health Statistics 1992
Philippine Institute for Development Studies
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 7.1.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 1998 - BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	28,283	89,279,318	1,740	4,853,908
2nd	28,333	89,437,159	1,743	4,862,489
3rd	28,295	89,316,157	1,741	4,855,910
4th	28,289	89,297,386	1,740	4,854,890
5th	28,278	89,264,101	1,740	4,853,080
6th	28,294	89,314,228	1,740	4,855,805
7th	28,314	89,378,028	1,742	4,859,274
8th	28,291	89,303,296	1,740	4,855,211
9th	15,087	47,622,948	928	2,589,148
10th	15,098	47,657,458	929	2,591,024

Notes:

[1] From Supporting Table 7.1.4.

[2] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).

[3] From Supporting Table 7.1.5.

Supporting Table 7.1.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 1998 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	41.22	41.22	41.22	41.22	41.22	41.22	41.22	41.22	21.98	21.98
Change in risk of chronic bronchitis [2]	c	0.0981	0.0981	0.0981	0.0981	0.0981	0.0981	0.0981	0.0981	0.0523	0.0523
Population at risk [3]	d	288,330	288,840	288,449	288,389	288,281	288,443	288,649	288,408	288,375	288,584
Excess morbidity cases	e	28,283	28,333	28,295	28,289	28,278	28,294	28,314	28,291	15,087	15,098

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:

(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:

DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.1.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 1998 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	41.22	41.22	41.22	41.22	41.22	41.22	41.22	41.22	21.98	21.98
Change in risk of chronic bronchitis [2]	c	0.00378	0.00378	0.00378	0.00378	0.00378	0.00378	0.00378	0.00378	0.00202	0.00202
Population at risk [3]	d	459,835	460,648	460,024	459,928	459,756	460,015	460,343	459,958	459,905	460,239
Excess morbidity cases	e	1,740	1,743	1,741	1,740	1,740	1,740	1,742	1,740	928	929

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:

(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:

DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.1.6
Excess Respiratory Symptom Days
NCR, 1998 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	41.22	41.22	41.22	41.22	41.22	41.22	41.22	41.22	21.98	21.98
Change in risk of chronic bronchitis [2]	c	11.29	11.29	11.29	11.29	11.29	11.29	11.29	11.29	6.02	6.02
Population at risk [3]	d	548,169	549,138	548,395	548,280	548,075	548,383	548,775	548,316	548,253	548,650
Excess morbidity cases	e	6,190,467	6,201,411	6,193,021	6,191,720	6,189,412	6,192,887	6,197,311	6,192,129	3,302,089	3,304,482

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.2 Value of Health Damages from PM10 Exposure by Income Decile (*in million* Philippine Pesos), National Capital Region, 1999 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	24	34	41	48	57	67	80	98	68	238	755
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.05	0.06	0.08	0.09	0.11	0.12	0.15	0.18	0.13	0.44	1.402
Cost of medication											
Total (3)	124	124	124	124	124	124	124	124	66	66	1,120
Chronic bronchitis	6	6	6	6	6	6	6	6	3	3	58
Lower respiratory illness	117	117	117	117	117	117	117	117	62	63	1,063
Respiratory symptom days	7.01	7.02	7.01	7.01	7.01	7.01	7.02	7.01	3.74	3.74	64
TOTAL = (1) + (2) + (3)	148	158	165	172	181	191	204	221	134	305	**1,877**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.2.1 to 7.2.6.

Supporting Table 7.2.1
Value of Foregone Earnings Due to Mortality
NCR, 1999- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/acm) [2]	b	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	24.09	24.09
Change in Pr(M) due to red'n in	c	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.031	0.031
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	952,495	954,179	952,888	952,688	952,333	952,868	953,548	952,751	952,641	953,332
Excess mortality cases	f	341	342	341	341	341	341	342	341	182	182
Estimated present value of future average earnings [5]	g	71,291	99,055	119,892	141,646	167,394	196,356	234,026	285,867	374,922	1,307,543
Estimated value of productivity l	h	24,325,155	33,858,088	40,925,012	48,340,328	57,106,235	67,024,429	79,939,531	97,566,189	68,237,858	238,152,122

Notes:

[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).

[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.

[4] Population at risk is total NCR population (See Supporting Table 7.13d).

[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:

(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:

Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.2.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 1999 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	24.09	24.09
Change in RAD per person per year	c	0.0408	0.0408	0.0408	0.0408	0.0408	0.0408	0.0408	0.0408	0.0218	0.0218
RAD per person per chronis bronchitis episod	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total popul	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cas	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,078	1,078	1,078	1,078	1,078	1,078	1,078	1,078	575	575
WLD [7]	l	847	847	847	847	847	847	847	847	452	452
Estimated average daily earnings [8]	m	53	74	90	106	125	147	175	214	280	978
Estimated value of WLD	n	45,162	62,749	75,950	89,730	106,040	124,389	148,249	181,090	126,670	441,762

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] The average RAD due to chronc bronchitis is 14 days (Supporting Table 7.11).

[4] NCR figure.

[5] 1992 figure.

[6] Supporting Table 7.17.

[7] WLD = RAD * (5.5/7)

[8] See Supporting Table 7.14.

Formula:

(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)

(ii) = (l) * (m)

Sources of basic data:

Employed Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.2.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 1999 - BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	32,022	117,152,736	1,970	6,369,320
2nd	32,079	117,359,856	1,973	6,380,581
3rd	32,035	117,201,076	1,971	6,371,948
4th	32,029	117,176,445	1,970	6,370,609
5th	32,017	117,132,767	1,969	6,368,234
6th	32,035	117,198,545	1,971	6,371,811
7th	32,058	117,282,263	1,972	6,376,362
8th	32,031	117,184,199	1,970	6,371,031
9th	17,081	62,491,054	1,051	3,397,492
10th	17,093	62,536,337	1,051	3,399,954

Notes:

[1] From Supporting Table 7.2.4.

[2] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).

[3] From Supporting Table 7.2.5.

Supporting Table 7.2.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 1999 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	24.09	24.09
Change in risk of chronic bronchitis [2]	c	0.1075	0.1075	0.1075	0.1075	0.1075	0.1075	0.1075	0.1075	0.0573	0.0573
Population at risk [3]	d	297,845	298,372	297,968	297,905	297,794	297,962	298,175	297,925	297,891	298,107
Excess morbidity cases	e	32,022	32,079	32,035	32,029	32,017	32,035	32,058	32,031	17,081	17,093

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:

(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:

DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.2.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 1999 - BASELINE LEVEL
(In pesos)

	Variable co	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient	a	0.0000918	0.0000918	9.18E-05	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	24.09	24.09
Change in risk of chronic bronchitis [2]	c	0.00415	0.00415	0.00415	0.00415	0.00415	0.00415	0.00415	0.00415	0.00221	0.00221
Population at risk [3]	d	475,009	475,849	475,205	475,105	474,928	475,195	475,534	475,137	475,082	475,426
Excess morbidity cases	e	1,970	1,973	1,971	1,970	1,969	1,971	1,972	1,970	1,051	1,051

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:

(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:

DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.2.6
Excess Respiratory Symptom Days
NCR, 1999 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	45.17	45.17	45.17	45.17	45.17	45.17	45.17	45.17	24.09	24.09
Change in risk of chronic bronchitis [2]	c	12.38	12.38	12.38	12.38	12.38	12.38	12.38	12.38	6.60	6.60
Population at risk [3]	d	566,258	567,259	566,492	566,373	566,162	566,480	566,884	566,410	566,345	566,756
Excess morbidity cases	e	7,008,865	7,021,257	7,011,757	7,010,284	7,007,671	7,011,606	7,016,615	7,010,748	3,738,636	3,741,345

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:

(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:

DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.3 Value of Health Damages from PM10 Exposure by Income Decile (in million Philippine Pesos), National Capital Region, 2000 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	26	37	44	52	62	73	87	106	74	259	820
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.05	0.07	0.08	0.09	0.11	0.13	0.16	0.19	0.13	0.46	1.473
Cost of medication											
Total (3)	153	153	153	153	153	153	153	153	82	82	1,388
Chronic bronchitis	8	8	8	8	8	8	8	8	4	4	72
Lower respiratory illness	145	145	145	145	145	145	145	145	77	77	1,316
Respiratory symptom days	7.52	7.54	7.53	7.53	7.52	7.53	7.53	7.53	4.01	4.02	68
TOTAL = (1) + (2) + (3)	179	190	198	206	215	226	240	259	156	341	**2,209**

Notes:
Respiratory symptom days are not *included in the valuation*
Sources:
Supporting Tables 7.3.1 to 7.3.6.

Supporting Table 7.3.1
Value of Foregone Earnings Due to Mortality
NCR, 2000 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	46.95	46.95	46.95	46.95	46.95	46.95	46.95	46.95	25.04	25.04
Change in Pr(M) due to red'n in	c	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.033	0.033
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	983,927	985,667	984,333	984,127	983,760	984,312	985,015	984,192	984,079	984,792
Excess mortality cases	f	366	367	366	366	366	366	367	366	195	196
Estimated present value of future average earnings [5]	g	72,090	100,165	121,235	143,232	169,268	198,555	236,647	289,069	379,122	1,322,187
Estimated value of productivity l	h	26,407,774	36,756,878	44,428,843	52,479,027	61,995,435	72,762,784	86,783,623	#########	74,080,101	258,541,723

Notes:

[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).

[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.

[4] *Population at risk is total NCR population* (See Supporting Table 7.13d).

[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:

(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:

Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.3.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2000 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	46.95	46.95	46.95	46.95	46.95	46.95	46.95	46.95	25.04	25.04
Change in RAD per person per year	c	0.0424	0.0424	0.0424	0.0424	0.0424	0.0424	0.0424	0.0424	0.0226	0.0226
RAD per person per chronis bronchitis episod	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total popul	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cas	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	597	597
WLD [7]	l	880	880	880	880	880	880	880	880	469	469
Estimated average daily earnings [8]	m	54	75	91	107	127	149	177	216	284	989
Estimated value of WLD	n	47,462	65,945	79,819	94,300	111,441	130,724	155,800	190,314	133,122	464,263

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10)

[3] The average RAD due to chrone bronchitis is 14 days (Supporting Table 7.11).

[4] NCR figure.

[5] 1992 figure

[6] Supporting Table 7.17.

[7] WLD = RAD * (5.5/7)

[8] See Supporting Table 7.14

Formula:

(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of base data:

Current Labor Statistics, December 1996, DOLE
DENR-NCR Office
Integrated Survey of Households, October 1995, NSO
Philippine Health Statistics 1992
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 7.3.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2000 - BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	34,379	145,079,623	2,115	7,887,639
2nd	34,439	145,336,116	2,119	7,901,584
3rd	34,393	145,139,486	2,116	7,890,894
4th	34,386	145,108,983	2,115	7,889,236
5th	34,373	145,054,894	2,114	7,886,295
6th	34,392	145,136,352	2,116	7,890,724
7th	34,417	145,240,027	2,117	7,896,360
8th	34,388	145,118,587	2,115	7,889,758
9th	18,338	77,387,681	1,128	4,207,387
10th	18,351	77,443,759	1,129	4,210,436

Notes:

[1] From Supporting Table 7.3.4.

[2] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).

[3] From Supporting Table 7.3.5.

Supporting Table 7.3.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2000 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	46.95	46.95	46.95	46.95	46.95	46.95	46.95	46.95	25.04	25.04
Change in risk of chronic bronchitis [2]	c	0.1117	0.1117	0.1117	0.1117	0.1117	0.1117	0.1117	0.1117	0.0596	0.0596
Population at risk [3]	d	307,674	308,218	307,801	307,736	307,622	307,794	308,014	307,757	307,721	307,944
Excess morbidity cases	e	34,379	34,439	34,393	34,386	34,373	34,392	34,417	34,388	18,338	18,351

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:

(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:

DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.3.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2000 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	46.95	46.95	46.95	46.95	46.95	46.95	46.95	46.95	25.04	25.04
Change in risk of chronic bronchitis [2]	c	0.00431	0.00431	0.00431	0.00431	0.00431	0.00431	0.00431	0.00431	0.00230	0.00230
Population at risk [3]	d	490,685	491,552	490,887	490,784	490,601	490,876	491,227	490,816	490,760	491,116
Excess morbidity cases	e	2,115	2,119	2,116	2,115	2,114	2,116	2,117	2,115	1,128	1,129

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.3.6
Excess Respiratory Symptom Days
NCR, 2000 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	46.95	46.95	46.95	46.95	46.95	46.95	46.95	46.95	25.04	25.04
Change in risk of chronic bronchitis [2]	c	12.86	12.86	12.86	12.86	12.86	12.86	12.86	12.86	6.86	6.86
Population at risk [3]	d	584,945	585,979	585,186	585,063	584,845	585,174	585,592	585,102	585,035	585,459
Excess morbidity cases	e	7,521,659	7,537,962	7,527,764	7,526,182	7,523,377	7,527,602	7,532,979	7,526,680	4,013,768	4,016,676

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above *19 years old for NCR (Supporting Table 7.13c)*

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.4 Value of Health Damages from PM10 Exposure by Income Decile (in million Philippine Pesos), National Capital Region, 2001 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	30	42	51	60	71	83	99	121	85	295	937
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.05	0.07	0.09	0.10	0.12	0.14	0.17	0.21	0.15	0.51	1.630
Cost of medication											
Total (3)	199	199	199	199	199	199	199	199	106	106	1,805
Chronic bronchitis	10	10	10	10	10	10	10	10	5	5	93
Lower respiratory illness	189	189	189	189	189	189	189	189	101	101	1,712
Respiratory symptom days	8.50	8.52	8.51	8.51	8.50	8.51	8.51	8.51	4.54	4.54	77
TOTAL = (1) + (2) + (3)	229	241	250	259	270	282	299	320	191	402	**2,744**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.4.1 to 7.4.6.

Supporting Table 7.4.1
Value of Foregone Earnings Due to Mortality
NCR, 2001 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	27.40	27.40
Change in Pr(M) due to red'n in PM	c	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.036	0.036
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,016,397	1,018,194	1,016,816	1,016,603	1,016,224	1,016,794	1,017,521	1,016,670	1,016,553	1,017,290
Excess mortality cases	f	414	415	414	414	414	414	414	414	221	221
Estimated present value of future average earnings [5]	g	72,897	101,286	122,593	144,836	171,164	200,779	239,297	292,306	383,368	1,336,996
Estimated value of productivity loss	h	30,181,125	42,008,991	50,777,187	59,977,645	70,853,832	83,159,705	99,183,953	121,054,005	84,665,252	295,484,207

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.4.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2001 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	27.40	27.40
Change in RAD per person per year	c	0.0464	0.0464	0.0464	0.0464	0.0464	0.0464	0.0464	0.0464	0.0247	0.0247
RAD per person per chronis bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,226	1,226	1,226	1,226	1,226	1,226	1,226	1,226	654	654
WLD [7]	l	963	963	963	963	963	963	963	963	514	514
Estimated average daily earnings [8]	m	55	76	92	108	128	150	179	219	287	1000
Estimated value of WLD	n	52,511	72,960	88,310	104,332	123,296	144,630	172,374	210,559	147,283	513,651

Notes:
[1] See *Supporting Table 7.10.*
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronc bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WLD = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
*(k) = (j) * (c)*
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.4.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2001 - BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	38,856	188,744,683	2,390	10,261,607
2nd	38,924	189,078,373	2,394	10,279,749
3rd	38,872	188,822,563	2,391	10,265,841
4th	38,864	188,782,880	2,391	10,263,683
5th	38,849	188,712,511	2,390	10,259,857
6th	38,871	188,818,485	2,391	10,265,619
7th	38,899	188,953,363	2,393	10,272,952
8th	38,866	188,795,374	2,391	10,264,362
9th	20,726	100,679,289	1,275	5,473,697
10th	20,741	100,752,245	1,276	5,477,664

Notes:
[1/] From Supporting Table 7.4.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.4.5.

Supporting Table 7.4.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2001 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	27.40	27.40
Change in risk of chronic bronchitis [2]	c	0.1223	0.1223	0.1223	0.1223	0.1223	0.1223	0.1223	0.1223	0.0652	0.0652
Population at risk [3]	d	317,827	318,389	317,958	317,892	317,773	317,952	318,179	317,913	317,876	318,106
Excess morbidity cases	e	38,856	38,924	38,872	38,864	38,849	38,871	38,899	38,866	20,726	20,741

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.4.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2001 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	27.40	27.40
Change in risk of chronic bronchitis [2]	c	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472	0.00251	0.00251
Population at risk [3]	d	506,877	507,773	507,086	506,980	506,791	507,075	507,438	507,013	506,955	507,322
Excess morbidity cases	e	2,390	2,394	2,391	2,391	2,390	2,391	2,393	2,391	1,275	1,276

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.4.6
Excess Respiratory Symptom Days
NCR, 2001 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	51.37	51.37	51.37	51.37	51.37	51.37	51.37	51.37	27.40	27.40
Change in risk of chronic bronchitis [2]	c	14.07	14.07	14.07	14.07	14.07	14.07	14.07	14.07	7.51	7.51
Population at risk [3]	d	604,248	605,316	604,497	604,370	604,145	604,484	604,916	604,410	604,341	604,779
Excess morbidity cases	e	8,504,591	8,519,626	8,508,100	8,506,312	8,503,141	8,507,916	8,513,994	8,506,875	4,536,478	4,539,766

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.5 Value of Health Damages from PM_{10} Exposure by Income Decile (in million Philippine Pesos), National Capital Region, 2002 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	34	48	58	68	81	95	113	138	97	337	1,070
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.06	0.08	0.10	0.12	0.14	0.16	0.19	0.23	0.16	0.57	1.801
Cost of medication											
Total (3)	258	259	258	258	258	258	258	258	138	138	2,341
Chronic bronchitis	13	13	13	13	13	13	13	13	7	7	121
Lower respiratory illness	245	245	245	245	245	245	245	245	131	131	2,220
Respiratory symptom days	9.60	9.62	9.60	9.60	9.60	9.60	9.61	9.60	5.12	5.12	87
TOTAL = (1) + (2) + (3)	293	307	316	327	339	353	372	396	234	476	**3,412**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.5.1 to 7.5.6.

Supporting Table 7.5.1
Value of Foregone Earnings Due to Mortality
NCR, 2002- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	56.12	56.12	56.12	56.12	56.12	56.12	56.12	56.12	29.93	29.93
Change in Pr(M) due to red'n in PM	c	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.073	0.039	0.039
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,049,938	1,051,794	1,050,371	1,050,151	1,049,759	1,050,349	1,051,099	1,050,220	1,050,099	1,050,860
Excess mortality cases	f	467	468	467	467	467	467	468	467	249	249
Estimated present value of future average earnings [5]	g	73,714	102,421	123,966	146,458	173,081	203,028	241,977	295,580	387,661	1,351,970
Estimated value of productivity loss	h	34,444,401	47,943,028	57,949,787	68,449,869	80,862,387	94,906,543	113,194,317	138,153,653	96,624,757	337,223,231

Notes:
[1] Based on WHO air quality guideline and high estimates of *Ostro's dose-response function* (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to *unavailability of 1996 figure.*
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] *Estimated value of future earnings* of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, *1995, DOLE.*

Supporting Table 7.5.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2002 BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	56.12	56.12	56.12	56.12	56.12	56.12	56.12	56.12	29.93	29.93
Change in RAD per person per year	c	0.0507	0.0507	0.0507	0.0507	0.0507	0.0507	0.0507	0.0507	0.0270	0.0270
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419
Share of 15 years old and above to *total population* [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,339	1,339	1,339	1,339	1,339	1,339	1,339	1,339	714	714
WLD [7]	l	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	561	561
Estimated average daily earnings [8]	m	55	77	93	110	129	152	181	221	290	1011
Estimated value of WLD	n	58,014	80,606	97,561	115,266	136,218	159,787	190,438	232,626	162,718	567,480

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to *chronic bronchitis is 14 days* (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WLD = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO
Philippine Health Statistics 1992.
Philippine Institute for Development Studies
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.5.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2002- BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	43,853	244,738,333	2,698	13,305,850
2nd	43,931	245,171,017	2,702	13,329,374
3rd	43,871	244,839,318	2,699	13,311,341
4th	43,862	244,787,862	2,698	13,308,543
5th	43,846	244,696,618	2,697	13,303,582
6th	43,870	244,834,030	2,699	13,311,053
7th	43,902	245,008,922	2,701	13,320,562
8th	43,865	244,804,062	2,698	13,309,424
9th	23,392	130,547,155	1,439	7,097,543
10th	23,409	130,641,754	1,440	7,102,686

Notes:
[1/] From Supporting Table 7.5.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.5.5.

Supporting Table 7.5.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2002- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	56.12	56.12	56.12	56.12	56.12	56.12	56.12	56.12	29.93	29.93
Change in risk of chronic bronchitis [2]	c	0.1336	0.1336	0.1336	0.1336	0.1336	0.1336	0.1336	0.1336	0.0712	0.0712
Population at risk [3]	d	328,316	328,896	328,451	328,382	328,260	328,444	328,679	328,404	328,366	328,604
Excess morbidity cases	e	43,853	43,931	43,871	43,862	43,846	43,870	43,902	43,865	23,392	23,409

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a)

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.5.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2002- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	56.12	56.12	56.12	56.12	56.12	56.12	56.12	56.12	29.93	29.93
Change in risk of chronic bronchitis [2]	c	0.00515	0.00515	0.00515	0.00515	0.00515	0.00515	0.00515	0.00515	0.00275	0.00275
Population at risk [3]	d	523,604	524,530	523,820	523,710	523,515	523,809	524,183	523,745	523,685	524,064
Excess morbidity cases	e	2,698	2,702	2,699	2,698	2,697	2,699	2,701	2,698	1,439	1,440

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.5.6
Excess Respiratory Symptom Days
NCR, 2002- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	56.12	56.12	56.12	56.12	56.12	56.12	56.12	56.12	29.93	29.93
Change in risk of chronic bronchitis [2]	c	15.38	15.38	15.38	15.38	15.38	15.38	15.38	15.38	8.20	8.20
Population at risk [3]	d	624,188	625,292	624,446	624,315	624,082	624,432	624,878	624,356	624,284	624,736
Excess morbidity cases	e	9,598,416	9,615,385	9,602,377	9,600,358	9,596,780	9,602,169	9,609,028	9,600,994	5,119,941	5,123,651

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] *Population at risk are those above 19 years old for NCR (Supporting Table 7.13e).*

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.6 Value of Health Damages from PM10 Exposure by Income Decile (in million Philippine Pesos), National Capital Region, 2003 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	39	55	66	78	92	108	129	157	110	384	1,219
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.06	0.09	0.11	0.13	0.15	0.18	0.21	0.26	0.18	0.63	1.987
Cost of medication											
Total (3)	334	334	334	334	334	334	334	334	178	178	3,026
Chronic bronchitis	17	17	17	17	17	17	17	17	9	9	156
Lower respiratory illness	316	317	317	316	316	317	317	316	169	169	2,870
Respiratory symptom days	10.82	10.84	10.82	10.82	10.82	10.82	10.83	10.82	5.77	5.78	98
TOTAL = (1) + (2) + (3)	373	389	400	412	426	442	463	491	288	563	**4,247**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.6.1 to 7.6.6.

Supporting Table 7.6.4
Value of Foregone Earnings Due to Mortality
NCR, 2003- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	61.24	61.24	61.24	61.24	61.24	61.24	61.24	61.24	32.66	32.66
Change in Pr(M) due to red'n in PM	c	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.042	0.042
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,084,586	1,086,504	1,085,034	1,084,806	1,084,401	1,085,010	1,085,785	1,084,877	1,084,753	1,085,539
Excess mortality cases	f	527	528	527	527	527	527	527	527	281	281
Estimated present value of future average earnings [5]	g	74,539	103,568	125,354	148,099	175,020	205,302	244,687	298,891	392,003	1,367,112
Estimated value of productivity loss	h	39,260,118	54,646,007	66,051,824	78,019,936	92,167,864	108,175,552	129,020,165	157,469,099	110,133,993	384,370,858

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] *Crude death rate for* 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.6.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2003- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	61.24	61.24	61.24	61.24	61.24	61.24	61.24	61.24	32.66	32.66
Change in RAD per person per year	c	0.0553	0.0553	0.0553	0.0553	0.0553	0.0553	0.0553	0.0553	0.0295	0.0295
RAD per person per chronis bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to *chronic bronchitis* [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated *total RAD*	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,461	1,461	1,461	1,461	1,461	1,461	1,461	1,461	779	779
WLD [7]	l	1,148	1,148	1,148	1,148	1,148	1,148	1,148	1,148	612	612
Estimated average daily earnings [8]	m	56	77	94	111	131	154	183	221	293	1023
Estimated value of WLD	n	64,013	88,941	107,652	127,181	150,302	176,309	210,130	256,679	179,543	626,157

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronc bronchitis is 14 days (Supporting Table *7.11*).
[4] NCR figure.
[5] *1992 figure.*
[6] Supporting Table 7.17.
[7] WLD = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
*(j) = (i) * (d)*
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated *Survey of Households*, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.6.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2003- BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	49,431	316,401,343	3,041	17,202,000
2nd	49,518	316,960,723	3,046	17,232,413
3rd	49,451	316,531,898	3,042	17,209,098
4th	49,441	316,465,374	3,041	17,205,482
5th	49,422	316,347,413	3,040	17,199,068
6th	49,450	316,525,061	3,042	17,208,727
7th	49,485	316,751,164	3,044	17,221,019
8th	49,444	316,486,318	3,042	17,206,620
9th	26,367	168,773,296	1,622	9,175,809
10th	26,386	168,895,595	1,623	9,182,458

Notes:
[1/] From Supporting Table 7.6.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.6.5.

Supporting Table 7.6.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2003- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	61.24	61.24	61.24	61.24	61.24	61.24	61.24	61.24	32.66	32.66
Change in risk of chronic bronchitis [2]	c	0.1457	0.1457	0.1457	0.1457	0.1457	0.1457	0.1457	0.1457	0.0777	0.0777
Population at risk [3]	d	339,150	339,750	339,290	339,219	339,092	339,283	339,525	339,241	339,202	339,448
Excess morbidity cases	e	49,431	49,518	49,451	49,441	49,422	49,450	49,485	49,444	26,367	26,386

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.6.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2003- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	61.24	61.24	61.24	61.24	61.24	61.24	61.24	61.24	32.66	32.66
Change in risk of chronic bronchitis [2]	c	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562	0.00562	0.00300	0.00300
Population at risk [3]	d	540,883	541,839	541,106	540,993	540,791	541,095	541,481	541,028	540,966	541,358
Excess morbidity cases	e	3,041	3,046	3,042	3,041	3,040	3,042	3,044	3,042	1,622	1,623

Notes:
[1] *See Supporting Table 7.10.*
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.6.6
Excess Respiratory Symptom Days
NCR, 2003- BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	61.24	61.24	61.24	61.24	61.24	61.24	61.24	61.24	32.66	32.66
Change in risk of chronic bronchitis [2]	c	16.78	16.78	16.78	16.78	16.78	16.78	16.78	16.78	8.95	8.95
Population at risk [3]	d	644,786	645,926	645,052	644,917	644,677	645,039	645,499	644,960	644,885	645,353
Excess *morbidity cases*	e	10,819,208	10,838,336	10,823,672	10,821,398	10,817,364	10,823,439	10,831,170	10,822,114	5,771,130	5,775,312

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the *WHO air quality guideline.* (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.7 Value of Health Damages from PM10 Exposure by Income Decile (in million Philippine Pesos). National Capital Region, 2004 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	45	62	75	89	105	123	147	179	125	438	1,388
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.07	0.10	0.12	0.14	0.17	0.19	0.23	0.28	0.20	0.69	2.190
Cost of medication											
Total (3)	430	431	430	430	430	430	431	430	229	230	3,902
Chronic bronchitis	22	22	22	22	22	22	22	22	12	12	201
Lower respiratory illness	408	409	408	408	408	408	408	408	218	218	3,701
Respiratory symptom days	12.18	12.20	12.19	12.18	12.18	12.19	12.20	12.18	6.50	6.50	111
TOTAL = (1) + (2) + (3)	475	493	506	519	535	554	578	610	355	668	**5,292**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.7.1 to 7.7.6.

Supporting Table 7.7.1
Value of Foregone Earnings Due to Mortality
NCR, 2004 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	66.75	66.75	66.75	66.75	66.75	66.75	66.75	66.75	35.60	35.60
Change in Pr(M) due to red'n in PM	c	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.046	0.046
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,120,377	1,122,358	1,120,840	1,120,604	1,120,186	1,120,816	1,121,616	1,120,678	1,120,549	1,121,361
Excess mortality cases	f	593	594	593	593	593	593	594	593	316	317
Estimated present value of future average earnings [5]	g	75,374	104,728	126,758	149,757	176,980	207,601	247,428	302,238	396,394	1,382,424
Estimated value of productivity loss	h	44,698,830	62,216,128	75,201,995	88,828,052	104,935,896	123,161,132	146,893,353	179,283,322	125,390,875	437,617,826

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.7.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2004 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	66.75	66.75	66.75	66.75	66.75	66.75	66.75	66.75	35.60	35.60
Change in RAD per person per year	c	0.0603	0.0603	0.0603	0.0603	0.0603	0.0603	0.0603	0.0603	0.0321	0.0321
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Labor force participation rate [5]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593	849	849
WLD [7]	l	1,251	1,251	1,251	1,251	1,251	1,251	1,251	1,251	667	667
Estimated average daily earnings [8]	m	56	78	95	112	132	155	185	226	297	1034
Estimated value of WLD	n	70,552	98,027	118,650	140,177	165,657	191,321	231,596	282,901	197,881	690,125

Notes:
[1] See Supporting Table 7.10.
[2] *This is the difference in ambient PM_{10} concentration and the WHO air quality guideline.* (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WLD = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(e) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.7.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2004 - BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	55,655	407,958,407	3,424	22,179,744
2nd	55,754	408,679,655	3,430	22,218,956
3rd	55,678	408,126,741	3,425	22,188,895
4th	55,666	408,040,967	3,424	22,184,232
5th	55,646	407,888,871	3,423	22,175,963
6th	55,677	408,117,925	3,425	22,188,416
7th	55,717	408,409,455	3,427	22,204,266
8th	55,670	408,067,972	3,425	22,185,700
9th	29,687	217,611,228	1,826	11,831,013
10th	29,709	217,768,917	1,828	11,839,586

Notes:
[1/] From Supporting Table 7.7.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.7.5.

Supporting Table 7.7.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2004 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	66.75	66.75	66.75	66.75	66.75	66.75	66.75	66.75	35.60	35.60
Change in risk of chronic bronchitis [2]	c	0.1589	0.1589	0.1589	0.1589	0.1589	0.1589	0.1589	0.1589	0.0847	0.0847
Population at risk [3]	d	350,342	350,961	350,487	350,413	350,282	350,479	350,729	350,436	350,396	350,650
Excess morbidity cases	e	55,655	55,754	55,678	55,666	55,646	55,677	55,717	55,670	29,687	29,709

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.7.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2004 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	66.75	66.75	66.75	66.75	66.75	66.75	66.75	66.75	35.60	35.60
Change in risk of chronic bronchitis [2]	c	0.00613	0.00613	0.00613	0.00613	0.00613	0.00613	0.00613	0.00613	0.00327	0.00327
Population at risk [3]	d	558,732	559,720	558,963	558,845	558,637	558,951	559,350	558,882	558,818	559,223
Excess morbidity cases	e	3,424	3,430	3,425	3,424	3,423	3,425	3,427	3,425	1,826	1,828

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.7.6
Excess Respiratory Symptom Days
NCR, 2004 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [3]	b	66.75	66.75	66.75	66.75	66.75	66.75	66.75	66.75	35.60	35.60
Change in risk of chronic bronchitis [2]	c	18.29	18.29	18.29	18.29	18.29	18.29	18.29	18.29	9.75	9.75
Population at risk [4]	d	666,064	667,242	666,339	666,199	665,951	666,325	666,801	666,243	666,167	666,649
Excess morbidity cases	e	12,181,562	12,203,098	12,186,588	12,184,027	12,179,485	12,186,325	12,195,030	12,184,833	6,497,830	6,502,539

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10)
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.8 Value of Health Damages from PM10 Exposure by Income Decile (in million Philippine Pesos), National Capital Region, 2005 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	51	71	86	101	119	140	167	204	143	498	1,579
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.08	0.11	0.13	0.15	0.18	0.21	0.26	0.31	0.22	0.76	2.411
Cost of medication											
Total (3)	553	554	554	553	553	553	554	553	295	295	5,019
Chronic bronchitis	29	29	29	29	29	29	29	29	15	15	259
Lower respiratory illness	525	526	525	525	525	525	525	525	280	280	4,760
Respiratory symptom days	13.70	13.73	13.71	13.70	13.70	13.71	13.72	13.71	7.31	7.31	124
TOTAL = (1) + (2) + (3)	604	625	639	655	673	694	721	758	438	794	**6,600**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.8.1 to 7.8.6.

Supporting Table 7.8.1
Value of Foregone Earnings Due to Mortality
NCR, 2005 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	72.68	72.68	72.68	72.68	72.68	72.68	72.68	72.68	38.76	38.76
Change in Pt(M) due to red'n in PM	c	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.094	0.050	0.050
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,157,350	1,159,396	1,157,827	1,157,584	1,157,153	1,157,802	1,158,629	1,157,661	1,157,528	1,158,366
Excess mortality cases	f	667	668	667	667	667	667	668	667	356	356
Estimated present value of future average earnings [5]	g	76,218	105,901	128,178	151,435	178,962	209,926	250,199	305,623	400,833	1,397,907
Estimated value of productivity loss	h	50,840,174	70,764,241	85,534,286	101,032,479	119,353,441	140,082,712	167,075,593	203,915,745	142,618,808	497,743,816

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the *difference in ambient PM_{10} concentration* and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] *Estimated value of future earnings* of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 7.8.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2005 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	72.68	72.68	72.68	72.68	72.68	72.68	72.68	72.68	38.76	38.76
Change in RAD per person per year	c	0.0656	0.0656	0.0656	0.0656	0.0656	0.0656	0.0656	0.0656	0.0350	0.0350
RAD per person per chronis bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,734	1,734	1,734	1,734	1,734	1,734	1,734	1,734	925	925
WLD [7]	l	1,363	1,363	1,363	1,363	1,363	1,363	1,363	1,363	727	727
Estimated average daily earnings [8]	m	57	79	96	113	134	157	187	229	300	1046
Estimated value of WLD	n	77,682	107,934	130,641	154,343	182,398	213,959	255,001	311,490	217,882	759,868

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chrone bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WLD = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.8.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2005 - BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	62,601	524,748,279	3,851	28,529,336
2nd	62,711	525,676,006	3,858	28,579,774
3rd	62,627	524,964,803	3,852	28,541,107
4th	62,613	524,854,475	3,852	28,535,109
5th	62,590	524,658,837	3,850	28,524,473
6th	62,625	524,953,465	3,852	28,540,491
7th	62,670	525,328,453	3,855	28,560,878
8th	62,618	524,889,210	3,852	28,536,998
9th	33,392	279,908,725	2,054	15,217,982
10th	33,416	280,111,557	2,056	15,229,010

Notes:
[1/] From Supporting Table 7.84.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.8.5.

Supporting Table 7.8.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2005 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	72.68	72.68	72.68	72.68	72.68	72.68	72.68	72.68	38.76	38.76
Change in risk of chronic bronchitis [2]	c	0.1730	0.1730	0.1730	0.1730	0.1730	0.1730	0.1730	0.1730	0.0923	0.0923
Population at risk [3]	d	361,903	362,543	362,053	361,977	361,842	362,045	362,303	362,000	361,959	362,221
Excess morbidity cases	e	62,601	62,711	62,627	62,613	62,590	62,625	62,670	62,618	33,392	33,416

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.8.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2005 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	72.68	72.68	72.68	72.68	72.68	72.68	72.68	72.68	38.76	38.76
Change in risk of chronic bronchitis [2]	c	0.00667	0.00667	0.00667	0.00667	0.00667	0.00667	0.00667	0.00667	0.00356	0.00356
Population at risk [3]	d	577,170	578,191	577,409	577,287	577,072	577,396	577,809	577,325	577,259	577,677
Excess morbidity cases	e	3,851	3,858	3,852	3,852	3,850	3,852	3,855	3,852	2,054	2,056

Notes:
[1] See Supporting Table 7.10.
[2] *This is the difference in ambient* PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.8.6
Excess Respiratory Symptom Days
NCR, 2005 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	72.68	72.68	72.68	72.68	72.68	72.68	72.68	72.68	38.76	38.76
Change in risk of chronic bronchitis [2]	c	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	10.62	10.62
Population at risk [3]	d	688,044	689,261	688,328	688,184	687,927	688,314	688,805	688,229	688,150	688,649
Excess morbidity cases	e	13,701,773	13,725,997	13,707,427	13,704,546	13,699,438	13,707,131	13,716,922	13,705,453	7,308,734	7,314,031

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 7.9 Value of Health Damages from PM10 Exposure by Income Decile (in million Philippine Pesos), National Capital Region, 2006 - Baseline Level

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	58	80	97	115	136	159	190	232	162	566	1,794
Morbidity											
Value of work loss days											
Chronic bronchitis (2)	0.09	0.12	0.14	0.17	0.20	0.24	0.28	0.34	0.24	0.84	2.653
Cost of medication											
Total (3)	710	711	710	710	710	710	711	710	379	379	6,442
Chronic bronchitis	37	37	37	37	37	37	37	37	20	20	332
Lower respiratory illness	674	675	674	674	673	674	674	674	359	360	6,110
Respiratory symptom days	15.40	15.43	15.40	15.40	15.40	15.40	15.42	15.40	8.21	8.22	140
TOTAL = (1) + (2) + (3)	768	792	808	825	846	870	901	942	541	946	**8,239**

Notes:
Respiratory symptom days are not included in the valuation
Sources:
Supporting Tables 7.9.1 to 7.9.6.

Supporting Table 7.9.1
Value of Foregone Earnings Due to Mortality
NCR, 2006 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	42.17	42.17
Change in Pr(M) due to red'n in PM	c	0.103	0.103	0.103	0.103	0.103	0.103	0.103	0.103	0.055	0.055
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,195,542	1,197,656	1,196,036	1,195,784	1,195,339	1,196,010	1,196,864	1,195,863	1,195,726	1,196,592
Excess mortality cases	f	750	751	750	750	749	750	750	750	400	400
Estimated present value of future average earnings [5]	g	77,072	107,087	129,614	153,131	180,967	212,278	253,001	309,046	405,323	1,413,564
Estimated value of productivity loss	h	57,774,061	80,415,491	97,199,964	114,811,893	135,631,577	159,188,030	189,862,363	231,726,995	162,070,015	565,629,096

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 7.9.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2006 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	*10th*
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	42.17	42.17
Change in RAD per person per year	c	0.0714	0.0714	0.0714	0.0714	0.0714	0.0714	0.0714	0.0714	0.0381	0.0381
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated *total excess*											
RAD	k	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,006	1,006
WLD [7]	l	1,482	1,482	1,482	1,482	1,482	1,482	1,482	1,482	791	791
Estimated average daily earnings [8]	m	58	80	97	115	135	159	189	231	303	1057
Estimated value of WLD	n	85,457	118,736	143,716	169,790	200,653	235,372	280,522	342,665	239,689	835,918

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting *Table 7.11*).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WLD = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = ((j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 7.9.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2006 - BASELINE LEVEL
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	70,351	673,514,007	4,328	36,617,380
2nd	70,475	674,704,743	4,335	36,682,117
3rd	70,380	673,791,916	4,329	36,632,489
4th	70,365	673,650,309	4,328	36,624,790
5th	70,339	673,399,207	4,327	36,611,138
6th	70,378	673,777,362	4,329	36,631,698
7th	70,428	674,258,660	4,332	36,657,865
8th	70,370	673,694,892	4,329	36,627,214
9th	37,526	359,262,630	2,308	19,532,268
10th	37,553	359,522,965	2,310	19,546,422

Notes:
[1/] From Supporting Table 7.9.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.9.5.

Supporting Table 7.9.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2006 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	42.17	42.17
Change in risk of chronic bronchitis [2]	c	0.1882	0.1882	0.1882	0.1882	0.1882	0.1882	0.1882	0.1882	0.1004	0.1004
Population at risk [3]	d	373,846	374,507	374,000	373,922	373,782	373,992	374,259	373,947	373,904	374,174
Excess morbidity cases	e	70,351	70,475	70,380	70,365	70,339	70,378	70,428	70,370	37,526	37,553

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.9.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2006 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	42.17	42.17
Change in risk of chronic bronchitis [2]	c	0.00726	0.00726	0.00726	0.00726	0.00726	0.00726	0.00726	0.00726	0.00387	0.00387
Population at risk [3]	d	596,217	597,271	596,463	596,338	596,115	596,450	596,876	596,377	596,309	596,741
Excess morbidity cases	e	4,328	4,335	4,329	4,328	4,327	4,329	4,332	4,329	2,308	2,310

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.9.6
Excess Respiratory Symptom Days
NCR, 2006 - BASELINE LEVEL
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	79.07	79.07	79.07	79.07	79.07	79.07	79.07	79.07	42.17	42.17
Change in risk of chronic bronchitis [2]	c	21.66	21.66	21.66	21.66	21.66	21.66	21.66	21.66	11.55	11.55
Population at risk [3]	d	710,750	712,007	711,043	710,894	710,629	711,028	711,536	710,941	710,859	711,374
Excess morbidity cases	e	15,398,045	15,425,268	15,404,398	15,401,161	15,395,420	15,404,066	15,415,069	15,402,180	8,213,552	8,219,503

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 7.10
Dose-Response Functions and Coefficients

Pollutant/Health Effect	Dose-Response Function					
I. PARTICULATE MATTER (PM_{10})						
Premature Mortality (M)	% DM	=	0.130	*	$[DPM_{10}]$	
Restricted Activity Days (RAD)	% DRAD	=	0.0903	*	$[DPM_{10}]$	(per person per year)
Lower Respiratory Illness in Children	% DAnnual Risk of Bronchitis	=	0.00238	*	$[DPM_{10}]$	(in children)
Asthma Attacks	% DAsthma Attacks	=	0.2730	*	$[DPM_{10}]$	(per asthmatic)
Respiratory Symptoms	% DSymptom Days	=	0.2740	*	$[DPM_{10}]$	(per person per year)
Chronic Bronchitis	% Dincidence of Chronic Bronchitis	=	0.0000918	*	$[DPM_{10}]$	

[DPM10] = ambient level - standard

standard = 37.46 mg/cu m

[DPM10]:		
	1998	84.40
	1999	93.15
	2000	97.07
	2001	106.84
	2002	117.35
	2003	128.66
	2004	140.84
	2005	153.95
	2006	168.07

Adj factor for 9th and 10 decile = 0.533
Change in PM10 was also adjusted by 0.3714, the share of mobile PM10 emissions out of total PM10 emissions (based on ENRAP III estimates).

Supporting Table 7.10 (Continued)

Pollutant/Health Effect	Dose-Response Function			
II. LEAD (Pb)				
IQ Loss	IQ Decrement		=	0.975 IQ D Air Lead (mg/cu m)
		D Air lead	=	current ambient level - ambient of the previous period
Hypertension		$DPr(H)$	=	$\{1 + \exp(2.744-0.793[\ln 2(Pb\,A_2)])\}^{-1} - \{1 + \exp(2.744-0.793[\ln 2(Pb\,A_1)])\}^{-1}$
	Where	$DPr(H)$	=	change in the probability of hypertension event or risk coefficient associated incidence of hypertension
		$Pb\,A_1$	=	ambient level of base case 1996 for the different scenarios in 1996
		$Pb\,A_2$	=	current ambient lead level
Coronary Heart Diseases	$DPr(CHD)$		=	$\{(1 + \exp(5.00-0.030[DBP_2])\}^{-1}\ \{1 + \exp(5.00-0.030[DBP_1])\}-1)/10$
	Where	$DPr(CHD)$	=	probability of a chronic heart disease event or the risk coefficient associated with chronic heart disease per year incidence
		DBP_1	=	base case diastolic blood pressure
		DBP_2	=	$DBP_1 + DDBP$
		DDBP	=	$2.744(\ln PbA_2 - \ln PbA_1)$
		DBP	=	Diastolic Blood Pressure.
Mortality	$DPr(Af)$		=	$[\{(1 + \exp(5.315-0.035316[DBP_2])\}^{-1} - \{(1 + \exp(5.315-0.035316[DBP_1])\}^{-1}]/12$
	Where	$Pr(Af)$	=	probability of death occurrence per year

Source
Ostro,1994

Supporting Table 7.11
Resticted Activity Days for Different Illnesses

Disease	RAD
Asthma	7
Acute Bronchitis	8
Chronic bonchitis	14
Hypertension (uncomplicated)	3
Coronary Heart Disease (non-fatal)	14-30

Based on interviews with four physicians from the Department of Environmental and Occupational Health, College of Public Health, UP Manila.

Supporting Table 7.12
Minimum Cost of Medication from Lower Respiratory Illness and Chronic Bronchitis
NCR, 1995 to 2006
(In pesos)

	1995	1996 [1/]	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Projected Inflation Rate [2/]			14.38	16.60	15.90	15.35	15.11	14.89	14.69	14.52	14.36	14.21
Asthma (Lower Respiratory Illness)												
Emergency Room Cost	50	55	63	73	85	98	113	130	149	170	195	222
Medications	100	110	126	147	170	196	226	259	297	341	390	445
Hospitalization (3-4 days)	1,000	1,101	1,259	1,468	1,702	1,963	2,259	2,596	2,977	3,410	3,899	4,453
Maintenance drugs (for moderate to chronic)	1,000	1,101										
Total	2,150	2,367	2,707	3,157	3,658	4,220	4,858	5,581	6,401	7,330	8,382	9,574
Chronic bronchitis												
Treatment (min of 6 months)	200	220	252	293	340	392	451	519	595	681	779	890
Medications	200	220	252	293	340	392	451	519	595	681	779	890
Diagnosis	1,500	1,652	1,890	2,203	2,553	2,945	3,390	3,895	4,467	5,116	5,850	6,682
Maintenace drug												
Total	1,900	2,092	2,393	2,790	3,233	3,730	4,293	4,932	5,657	6,478	7,409	8,461

Notes:

[1/] CPI: 1995: 100; 1996: 110.13

[2/] Based on projected real and nominal GNP from 1992 to 2010.

[3/] Cost of medication were 1995 data from interview with four physicians from the Department of Environmental and Occupational Health, UP Manila

hypertension treatment = P20 per day

coronary heart disease treatment = P50 per day

Sources:

Bernagem, Logarta and Cortez. 1995. ENRAP 3: Volume 5: Refinement of Accounts.

Philippine Institute for Development Studies.

Philippine Statistical Yearbook. 1996.

Supporting Table 7.13a
Projected Number of Persons Below 15 Years Old
NCR, 1998-2006

Year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	TOTAL
1998	288,330	288,840	288,449	288,389	288,281	288,443	288,649	288,408	288,375	288,584	2,886,746
1999	297,845	298,372	297,968	297,905	297,794	297,962	298,175	297,925	297,891	298,107	2,981,943
2000	307,674	308,218	307,801	307,736	307,622	307,794	308,014	307,757	307,721	307,944	3,080,282
2001	317,827	318,389	317,958	317,892	317,773	317,952	318,179	317,913	317,876	318,106	3,181,867
2002	328,316	328,896	328,451	328,382	328,260	328,444	328,679	328,404	328,366	328,604	3,286,803
2003	339,150	339,750	339,290	339,219	339,092	339,283	339,525	339,241	339,202	339,448	3,395,203
2004	350,342	350,961	350,487	350,413	350,282	350,479	350,729	350,436	350,396	350,650	3,507,179
2005	361,903	362,543	362,053	361,977	361,842	362,045	362,303	362,000	361,959	362,221	3,622,851
2006	373,846	374,507	374,000	373,922	373,782	373,992	374,259	373,947	373,904	374,174	3,742,340

Note:
NCR population was projected to grow by 3.3% annually.

Source of basic data:
1994 Family Income and Expenditures Survey.

Supporting Table 7.13b
Projected Number of Persons Above 25 Years Old
NCR, 1998-2006

Year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	TOTAL
1998	459,835	460,648	460,024	459,928	459,756	460,015	460,343	459,958	459,905	460,239	4,602,649
1999	475,009	475,849	475,205	475,105	474,928	475,195	475,534	475,137	475,082	475,426	4,754,472
2000	490,685	491,552	490,887	490,784	490,601	490,876	491,227	490,816	490,760	491,116	4,911,304
2001	506,877	507,773	507,086	506,980	506,791	507,075	507,438	507,013	506,955	507,322	5,073,312
2002	523,604	524,530	523,820	523,710	523,515	523,809	524,183	523,745	523,685	524,064	5,240,666
2003	540,883	541,839	541,106	540,993	540,791	541,095	541,481	541,028	540,966	541,358	5,413,543
2004	558,732	559,720	558,963	558,845	558,637	558,951	559,350	558,882	558,818	559,223	5,592,125
2005	577,170	578,191	577,409	577,287	577,072	577,396	577,809	577,325	577,259	577,677	5,776,600
2006	596,217	597,271	596,463	596,338	596,115	596,450	596,876	596,377	596,309	596,741	5,967,163

Note:
NCR population was projected to grow by 3.3% annually.

Source of basic data:
1994 Family Income and Expenditures Survey.

Supporting Table 7.13c
Projected Number of Persons Above 19 Years Old
NCR, 1998-2006

Year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	TOTAL
1998	548,169	549,138	548,395	548,280	548,075	548,383	548,775	548,316	548,253	548,650	5,486,432
1999	566,258	567,259	566,492	566,373	566,162	566,480	566,884	566,410	566,345	566,756	5,667,419
2000	584,945	585,979	585,186	585,063	584,845	585,174	585,592	585,102	585,035	585,459	5,854,379
2001	604,248	605,316	604,497	604,370	604,145	604,484	604,916	604,410	604,341	604,779	6,047,508
2002	624,188	625,292	624,446	624,315	624,082	624,432	624,878	624,356	624,284	624,736	6,247,011
2003	644,786	645,926	645,052	644,917	644,677	645,039	645,499	644,960	644,885	645,353	6,453,097
2004	666,064	667,242	666,339	666,199	665,951	666,325	666,801	666,243	666,167	666,649	6,665,984
2005	688,044	689,261	688,328	688,184	687,927	688,314	688,805	688,229	688,150	688,649	6,885,897
2006	710,750	712,007	711,043	710,894	710,629	711,028	711,536	710,941	710,859	711,374	7,113,066

Note:
NCR population was projected to grow by 3.3% annually.

Source of basic data:
1994 Family Income and Expenditures Survey.

Supporting Table 7.13d
Projected Total Population by Income Decile
NCR, *1998-2006*

Year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	TOTAL
1998	922,067	923,697	922,447	922,253	921,910	922,427	923,086	922,315	922,208	922,877	9,227,286
1999	952,495	954,179	952,888	952,688	952,333	952,868	953,548	952,751	952,641	953,332	9,531,721
2000	983,927	985,667	984,333	984,127	983,760	984,312	985,015	984,192	984,079	984,792	9,846,203
2001	1,016,397	1,018,194	1,016,816	1,016,603	1,016,224	1,016,794	1,017,521	1,016,670	1,016,553	1,017,290	10,171,063
2002	1,049,938	1,051,794	1,050,371	1,050,151	1,049,759	1,050,349	1,051,099	1,050,220	1,050,099	1,050,860	10,506,643
2003	1,084,586	1,086,504	1,085,034	1,084,806	1,084,401	1,085,010	1,085,785	1,084,877	1,084,753	1,085,539	10,853,297
2004	1,120,377	1,122,358	1,120,840	1,120,604	1,120,186	1,120,816	1,121,616	1,120,678	1,120,549	1,121,361	11,211,391
2005	1,157,350	1,159,396	1,157,827	1,157,584	1,157,153	1,157,802	1,158,629	1,157,661	1,157,528	1,158,366	11,581,302
2006	1,195,542	1,197,656	1,196,036	1,195,784	1,195,339	1,196,010	1,196,864	1,195,863	1,195,726	1,196,592	11,963,419

Note:
NCR population was projected to grow by 3.3% annually.
Number of households can be derived by dividing total population by average household size in NCR= 4.7.

Source of basic data:
1994 Family Income and Expenditures Survey.

Supporting Table 7.14
Projected Average Daily Earnings by Income Decile
NCR, 1998-2006
(In pesos)

Year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1998	52.7	73.3	88.7	104.8	123.8	145.3	173.1	211.5	277.3	967.2
1999	53.3	74.1	89.7	106.0	125.2	146.9	175.1	213.8	280.4	978.1
2000	53.9	74.9	90.7	107.1	126.6	148.5	177.0	216.2	283.6	989.0
2001	54.5	75.8	91.7	108.3	128.0	150.2	179.0	218.6	286.8	1000.1
2002	55.1	76.6	92.7	109.6	129.5	151.9	181.0	221.1	290.0	1011.3
2003	55.8	77.5	93.8	110.8	130.9	153.6	183.0	223.6	293.2	1022.6
2004	56.4	78.3	94.8	112.0	132.4	155.3	185.1	226.1	296.5	1034.1
2005	57.0	79.2	95.9	113.3	133.9	157.0	187.2	228.6	299.8	1045.7
2006	57.7	80.1	97.0	114.5	135.4	158.8	189.2	231.2	303.2	1057.4

Note:
Income was projected to grow 1.11% from 1996 to 1997 and 1.12% annually from 1997 to 2006. Projections are based on *projected nominal* GNP growth rates.

Source of basic data:
1994 Family Income and Expenditures Survey.

Supporting Table 7.15
Projected Present Value of Future Foregone Earnings Due to Premature Mortality by Income Decile
NCR, 1998-2006
(In pesos)

Year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1998	70,502	97,958	118,564	140,077	165,540	194,181	231,433	282,701	370,770	1,293,061
1999	71,291	99,055	119,892	141,646	167,394	196,356	234,026	285,867	374,922	1,307,543
2000	72,090	100,165	121,235	143,232	169,268	198,555	236,647	289,069	379,122	1,322,187
2001	72,897	101,286	122,593	144,836	171,164	200,779	239,297	292,306	383,368	1,336,996
2002	73,714	102,421	123,966	146,458	173,081	203,028	241,977	295,580	387,661	1,351,970
2003	74,539	103,568	125,354	148,099	175,020	205,302	244,687	298,891	392,003	1,367,112
2004	75,374	104,728	126,758	149,757	176,980	207,601	247,428	302,238	396,394	1,382,424
2005	76,218	105,901	128,178	151,435	178,962	209,926	250,199	305,623	400,833	1,397,907
2006	77,072	107,087	129,614	153,131	180,967	212,278	253,001	309,046	405,323	1,413,564

Note:

Income was projected to grow 1.11% from 1996 to 1997 and 1.12% annually from 1997 to 2006. Projections are based on projected nominal GNP growth rates.

Projected for males 50 years old, the median age of the population at risk of premature mortality due to lead exposure.

Source of basic data:

1994 Family Income and Expenditures Survey.

Supporting Table 7.16
Projected Average Annual Household Income by Income Decile
NCR, 1998-2006
(In pesos)

Year	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1998	65,435	90,918	110,045	130,010	153,642	180,227	214,799	262,383	344,123	1,200,134
1999	66,168	91,936	111,277	131,466	155,363	182,246	217,205	265,321	347,977	1,213,576
2000	66,909	92,965	112,523	132,939	157,103	184,287	219,638	268,293	351,875	1,227,168
2001	67,659	94,007	113,784	134,428	158,863	186,351	222,098	271,298	355,816	1,240,912
2002	68,416	95,060	115,058	135,933	160,642	188,438	224,585	274,336	359,801	1,254,810
2003	69,183	96,124	116,347	137,456	162,441	190,549	227,100	277,409	363,831	1,268,864
2004	69,957	97,201	117,650	138,995	164,261	192,683	229,644	280,516	367,905	1,283,076
2005	70,741	98,289	118,967	140,552	166,100	194,841	232,216	283,658	372,026	1,297,446
2006	71,533	99,390	120,300	142,126	167,961	197,023	234,817	286,835	376,193	1,311,977

Note:
Income was projected to grow 1.11% from 1996 to 1997 and 1.12% annually from 1997 to 2006. Projections are based on projected nominal GNP growth rates.

Source of basic data:
1994 Family Income and Expenditures Survey.

Supporting Table 7.17
Labor Force Participation Rate and Employment Rate by Age Bracket and Sex

Age Bracket	Labor Force Participation Rate			Employment Rate		
	Male	Female	Total	Male	Female	Total
15-19	23.03	24.65	24.07	52.14	72.14	62.93
20-24	73.46	60.68	66.87	69.36	74.67	71.85
25-34	96.41	56.67	76.11	83.83	84.85	84.22
35-44	97.93	53.93	74.50	91.54	93.92	92.35
45-54	91.74	50.51	70.03	90.68	96.46	92.90
55-64	70.44	35.95	51.46	89.51	94.25	91.70
65 and above	31.85	13.10	21.38	86.05	90.91	87.69
Average (over all age brackets)	74.90	46.64	60.04	83.11	85.70	84.17
Average:						
Male, 20-69 years old	76.97			85.16		
Male, above 35 years old (40-59 years old)	72.99			89.44		
Average Male and female:						
>15 years old			54.92			83.38
>25 years old			58.70			89.77
>19 years old			60.06			86.79

Notes:

Due to unavailability of data for 1998 to 2006, 1995 data were used.

For males 40-59 years old, the age bracket 35 years old and above was used *since the former* classification is not available.

Sources:

Integrated Survey of Households, 1995. NSO.

Table 8
Emission Standards for Carbon Monoxide and Hydrocarbons

Inclusive model year	Carbon Monoxide (%)	Hydrocarbons (ppm)
1976-1981	4.5	1,000
1971-1975	5.0	1,000
1965-1970	5.5	2,000
1964-older	6.0	2,000
2-stroke engine	6.0	7,800

Source:

DENR Administrative Oder No.46, Series of 1998. Revised Rules and Regulations for the Prevention, Control and Abatement of Air Pollution from Motor Vehicles.

Table 9
Anti-Smoke Belching Operation Enforcement Profiles

Unit	Enforcement Cost (P)	Number of Vehicles Apprehended	Total Fines Collected (P)	Number of Personnel Involved	Number and Type of Equipment Use
Muntinlupa [a/]	160,699	697	n/a	n/a	n/a
Manila [b/]	320,000	n/a	1,574,200	2 teams	1
Makati [c/]	1,329,500	19,544	2,183,100	5 teams , 53 personnel	2 Smokemeters
Quezon City [c/]	4,034,564	23,014	3,985,120	2 teams , 43 personnel	n/a
MMDA [a/]	458,923	25,834	4,899,130	3 teams , 94 personnel	2 Bosch, 3 Hartridge

Notes:
[a/] 1996 data.
[b/] 1994 data.
[c/] 1995 data.
n/a means not available

Source: National Tax Research Center, 1997.

Table 10
Vehicular Emission Rate of Compliance with the Anti-Smoke Belching Program

Unit	Number of Vehicles			Compliance Rate [3/]
	Tested	Passed	Failed	
DENR-NCR and Quezon City Pollution Control Unit [1/]	20,265	12,171	9,295	0.60
Metro Manila Development Authority [2/]	33,708	22,172	11,230	0.66
Average				0.63

Notes : [1/] January to June, 1995.
[2/] 1996.
[3/] Compliance rate is the number of vehicles which passed over the total number of vehicles tested.

Sources: Communication from MMDA-Anti Smoke Belching Task Force to the National Tax Research Center, Department of Finance. January 16, 1996 for DENR-NCR and Quezon City Unit
Communication from MMDA Operations Division to MEIP, February 19, 1997 for MMDA.

Table 11
Number of Vehicles Apprehended and Fines Collected

Unit	Number of Vehicles Apprehended (a)	Amount of Fines Collected (b)	Average Fines Collected per Vehicle Tested (c) = (b)/(a)
DENR-NCR & QC [1/]	23,014	3,985,120	173.16
MMDA [2/]	25,834	4,830,830	187.00
Makati [1/]	19,544	6,174,110	315.91
Manila [3/]	17,188	2,523,350	146.81
Muntinlupa [4/]	1,089	101,750	93.43
AVERAGE	17,334	3,523,032	**183.26**

Notes:

[1/] 1995 data.

[2/] 1996 data.

[3/] January to March 1995.

[4/] March to June 1995.

Source: MMDA, 1997.

Table 12
Apprehension Costs for the Anti-Smoke Belching Program

Unit/City	No. of Apprehension (a)	Enforcement Cost (P) (b)	Cost per Apprehension (P/vehicle) (c) = (b)/(a)
MMDA [2/]	25,834	458,923	17.76
Muntinlupa [3/]	697	160,700	230.56
Manila [4/]	12,128	2,250,827	185.59
Makati [5/]	19,544	1,329,500	68.03
Quezon City [6/]	23,014	4,034,564	175.31
Average	16,243	1,646,903	**135.45**

Notes:

[1/] Apprehensions are based on road-side inspection conducted by a team using smoke meters. The team is usually composed of a testing, apprehension, and police officers supported by administrative staff.

[2/] 1996 apprehensions.

[3/] 1996 apprehension and administrative cost.

[4/] Based on 1993 to February 1995 apprehensions and administrative costs.

[5/] 1995 data, administrative cost based on M.O. No. 93-123.

[6/] 1995 data.

Sources: Communications from MMDA, Muntinlupa, Manila, Makati, and Quezon City Smoke Belching Teams to the National Tax Research Center, Department of Finance, January 1996.

Table 13
Proposed Emission Limits for Motor Vehicles Starting Year 2000

Vehicle Type	PM Emission Limit (g/km)
Cars	0.14
Light-duty vehicles	0.14
Reference weight </=1250 kg	0.14
1250 kg< RW < 1700 kg	0.19
RW >/= 1700 kg	0.25

Source: DENR, 1997.

Table 14
Projected PM_{10} Emissions, Ambient Level and Costs
NCR, 1998-2006 - WITH ANTI-SMOKE BELCHING PROGRAM

	1998	1999	2000	2001	2002	2003	2004	2005	2006
PM_{10} Emissions [1/] (In tons)	3,093	3,337	3,601	3,887	4,198	4,534	4,898	5,293	5,721
Ambient Concentration [2/] (In mg/cu. m)	24.4	26.4	28.5	30.7	33.2	35.8	38.7	41.8	45.2
Private Costs [3/] (In million pesos)	2,313	2,489	2,679	2,884	3,106	3,346	3,605	3,886	4,189
Government Costs [3/] (In million pesos)	187	203	221	241	262	285	311	338	369

Notes:

[1/] See Supporting Table 14.1.

[2/] Based on average ratio on PM_{10} emissions to ambient concentration in 1996.
Ambient concentration is below *WHO standard, implying zero health damages from transport PM_{10}.*

[3/] See Supporting Table 14.2.

Supporting Table 14.1
PM_{10} Emission Reduction from Full Enforcement of Revised PD 1181 IRR
NCR, 1998

Vehicle Type	Number of Registered Vehicles									Average Annual Distance Travelled [1]	Regulated PM Emission per Vehicle [2]	Regulated PM_{10} Emission per Vehicle [3]	Total Regulated PM_{10} Emission [4] (t/year)								
	1998	1999	2000	2001	2002	2003	2004	2005	2006	(km)	(gm/km)	(gm/km)	1998	1999	2000	2001	2002	2003	2004	2005	2006
Gasoline																					
Cars	564,554	619,881	680,629	747,330	820,569	900,985	989,281	1,086,231	1,192,681	12,000	0.1400	0.0699	474	520	571	627	689	756	830	912	1,001
UV	243,587	267,459	293,670	322,450	354,050	388,747	426,844	468,674	514,605	30,000	0.1900	0.0949	694	761	836	918	1,008	1,107	1,215	1,334	1,465
Bus	109	119	131	144	158	173	190	209	229	50,000	0.2500	0.1249	0.68	0.74	0.82	0.90	0.98	1.08	1.19	1.30	1.43
Trucks	6,587	7,233	7,942	8,720	9,575	10,513	11,543	12,675	13,917	50,000	0.2500	0.1249	41	45	50	54	60	66	72	79	87
MC/TC	158,860	174,428	191,522	210,291	230,900	253,528	278,374	305,655	335,609	10,000	0.2500	0.1249	198	218	239	263	288	317	348	382	419
Diesel																					
Cars	25,241	26,831	28,522	30,319	32,229	34,259	36,418	38,712	41,151	12,000	0.1400	0.0699	21	23	24	25	27	29	31	32	35
UV	294,848	313,424	333,170	354,159	376,471	400,189	425,401	452,201	480,690	40,000	0.1900	0.0949	1,119	1,190	1,265	1,344	1,429	1,519	1,615	1,717	1,825
Bus	9,806	10,424	11,080	11,778	12,520	13,309	14,148	15,039	15,986	50,000	0.2500	0.1249	61	65	69	74	78	83	88	94	100
Trucks	77,448	82,327	87,514	93,027	98,888	105,118	111,740	118,780	126,263	50,000	0.2500	0.1249	484	514	546	581	617	656	698	742	788
TOTAL	1,381,041												3,093	3,337	3,601	3,887	4,198	4,534	4,898	5,293	5,721

Notes:

[1] 1990 EMB Emissions Inventory.

[2] In lieu of conversion factor from smoke unit to PM, draft DAO revising PD 1181 IRR provisions on PM vehicular emission limits for low-emission vehicles which are as follows: (See Table 12)

for cars equipped with spark-ignition and compression-ignition engines - 0.14 g/km PM;

for light duty vehicles (assumed as UVs) = 0.19 g/km PM;

for trucks (assumed as the upper value for LDVs) = 0.25 g/km PM; and

for MC/TC (no PM limit was provided in draft DAO, assumed equal to trucks) = 0.25 g/km PM.

[3] Assumed that 49.95% of PM total is PM_{10}

[4] $\Sigma\Sigma$ (vehicle stock* average distance* emission factor); i=vehicle type, j=fuel type

Table 14.2
Projected Cost of Enforcement and Compliance
NCR, 1998-2006 - WITH ANTI-SMOKE BELCHING PROGRAM

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Private Costs	2,313	2,489	2,679	2,884	3,106	3,346	3,605	3,886	4,189
Cost of Tune-up [1/] (In million pesos)	2,134	2,293	2,465	2,650	2,850	3,066	3,299	3,551	3,822
Foregone Income [1/] (In million pesos)	86	94	103	113	125	137	151	166	183
Fine collections [2/] (In million pesos)	94	102	111	121	131	143	156	169	185
Government Costs									
Enforcement Cost [3/] (In million pesos)	187	203	221	241	262	285	311	338	369

Notes:
[1/] See Supporting Tables 14.2.1 to 14.2.9.
[2/] Also government benefits. See Supporting Table 14.3
[3/] See Supporting Table 14.4

Supporting Table 14.2.1
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 1998

Vehicle Type	Number of Registered Vehicles [1] (a)	Annual Distance Travelled [2] (b)	Number of Vehicles Not Complying [3] (c)	Cost of Tune-Up per Vehicle [4] (d)	Number of Tune-Ups per Vehicle per Year [5] (e)	Total Tune up Cost [6] (f)	Minimum Wage [7] (g)	Cost of Work Loss Days [8] (h)
Gasoline								
Cars	564,554	12,000	208,885	625	2.40	313,327,588	189	39,510,295
UV	243,587	30,000	90,127	625	6.00	337,977,609	189	17,047,455
Bus	109	50,000	40	5,000	5.00	1,003,665	189	7,594
Trucks	6,587	50,000	2,437	5,000	5.00	60,933,637	189	461,020
MC/TC	158,860	10,000	58,778	n.e.		n.e.		
Diesel								
Cars	25,241	12,000	9,339	685	2.40	15,353,746	189	1,766,507
UV	294,848	40,000	109,094	685	8.00	597,834,740	189	20,634,953
Bus	9,806	50,000	3,628	5,000	5.00	90,704,307	189	686,263
Trucks	77,448	50,000	28,656	5,000	5.00	716,394,696	189	5,420,199
MC/TC				n.e.		n.e.		
TOTAL	**1,381,041**		**510,985**			**2,133,529,988**		**85,534,288**

Notes:

[1] See Table 5.

[2] See Supporting Table 6.3.

[3] Formula: (a) * non-compliance rate. Compliance rate is 63%, see Table 9.

[4] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P340 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5] Annual distance travelled / recommended tune-up frequency.
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6] Formula: (f) = (c) * (d) * (e).

[7] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.

[8] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILHINO

Supporting Table 14.2.2
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 1999

Vehicle Type	Number of Registered Vehicles [1] (a)	Annual Distance Travelled [2] (b)	Number of Vehicles Not Complying [3] (c)	Cost of Tune-Up per Vehicle [4] (d)	Number of Tune-Ups per Vehicle per Year [5] (e)	Total Tune up Cost [6] (f)	Minimum Wage [7] (g)	Cost of Work Loss Days [8] (h)
Gasoline								
Cars	619,881	12,000	229,356	625	2.40	344,033,692	191	43,868,186
UV	267,459	30,000	98,960	625	6.00	371,099,414	191	18,927,749
Bus	119	50,000	44	5,000	5.00	1,102,025	191	8,431
Trucks	7,233	50,000	2,676	5,000	5.00	66,905,134	191	511,870
MC/TC	174,428	10,000	64,538	n.e.		n.e.		
Diesel								
Cars	26,831	12,000	9,928	685	2.40	16,321,032	191	1,898,829
UV	313,424	40,000	115,967	685	8.00	635,498,328	191	22,180,627
Bus	10,424	50,000	3,857	5,000	5.00	96,418,678	191	737,668
Trucks	82,327	50,000	30,461	5,000	5.00	761,527,562	191	5,826,203
MC/TC				n.e.		n.e.		
TOTAL	**1,502,126**		**555,787**			**2,292,905,865**		**93,959,562**

Notes:

[1] *See Table 5.*

[2] See Supporting Table 6.3.

[3] Formula (a) * non-compliance rate. Compliance rate is 63%, see Table 9.

[4] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P340 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5] *Annual distance travelled / recommended tune-up frequency.*
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6] Formula (f) = (c) * (d) * (e).

[7] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.

[8] Formula (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILHINO

Supporting Table 14.2.3
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 2000

Vehicle Type	Number of Registered Vehicles [1] (a)	Annual Distance Travelled [2] (b)	Number of Vehicles Not Complying [3] (c)	Cost of Tune-Up per Vehicle [4] (d)	Number of Tune-Ups per Vehicle per Year [5] (e)	Total Tune up Cost [6] (f)	Minimum Wage [7] (g)	Cost of Work Loss Days [8] (h)
Gasoline								
Cars	680,629	12,000	251,833	625	2.40	377,748,994	193	48,706,742
UV	293,670	30,000	108,658	625	6.00	407,467,157	193	21,015,434
Bus	131	50,000	48	5,000	5.00	1,210,023	193	9,361
Trucks	7,942	50,000	2,938	5,000	5.00	73,461,837	193	568,328
MC/TC	191,522	10,000	70,863	n.e.		n.e.	193	
Diesel								
Cars	28,522	12,000	10,553	685	2.40	17,349,257	193	2,041,061
UV	333,170	40,000	123,273	685	8.00	675,534,723	193	23,842,080
Bus	11,080	50,000	4,100	5,000	5.00	102,493,055	193	792,924
Trucks	87,514	50,000	32,380	5,000	5.00	809,503,798	193	6,262,618
MC/TC				n.e.		n.e.		
TOTAL	**1,634,179**		**604,646**			**2,464,768,844**		**103,238,548**

Notes:

[1] See Table 5.

[2] See Supporting Table 6.3.

[3] Formula: (a) * non-compliance rate. Compliance rate is 63%, see Table 9.

[4] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P340 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5] Annual distance travelled / recommended tune-up frequency.
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6] Formula: (f) = (c) * (d) * (e).

[7] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.

[8] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILHINO

Supporting Table 14.2.4
Cost to Vehicle Owners of Complying with the *Anti-Smoke Belching Program*
NCR, 2001

Vehicle Type	*Number of* Registered Vehicles [1] *(a)*	Annual Distance Travelled [2] *(b)*	Number of Vehicles Not Complying [3] *(c)*	Cost of Tune-Up *per Vehicle* [4] *(d)*	Number of Tune-Ups per Vehicle per Year [5] *(e)*	Total Tune up Cost [6] *(f)*	Minimum Wage [7] *(g)*	Cost of Work Loss Days [8] *(h)*
Gasoline								
Cars	747,330	12,000	276,512	625	2.40	414,768,395	196	54,078,979
UV	322,450	30,000	119,306	625	6.00	447,398,938	196	23,333,386
Bus	144	50,000	53	5,000	5.00	1,328,605	196	10,394
Trucks	8,720	50,000	3,226	5,000	5.00	80,661,097	196	631,013
MC/TC	210,291	10,000	77,808	n.e.		n.e.	196	
Diesel								
Cars	30,319	12,000	11,218	685	2.40	18,442,260	196	2,193,948
UV	354,159	40,000	131,039	685	8.00	718,093,410	196	25,627,985
Bus	11,778	50,000	4,358	5,000	5.00	108,950,117	196	852,318
Trucks	93,027	50,000	34,420	5,000	5.00	860,502,538	196	6,731,723
MC/TC	-			n.e.		n.e.		
TOTAL	1,778,219		657,941			**2,650,145,361**		**113,459,746**

Notes:

[1] See Table 5.

[2] See Supporting Table 6.3.

[3] Formula: (a) * *non-compliance rate*. Compliance rate is 63%, see Table 9.

[4] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P310 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5] Annual distance travelled / recommended tune-up frequency.
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6] Formula: (f) = (c) * (d) * (e).

[7] *Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.*

[8] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine *Statistical Yearbook*
PHILHINO

Supporting Table 14.2.5
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 2002

Vehicle Type	Number of Registered Vehicles [1] (a)	Annual Distance Travelled [2] (b)	Number of Vehicles Not Complying [3] (c)	Cost of Tune-Up per Vehicle [4] (d)	Number of Tune-Ups per Vehicle per Year [5] (e)	Total Tune up Cost [6] (f)	Minimum Wage [7] (g)	Cost of Work Loss Days [8] (h)
Gasoline								
Cars	820,569	12,000	303,610	625	2.40	455,415,698	198	60,043,760
UV	354,050	30,000	130,998	625	6.00	491,244,034	198	25,907,002
Bus	158	50,000	58	5,000	5.00	1,458,808	198	11,540
Trucks	9,575	50,000	3,543	5,000	5.00	88,565,884	198	700,612
MC/TC	230,900	10,000	85,433	n.e.		n.e.	198	
Diesel								
Cars	32,229	12,000	11,925	685	2.40	19,604,123	198	2,358,287
UV	376,471	40,000	139,294	685	8.00	763,333,295	198	27,547,665
Bus	12,520	50,000	4,633	5,000	5.00	115,813,974	198	916,162
Trucks	98,888	50,000	36,589	5,000	5.00	914,714,198	198	7,235,967
MC/TC	-			n.e.		n.e.		
TOTAL	**1,935,360**		**716,083**			**2,850,150,015**		**124,720,995**

Notes:
[1] See Table 5.
[2] See Supporting Table 6.3.
[3] Formula: (a) * non-compliance rate. Compliance rate is 63%, see Table 9.
[4] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P340 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5] Annual distance travelled / recommended tune-up frequency.
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers
[6] Formula: *(f) = (c) * (d) * (e).*
[7] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.
[8] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILHINO

Supporting Table 14.2.6
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 2003

Vehicle Type	Number of Registered Vehicles [1/] (a)	Annual Distance Travelled [2/] (b)	Number of Vehicles Not Complying [3/] (c)	Cost of Tune-Up per Vehicle [4/] (d)	Number of Tune-Ups per Vehicle per Year [5/] (e)	Total Tune up Cost [6/] (f)	Minimum Wage [7/] (g)	Cost of Work Loss Days [8/] (h)
Gasoline								
Cars	900,985	12,000	333,364	625	2.40	500,046,436	200	66,666,443
UV	388,747	30,000	143,836	625	6.00	539,385,950	200	28,764,483
Bus	173	50,000	64	5,000	5.00	1,601,772	200	12,813
Trucks	10,513	50,000	3,890	5,000	5.00	97,245,341	200	777,888
MC/TC	253,528	10,000	93,805	n.e.		n.e.	200	
Diesel								
Cars	34,259	12,000	12,676	685	2.40	20,839,182	200	2,534,936
UV	400,189	40,000	148,070	685	8.00	811,423,293	200	29,611,139
Bus	13,309	50,000	4,924	5,000	5.00	123,110,255	200	984,787
Trucks	105,118	50,000	38,894	5,000	5.00	972,341,192	200	7,777,981
MC/TC	-			n.e.		n.e.		
TOTAL	**2,106,821**		**779,524**			**3,065,993,421**		**137,130,470**

Notes:

[1/] See Table 5.

[2/] See Supporting Table 6.3.

[3/] Formula: (a) * non-compliance rate. Compliance rate is 63%, see Table 9.

[4/] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P310 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5/] Annual distance travelled / recommended tune-up frequency.
Recommended tune-up frequency: for cars and AUV's every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6/] Formula: (f) = (c) * (d) * (e).

[7/] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%

[8/] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILJINO

Supporting Table 14.2.7
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 2004

Vehicle Type	Number of Registered Vehicles [1/] *(a)*	Annual Distance Travelled [2/] *(b)*	Number of Vehicles Not Complying [3/] *(c)*	Cost of Tune-Up per Vehicle [4/] *(d)*	Number of Tune-Ups per Vehicle per Year [5/] *(e)*	Total Tune up Cost [6/] *(f)*	Minimum Wage [7/] *(g)*	Cost of Work Loss Days [8/] *(h)*
Gasoline								
Cars	989,281	12,000	366,034	625	2.40	549,050,987	202	74,019,591
UV	426,844	30,000	157,932	625	6.00	592,245,773	202	31,937,136
Bus	190	50,000	70	5,000	5.00	1,758,745	202	14,226
Trucks	11,543	50,000	4,271	5,000	5.00	106,775,385	202	863,687
MC/TC	278,374	10,000	102,998	n.e.		n.e.	202	
Diesel								
Cars	36,418	12,000	13,474	685	2.40	22,152,051	202	2,724,817
UV	425,401	40,000	157,398	685	8.00	862,542,960	202	31,829,179
Bus	14,148	50,000	5,235	5,000	5.00	130,866,201	202	1,058,553
Trucks	111,740	50,000	41,344	5,000	5.00	1,033,598,687	202	8,360,595
MC/TC	-			n.e.		n.e.		
TOTAL	2,293,939		848,757			**3,298,990,789**		**150,807,786**

Notes:

[1/] See Table 5.

[2/] See Supporting Table 6.3.

[3/] Formula: (a) * non-compliance rate. *Compliance rate is 63%, see Table 9.*

[4/] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P340 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5/] *Annual distance travelled / recommended tune-up frequency.*
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6/] Formula: (f) = (c) * (d) * (e).

[7/] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.

[8/] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILHINO

Supporting Table 14.2.8
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 2005

Vehicle Type	Number of Registered Vehicles [1] (a)	Annual Distance Travelled [2] (b)	Number of Vehicles Not Complying [3] (c)	Cost of Tune-Up per Vehicle [4] (d)	Number of Tune-Ups per Vehicle per Year [5] (e)	Total Tune up Cost [6] (f)	Minimum Wage [7] (g)	Cost of Work Loss Days [8] (h)
Gasoline								
Cars	1,086,231	12,000	401,905	625	2.40	602,857,984	204	82,183,775
UV	468,674	30,000	173,410	625	6.00	650,285,859	204	35,459,725
Bus	209	50,000	77	5,000	5.00	1,931,102	204	15,795
Trucks	12,675	50,000	4,690	5,000	5.00	117,239,372	204	958,950
MC/TC	305,655	10,000	113,092	n.e.		n.e.	204	
Diesel								
Cars	38,712	12,000	14,323	685	2.40	23,547,630	204	2,928,921
UV	452,201	40,000	167,314	685	8.00	916,883,167	204	34,213,363
Bus	15,039	50,000	5,564	5,000	5.00	139,110,772	204	1,137,845
Trucks	118,780	50,000	43,949	5,000	5.00	1,098,715,404	204	8,986,851
MC/TC	-			n.e.		n.e.		
TOTAL	**2,498,175**		**924,325**			**3,550,571,290**		**165,885,225**

Notes:

[1] See Table 5.

[2] See Supporting Table 6.3.

[3] Formula: (a) * non-compliance rate. Compliance rate is 63%, see Table 9.

[4] *Cost of tune-up for gasoline cars and UV's is composed of the following:*
P120 - labor
P100 - change oil
P310 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5] Annual distance travelled / recommended tune-up frequency.
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6] Formula: (f) = (c) * (d) * (e).

[7] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.

[8] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILHINO

Supporting Table 14.2.9
Cost to Vehicle Owners of Complying with the Anti-Smoke Belching Program
NCR, 2006

Vehicle Type	Number of Registered Vehicles [1] (a)	Annual Distance Travelled [2] (b)	Number of Vehicles Not Complying [3] (c)	Cost of Tune-Up per Vehicle [4] (d)	Number of Tune-Ups per Vehicle per Year [5] (e)	Total Tune up Cost [6] (f)	Minimum Wage [7] (g)	Cost of Work Loss Days [8] (h)
Gasoline								
Cars	1,192,681	12,000	441,292	625	2.40	661,938,066	207	91,248,448
UV	514,605	30,000	190,404	625	6.00	714,013,873	207	39,370,848
Bus	229	50,000	85	5,000	5.00	2,120,350	207	17,537
Trucks	13,917	50,000	5,149	5,000	5.00	128,728,831	207	1,064,719
MC/TC	335,609	10,000	124,175	n.e.		n.e.	207	
Diesel								
Cars	41,151	12,000	15,226	685	2.40	25,031,131	207	3,148,314
UV	480,690	40,000	177,855	685	8.00	974,646,806	207	36,776,136
Bus	15,986	50,000	5,915	5,000	5.00	147,874,750	207	1,223,076
Trucks	126,263	50,000	46,717	5,000	5.00	1,167,934,475	207	9,660,016
MC/TC	-			n.e.		n.e.		
TOTAL	2,721,131		1,006,818			**3,822,288,282**		**182,509,094**

Notes:

[1] See Table 5.

[2] See Supporting Table 6.3.

[3] Formula: (a) * non-compliance rate. Compliance rate is 63%, see Table 9.

[4] Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P340 - spark plugs
P65 - fuel filter

Cost of tune-up for gasoline cars and UV's is composed of the following:
P120 - labor
P100 - change oil
P200 - gaskets
P265 - fuel filters

[5] Annual distance travelled / recommended tune-up frequency.
Recommended tune-up frequency: for cars and AUVs every 5,000 kilometers
for buses and trucks every 10,000 kilometers

[6] Formula: (f) = (c) * (d) * (e).

[7] Wages are assumed to increase by the rate of nominal GNP growth rate: 1.12%.

[8] Formula: (f) = (c) * (g) *(e).

Sources:
Philippine Statistical Yearbook.
PHILHINO

Supporting Table 14.3
Projected Fine Collections from the Enforcement of the Anti-Smoke Belching Program
NCR, 1998-2006

Year	Number of Registered Vehicles *(a)*	Existing Compliance Rate [1/] *(b)*	Number of Vehicles Not Complying *(c) = (a) x (1-b)*	Average Fines Collected per Vehicle Tested [2/] *(d)*	Total Fines to be Collected *(e) = (d) x (c)* (P)
1998	1,381,041	63%	510,985	183.26	93,643,887
1999	1,502,126	63%	555,787	183.26	101,854,266
2000	1,634,179	63%	604,646	183.26	110,808,358
2001	1,778,219	63%	657,941	183.26	120,575,211
2002	1,935,360	63%	716,083	183.26	131,230,396
2003	2,106,821	63%	779,524	183.26	142,856,635
2004	2,293,939	63%	848,757	183.26	155,544,482
2005	2,498,175	63%	924,325	183.26	169,393,075
2006	2,721,131	63%	1,006,818	183.26	184,510,960

Notes:
[1/] From Table 10.
[2/] From Table 11.

Sources of basic data:
Land Transportation Office.
MMDA, 1997.

Supporting Table 14.4
Estimated Cost of Enforcing the Anti-Smoke Belching Program
NCR, 1998-2006

Year	Number of Registered Vehicles *(a)*	Average Cost of Enforcement per Apprehended Vehicle [1/] *(b)*	Total Enforcement Cost *(c) = (a) x (b)* (₱)
1998	1,381,041	135.45	187,061,353
1999	1,502,126	135.45	203,462,258
2000	1,634,179	135.45	221,348,792
2001	1,778,219	135.45	240,858,883
2002	1,935,360	135.45	262,143,490
2003	2,106,821	135.45	285,367,856
2004	2,293,939	135.45	310,712,872
2005	2,498,175	135.45	338,376,574
2006	2,721,131	135.45	368,575,790

Notes:
[1/] From Table 12.

Sources of basic data:
Land Transportation Office.
MMDA, 1997.

Table 15

Projected PM_{10} Emissions, Ambient Concentration, Health Damages and Costs
NCR, 2000-2006 - WITH DIESEL DESULPHURIZATION

	2000	2001	2002	2003	2004	2005	2006
Sulphur Content of Diesel [1/] (In percent)	0.3	0.3	0.3	0.3	0.3	0.2	0.2
PM_{10} Emissions [2/] (In tons)	18,318	19,671	21,129	22,701	24,394	27,312	29,350
Ambient Concentration [3/] (In mg/cu. m)	144.8	155.5	167.0	179.4	192.8	215.9	232.0
Health Damages [4/] (In million pesos)	2,245	2,785	3,459	4,299	5,349	7,001	8,718
Cost of Adjustment [5/] (In million pesos)	166	177	188	200	212	426	453

Notes:

[1/] Based from the schedule proposed by the Bureau of Product Standards-Department of Trade and Industry

[2/] See Supporting Table 15.1 to 15.2

[3/] Based on ratio of PM_{10} emissions to ambient concentration in 1996.

[4/] See Table 16 and its Supporting Tables.

[5/] See Supporting Table 15.3.

Supporting Table 15.1
Change in PM_{10} Emissions Due to Diesel Desulphurization
(In tons)

	2000	2001	2002	2003	2004	2005	2006
Baseline PM_{10} Emissions [1/]	20,729	22,234	23,854	25,597	27,473	29,493	31,669
Change in Sulfates [2/]	2,411	2,563	2,725	2,896	3,079	2,182	2,319
New PM_{10} Emissions [3/]	18,318	19,671	21,129	22,701	24,394	27,312	29,350

Notes:
[1/] See Table 6.
[2/] See Supporting Table 15.2.
[3/] Baseline emissions less change in sulfates.

Supporting Table 15.2
Computation of Change in Sulfates from Diesel Desulphurization
NCR, 2000-2006

Year	Sulphur Content [1/] (% weight)	Density [2/] (kg/li)	Volume of diesel sales [3/] (liters)	SO_2 emissions [4/] (tons)	Sulfates [5/] (tons)
2000	0.3	0.87	1,847,620,921	9,645	2,411
2001	0.3	0.87	1,964,021,039	10,252	2,563
2002	0.3	0.87	2,087,754,364	10,898	2,725
2003	0.3	0.87	2,219,282,889	11,585	2,896
2004	0.3	0.87	2,359,097,711	12,314	3,079
2005	0.2	0.87	2,507,720,867	8,727	2,182
2006	0.2	0.87	2,665,707,281	9,277	2,319

Notes:

[1/] Based from the schedule set by BPS-DTI.

[2/] Diesel density is 7.05 lbs/gallon

[3/] From Tables 5.

[4/] Formula: fuel consumption * density * sulphur content (in%) * 2

[5/] 0.25 of SO_2 = sulfates (TEC 1993)

Sources of basic data:

Supporting Table 15.3
Projected Costs
NCR, 1998 to 2006 - WITH DIESEL DESULPHURIZATION

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sulphur content (In percent)	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.2	0.2
Fuel consumption [1/] (In million liters)	1,635	1,738	1,848	1,964	2,088	2,219	2,359	2,508	2,666
Cost of diesel refinery [2/] (In pesos per liter)	0	0	0.09	0.09	0.09	0.09	0.09	0.17	0.17
Total costs [3/] (In million pesos)	0	0	166	177	188	200	212	426	453

Notes:
[1/] From Table 5.
[2/] From Caltex Philippines.
[3/] Fuel consumption * per liter cost

Sources of basic data:
Caltex Philippines.
Department of Energy.
Energy Regulatory Board.

Supporting Table 15.4
Refinery Cost Estimates of Diesel Desulphurization
NCR, 1996

Sulphur reduction [1/]	Refinery costs [2/] ($/bbl)	(P/li)
From 0.5% to 0.3%	0.55-1.65	0.09-0.27
From 0.3% to 0.2%	1.07-6.54	0.17-1.03
From 0.2% to 0.05%	2.61	0.43

Notes:

[1/] The schedule of reduction is set by the Bureau of Product Standards-Department of Trade and Industry.

[2/] Refinery costs were provided by two oil companies. The lower estimates were used.

Table 16
Projected Health Damages Associated with PM_{10} Exposure
NCR, 1998-2006 - WITH DIESEL DESULPHURIZATION
(In million pesos)

Health Effect	1998	1999	2000	2001	2002	2003	2004	2005	2006
Mortality	894	1,024	944	1,084	1,243	1,423	1,626	1,951	2,222
Morbidity									
Cost of work days lost	1.71	1.90	1.69	1.88	2.09	2.32	2.57	2.98	3.28
Cost of medication	942	1,236	1,300	1,699	2,214	2,874	3,721	5,047	6,493
Chronic Bronchitis	49	64	67	88	114	148	192	260	335
Lower Respiratory Illness	893	1,172	1,233	1,612	2,100	2,726	3,529	4,787	6,158
TOTAL	1,838	2,261	2,245	2,785	3,459	4,299	5,349	7,001	8,718

Notes:
1998 estimate assumes the following:
1) 9.8% and 6.3% annual growth rate of gasoline-and diesel-fed vehicle stock since 1996.
2) 1.12% growth rate of income.
3) 3.3% NCR population growth rate.
4) Post deregulation and post- tax restructuring fuel tax rates.
5) No other pollution control policy.
6) Reduction of sulphur content to 0.3% and 0.2% in 2000 and 2005, respectively.
See Supporting Tables 16.1 to 16.7 for the breakdown of health effects by income decile.

Table 16.1
Value of Health Damages from PM_{10} Exposure by Income Decile
NCR, 2000 - WITH DIESEL DESULPHURIZATION
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss	22	31	38	45	53	62	74	90	118	412	944
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.04	0.06	0.07	0.08	0.09	0.11	0.13	0.16	0.21	0.74	1.695
Cost of medication											
Total (3)	130	130	130	130	130	130	130	130	130	130	1,300
Chronic bronchitis	7	7	7	7	7	7	7	7	7	7	67
Lower respiratory illness	123	123	123	123	123	123	123	123	123	123	1,233
Respiratory symptom days	6.39	6.40	6.39	6.39	6.39	6.39	6.40	6.39	6.39	6.40	64
TOTAL = (1) + (2) + (3)	152	161	168	175	183	192	204	220	248	542	2,245

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 16.1.1 to 16.1.6.

Supporting Table 16.1.1
Value of Foregone Earnings Due to Mortality
NCR, 2000 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87
Change in Pr(M) due to red'n in PM	c	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	983,927	985,667	984,333	984,127	983,760	984,312	985,015	984,192	984,079	984,792
Excess mortality cases	f	311	312	311	311	311	311	311	311	311	311
Estimated present value of future average earnings [5]	g	72,090	100,165	121,235	143,232	169,268	198,555	236,647	289,069	379,122	1,322,187
Estimated value of productivity loss	h	22,425,900	31,214,524	37,729,678	44,566,022	52,647,506	61,791,310	73,698,029	89,948,437	117,956,245	411,670,747

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] *Crude death rate for* 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of *future earnings of individuals* at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 16.1.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2000 - WITH DIESEL DESULPHURIZATION
(in pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10}	b	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87
Change in RAD per person per year	c	0.0360	0.0360	0.0360	0.0360	0.0360	0.0360	0.0360	0.0360	0.0360	0.0360
RAD per person per chronic bronchitis episode	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [1]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total populatio	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [2]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [2]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	951	951	951	951	951	951	951	951	951	951
WDL	l	747	747	747	747	747	747	747	747	747	747
Estimated average daily earnings [7]	m	54	75	91	107	127	149	177	216	284	989
Estimated value of WDL	n	40,306	56,002	67,783	80,081	94,638	111,013	132,308	161,618	211,967	739,237

Notes
[1] *See Supporting Table 7.10*
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11)
[4] NCR figure
[5] 1992 figure
[6] Supporting Table 7.17
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14

Formula
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data
Current Labor Statistics, December 1996, DOLE
DENR-HLR Office
Integrated Survey of Households, October 1995, NSO
Philippine Health Statistics 1992
Philippine Institute for Development Studies
Philippine Statistical Yearbook 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 16.1.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2000 - WITH DIESEL DESULPHURIZATION
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	29,195	123,203,917	1,796	6,698,309
2nd	29,247	123,421,735	1,799	6,710,151
3rd	29,207	123,254,754	1,797	6,701,072
4th	29,201	123,228,851	1,796	6,699,664
5th	29,190	123,182,917	1,796	6,697,167
6th	29,206	123,252,092	1,797	6,700,928
7th	29,227	123,340,134	1,798	6,705,714
8th	29,203	123,237,006	1,796	6,700,108
9th	29,199	123,222,836	1,796	6,699,337
10th	29,221	123,312,128	1,797	6,704,192

Notes:
[1/] From Supporting Table 7.3.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.3.5.

Supporting Table 16.1.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2000 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87
Change in risk of chronic bronchitis [2]	c	0.0949	0.0949	0.0949	0.0949	0.0949	0.0949	0.0949	0.0949	0.0949	0.0949
Population at risk [3]	d	307,674	308,218	307,801	307,736	307,622	307,794	308,014	307,757	307,721	307,944
Excess morbidity cases	e	29,195	29,247	29,207	29,201	29,190	29,206	29,227	29,203	29,199	29,221

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.1.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2000 - *WITH DIESEL DESULPHURIZATION*
(In pesos)

	Variable cod	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0 0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87
Change in risk of chronic bronchitis [2]	c	0.00366	0.00366	0.00366	0.00366	0.00366	0.00366	0.00366	0.00366	0.00366	0.00366
Population at risk [3]	d	490,685	491,552	490,887	490,784	490,601	490,876	491,227	490,816	490,760	491,116
Excess morbidity cases	e	1,796	1,799	1,797	1,796	1,796	1,797	1,798	1,796	1,796	1,797

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.1.6
Excess Respiratory Symptom Days
NCR, 2000 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87	39.87
Change in risk of chronic bronchitis [2]	c	10.92	10.92	10.92	10.92	10.92	10.92	10.92	10.92	10.92	10.92
Population at risk [3]	d	584,945	585,979	585,186	585,063	584,845	585,174	585,592	585,102	585,035	585,459
Excess morbidity cases	e	6,390,060	6,401,357	6,392,697	6,391,353	6,388,971	6,392,559	6,397,125	6,391,776	6,391,041	6,395,672

Notes.
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 16.2
Value of Health Damages from PM_{10} Exposure by Income Decile
NCR, 2001 - WITH DIESEL DESULPHURIZATION
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss	26	36	43	51	60	71	85	103	135	473	1,084
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.04	0.06	0.08	0.09	0.11	0.12	0.15	0.18	0.24	0.82	1.885
Cost of medication											
Total (3)	170	170	170	170	170	170	170	170	170	170	1,699
Chronic bronchitis	9	9	9	9	9	9	9	9	9	9	88
Lower respiratory illness	161	161	161	161	161	161	161	161	161	161	1,612
Respiratory symptom days	7.26	7.27	7.26	7.26	7.26	7.26	7.27	7.26	7.26	7.27	73
TOTAL = (1) + (2) + (3)	196	206	213	221	230	241	255	273	306	644	2,785

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 16.2.1 to 16.2.6.

Supporting Table 16.2.1
Value of Foregone Earnings Due to Mortality
NCR, 2001 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84
Change in Pr(M) due to red'n in PM	c	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,016,397	1,018,194	1,016,816	1,016,603	1,016,224	1,016,794	1,017,521	1,016,670	1,016,553	1,017,290
Excess mortality cases	f	353	354	354	353	353	354	354	353	353	354
Estimated present value of future average earnings [5]	g	72,897	101,286	122,593	144,836	171,164	200,779	239,297	292,306	383,368	1,336,996
Estimated value of productivity loss	h	25,759,743	35,854,886	43,338,585	51,191,222	60,474,103	70,977,228	84,654,004	103,320,204	135,491,662	472,869,865

Notes:

[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).

[2] This is the *difference in ambient* PM_{10} *concentration* and the WHO air quality guideline (Supporting Table 7.10).

[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.

[4] Population at risk is total NCR population (See Supporting Table 7.13d).

[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:

(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:

Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 16.2.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2001 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10}	b	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84
Change in RAD per person per year	c	0.0396	0.0396	0.0396	0.0396	0.0396	0.0396	0.0396	0.0396	0.0396	0.0396
RAD per person per chronic bronchitis episode	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [2]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total populatio	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [3]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [4]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,046	1,046	1,046	1,046	1,046	1,046	1,046	1,046	1,046	1,046
WDL	l	822	822	822	822	822	822	822	822	822	822
Estimated average daily earnings [5]	m	55	76	92	108	128	150	179	219	287	1000
Estimated value of WDL	n	44,818	62,272	75,373	89,048	105,234	123,443	147,122	179,713	235,700	822,006

Notes

[1] *See Supporting Table 7.10*

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10)
The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11)

[3] NCR figure

[4] 1992 figure

[5] Supporting Table 7.17

[6] WDL = RAD * (5.5/7)

[7] See Supporting Table 7.14

Formula

(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data

Current Labor Statistics, December 1996, DOLE
DENR-NCR Office
Integrated Survey of Households, October 1995, NSO
Philippine Health Statistics 1992
Philippine Institute for Development Studies
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 16.2.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2001 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Lower Respiratory Illness		Chronic Bronchitis	
Income Decile	Number of Excess Morbidity Cases [1]	Total Cost of Medication [2] (In pesos)	Number of Excess Morbidity Cases [3]	Total Cost of Medication [2] (In pesos)
1st	33,164	161,094,539	2,040	8,758,333
2nd	33,222	161,379,345	2,044	8,773,817
3rd	33,177	161,161,010	2,041	8,761,947
4th	33,170	161,127,140	2,040	8,760,105
5th	33,158	161,067,080	2,040	8,756,840
6th	33,177	161,157,529	2,041	8,761,758
7th	33,200	161,272,649	2,042	8,768,016
8th	33,173	161,137,804	2,041	8,760,685
9th	33,169	161,119,276	2,040	8,759,678
10th	33,193	161,236,030	2,042	8,766,025

Notes:
[1] From Supporting Table 7.4.4.
[2] *Number of excess* morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3] From Supporting Table 7.4.5.

Supporting Table 16.2.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2001 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84
Change in risk of chronic bronchitis [2]	c	0.1043	0.1043	0.1043	0.1043	0.1043	0.1043	0.1043	0.1043	0.1043	0.1043
Population at risk [3]	d	317,827	318,389	317,958	317,892	317,773	317,952	318,179	317,913	317,876	318,106
Excess morbidity cases	e	33,164	33,222	33,177	33,170	33,158	33,177	33,200	33,173	33,169	33,193

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.2.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2001 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable cod	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84
Change in risk of chronic bronchitis [2]	c	0.00402	0.00402	0.00402	0.00402	0.00402	0.00402	0.00402	0.00402	0.00402	0.00402
Population at risk [3]	d	506,877	507,773	507,086	506,980	506,791	507,075	507,438	507,013	506,955	507,322
Excess morbidity cases	e	2,040	2,044	2,041	2,040	2,040	2,041	2,042	2,041	2,040	2,042

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.2.6
Excess Respiratory Symptom Days
NCR, 2001 - WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84	43.84
Change in risk of chronic bronchitis [2]	c	12.01	12.01	12.01	12.01	12.01	12.01	12.01	12.01	12.01	12.01
Population at risk [3]	d	604,248	605,316	604,497	604,370	604,145	604,484	604,916	604,410	604,341	604,779
Excess morbidity cases	e	7,258,711	7,271,544	7,261,706	7,260,180	7,257,474	7,261,549	7,266,736	7,260,661	7,259,826	7,265,086

Notes:
[1] See Supporting Table 7.10.
[2] *This is the difference in* ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 16.3
Value of Health Damages from PM_{10} Exposure by Income Decile
NCR, 2002- WITH DIESEL DESULPHURIZATION
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss	30	41	50	59	69	81	97	118	155	542	1,243
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.05	0.07	0.08	0.10	0.12	0.14	0.16	0.20	0.26	0.91	2.092
Cost of medication											
Total (3)	221	222	221	221	221	221	222	221	221	221	2,214
Chronic bronchitis	11	11	11	11	11	11	11	11	11	11	114
Lower respiratory illness	210	210	210	210	210	210	210	210	210	210	2,100
Respiratory symptom days	8.23	8.24	8.23	8.23	8.23	8.23	8.24	8.23	8.23	8.24	82
TOTAL = (1) + (2) + (3)	251	263	271	280	291	303	319	340	377	765	3,459

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 16.3.1 to 16.3.6.

Supporting Table 16.3.1
Value of Foregone Earnings Due to Mortality
NCR, 2002- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12
Change in Pr(M) due to red'n in PM	c	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,049,938	1,051,794	1,050,371	1,050,151	1,049,759	1,050,349	1,051,099	1,050,220	1,050,099	1,050,860
Excess mortality cases	f	401	401	401	401	401	401	401	401	401	401
Estimated present value of future average earnings [5]	g	73,714	102,421	123,966	146,458	173,081	203,028	241,977	295,580	387,661	1,351,970
Estimated value of productivity loss	h	29,534,997	41,109,648	49,690,132	58,693,623	69,336,970	81,379,394	97,060,589	118,462,440	155,348,830	542,171,965

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 16.3.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2002- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12
Change in RAD per person per year	c	0.0435	0.0435	0.0435	0.0435	0.0435	0.0435	0.0435	0.0435	0.0435	0.0435
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years *old and above to total populatio*	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,148	1,148	1,148	1,148	1,148	1,148	1,148	1,148	1,148	1,148
WDL	l	902	902	902	902	902	902	902	902	902	902
Estimated average daily earnings [7]	m	55	77	93	110	129	152	181	221	290	1011
Estimated value of WDL	n	49,745	69,117	83,658	98,837	116,802	137,013	163,295	199,469	261,610	912,369

Notes
[1] See Supporting Table 7.10
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10)
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11)
[4] *NCR figure*
[5] 1992 figure
[6] Supporting Table 7.17
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14

Formula
(c) = (a/100) * (b)
*(e) = (c) * (f) * (g) * (h)*
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data
Current Labor Statistics, December 1996 DOLE
DENR NCR Office
Integrated Survey of Households October 1995, NSO
Philippine Health Statistics 1992
Philippine Institute *for Development Studies*
Philippine Statistical Yearbook 1996
Projected Population for NCR 1990-2050 NSO
Yearbook of Labor Statistics 1995, DOLE

Supporting Table 16.3.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2002- WITH DIESEL DESULPHURIZATION
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	37,603	209,855,472	2,313	11,409,351
2nd	37,669	210,226,485	2,317	11,429,522
3rd	37,618	209,942,064	2,314	11,414,059
4th	37,610	209,897,941	2,314	11,411,660
5th	37,596	209,819,702	2,313	11,407,406
6th	37,618	209,937,529	2,314	11,413,812
7th	37,644	210,087,493	2,316	11,421,965
8th	37,613	209,911,833	2,314	11,412,415
9th	37,609	209,887,697	2,313	11,411,103
10th	37,636	210,039,790	2,315	11,419,372

Notes:

[1/] *From Supporting Table 7.5.4.*

[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).

[3/] From Supporting Table 7.5.5.

Supporting Table 16.3.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2002- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12
Change in risk of chronic bronchitis [2]	c	0.1145	0.1145	0.1145	0.1145	0.1145	0.1145	0.1145	0.1145	0.1145	0.1145
Population at risk [3]	d	328,316	328,896	328,451	328,382	328,260	328,444	328,679	328,404	328,366	328,604
Excess morbidity cases	e	37,603	37,669	37,618	37,610	37,596	37,618	37,644	37,613	37,609	37,636

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the *WHO air quality guideline*. (Supporting Table 7.10).
[3] *Population at risk* are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.3.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2002- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable cod	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12
Change in risk of chronic bronchitis [2]	c	0.00442	0.00442	0.00442	0.00442	0.00442	0.00442	0.00442	0.00442	0.00442	0.00442
Population at risk [3]	d	523,604	524,530	523,820	523,710	523,515	523,809	524,183	523,745	523,685	524,064
Excess morbidity cases	e	2,313	2,317	2,314	2,314	2,313	2,314	2,316	2,314	2,313	2,315

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.3.6
Excess Respiratory Symptom Days
NCR, 2002- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0 2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12	48.12
Change in risk of *chronic bronchitis* [2]	c	13.19	13.19	13.19	13.19	13.19	13.19	13.19	13.19	13.19	13.19
Population at risk [3]	d	624,188	625,292	624,446	624,315	624,082	624,432	624,878	624,356	624,284	624,736
Excess morbidity cases	e	8,230,342	8,244,893	8,233,738	8,232,007	8,228,939	8,233,560	8,239,441	8,232,552	8,231,606	8,237,570

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 16.4
Value of Health Damages from PM_{10} Exposure by Income Decile
NCR, 2003- WITH DIESEL DESULPHURIZATION
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss	34	47	57	67	79	93	111	136	178	621	1,423
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.06	0.08	0.09	0.11	0.13	0.15	0.18	0.22	0.29	1.01	2.318
Cost of medication											
Total (3)	287	288	287	287	287	287	288	287	287	288	2,874
Chronic bronchitis	15	15	15	15	15	15	15	15	15	15	148
Lower respiratory illness	272	273	273	273	272	273	273	273	273	273	2,726
Respiratory symptom days	9.32	9.33	9.32	9.32	9.32	9.32	9.33	9.32	9.32	9.33	93
TOTAL = (1) + (2) + (3)	321	335	344	355	367	381	399	423	465	909	4,299

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 16.4.1 to 16.4.6.

Supporting Table 16.4.1
Value of Foregone Earnings Due to Mortality
NCR, 2003- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74
Change in Pr(M) due to red'n in PM	c	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.069
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,084,586	1,086,504	1,085,034	1,084,806	1,084,401	1,085,010	1,085,785	1,084,877	1,084,753	1,085,539
Excess mortality cases	f	454	454	454	454	453	454	454	454	454	454
Estimated present value of future average earnings [5]	g	74,539	103,568	125,354	148,099	175,020	205,302	244,687	298,891	392,003	1,367,112
Estimated value of productivity loss	h	33,808,827	47,058,376	56,880,488	67,186,820	79,370,301	93,155,311	111,105,637	135,604,419	177,828,414	620,626,371

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 16.4.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2003- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74
Change in RAD per person per year	c	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476	0.0476
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5.449	5,449	5,449	5.449	5,449	5.449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total populatio	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1.887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,258	1,258	1,258	1,258	1,258	1,258	1,258	1,258	1,258	1,258
WDL	l	989	989	989	989	989	989	989	989	989	989
Estimated average daily earnings [7]	m	56	77	94	111	131	154	183	224	293	1023
Estimated value of WDL	n	55,125	76,592	92,705	109,525	129,433	151,829	180,953	221,039	289,899	1,011,028

Notes
[1] See Supporting Table 7.10
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10)
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11)
[4] NCR figure
[5] 1992 figure
[6] Supporting Table 7.17
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14

Formula
(c) = (a/100) * (b)
(d) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data
Current Labor Statistics, December 1996, DOLE
DENR-NCR Office
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992
Philippine Institute for Development Studies
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 16.4.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2003- WITH DIESEL DESULPHURIZATION
(In pesos)

	Lower Respiratory Illness		Chronic Bronchitis	
Income Decile	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	42,567	272,468,824	2,619	14,813,492
2nd	42,643	272,950,534	2,623	14,839,682
3rd	42,585	272,581,252	2,620	14,819,605
4th	42,576	272,523,965	2,619	14,816,490
5th	42,560	272,422,382	2,618	14,810,967
6th	42,584	272,575,364	2,620	14,819,284
7th	42,614	272,770,072	2,621	14,829,870
8th	42,579	272,542,001	2,619	14,817,471
9th	42,574	272,510,664	2,619	14,815,767
10th	42,605	272,708,136	2,621	14,826,503

Notes:
[1/] From Supporting Table 7.6.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.6.5.

Supporting Table 16.4.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2003- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74
Change in risk of chronic bronchitis [2]	c	0.1255	0.1255	0.1255	0.1255	0.1255	0.1255	0.1255	0.1255	0.1255	0.1255
Population at risk [3]	d	339,150	339,750	339,290	339,219	339,092	339,283	339,525	339,241	339,202	339,448
Excess morbidity cases	e	42,567	42,643	42,585	42,576	42,560	42,584	42,614	42,579	42,574	42,605

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15-years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.4.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2003- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable cod	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74
Change in risk of chronic bronchitis [2]	c	0.00484	0.00484	0.00484	0.00484	0.00484	0.00484	0.00484	0.00484	0.00484	0.00484
Population at risk [3]	d	540,883	541,839	541,106	540,993	540,791	541,095	541,481	541,028	540,966	541,358
Excess morbidity cases	e	2,619	2,623	2,620	2,619	2,618	2,620	2,621	2,619	2,619	2,621

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.4.6
Excess Respiratory Symptom Days
NCR, 2003- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response *coefficient* [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74	52.74
Change in risk of chronic bronchitis [2]	c	14.45	14.45	14.45	14.45	14.45	14.45	14.45	14.45	14.45	14.45
Population at risk [3]	d	644,786	645,926	645,052	644,917	644,677	645,039	645,499	644,960	644,885	645,353
Excess morbidity cases	e	9,316,954	9,333,426	9,320,799	9,318,840	9,315,366	9,320,598	9,327,256	9,319,457	9,318,385	9,325,138

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(c) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 16.5
Value of Health Damages from PM_{10} Exposure by Income Decile
NCR, 2004- WITH DIESEL DESULPHURIZATION
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss	39	54	65	77	91	106	127	155	203	709	1,626
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.06	0.08	0.10	0.12	0.14	0.17	0.20	0.24	0.32	1.12	2.565
Cost of medication											
Total (3)	372	373	372	372	372	372	372	372	372	372	3,721
Chronic bronchitis	19	19	19	19	19	19	19	19	19	19	192
Lower respiratory illness	353	353	353	353	353	353	353	353	353	353	3,529
Respiratory symptom days	10.53	10.55	10.54	10.53	10.53	10.54	10.54	10.53	10.53	10.54	105
TOTAL = (1) + (2) + (3)	411	426	437	449	463	479	499	527	576	1,083	5,349

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 16 5.1 to 16 5 6.

Supporting Table 16.5.1
Value of Foregone Earnings *Due to Mortality*
NCR, 2004- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71
Change in Pr(M) due to red'n in PM	c	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,120,377	1,122,358	1,120,840	1,120,604	1,120,186	1,120,816	1,121,616	1,120,678	1,120,549	1,121,361
Excess mortality cases	f	513	514	513	513	513	513	513	513	513	513
Estimated present value of future average earnings [5]	g	75,374	104,728	126,758	149,757	176,980	207,601	247,428	302,238	396,394	1,382,424
Estimated value of productivity loss	h	38,645,839	53,790,993	65,018,351	76,799,205	90,725,769	106,482,994	127,001,464	155,005,274	203,270,235	709,419,072

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 16.5.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2004- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71
Change in RAD per person per year	c	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521	0.0521
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total populatio	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,377	1,377	1,377	1,377	1,377	1,377	1,377	1,377	1,377	1,377
WDL	l	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
Estimated average daily earnings [7]	m	56	78	95	112	132	155	185	226	297	1034
Estimated value of WDL	n	60,998	84,753	102,583	121,195	143,224	168,006	200,234	244,591	320,789	1,118,756

Notes

[1] See Supporting Table 7.10
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10)
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11)
[4] NCR figure
[5] 1992 figure
[6] Supporting Table 7.17
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14

Formula

(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data

Current Labor Statistics, December 1996, DOLE
DENR-NCR Office
Integrated Survey of Households, October 1995, NSO
Philippine Health Statistics 1992
Philippine Institute for Development Studies
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics, 1995, DOLE

Supporting Table 16.5.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2004- WITH DIESEL DESULPHURIZATION
(In pesos)

	Lower Respiratory Illness		Chronic Bronchitis	
Income Decile	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	48,118	352,708,510	2,960	19,174,768
2nd	48,204	353,332,079	2,965	19,208,668
3rd	48,138	352,854,046	2,961	19,182,680
4th	48,128	352,779,889	2,961	19,178,649
5th	48,110	352,648,391	2,959	19,171,500
6th	48,137	352,846,425	2,961	19,182,266
7th	48,172	353,098,473	2,963	19,195,968
8th	48,131	352,803,237	2,961	19,179,918
9th	48,126	352,762,672	2,960	19,177,712
10th	48,161	353,018,297	2,963	19,191,609

Notes:
[1/] From Supporting Table 7.7.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.7.5.

Supporting Table 16.5.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2004- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71
Change in risk of chronic bronchitis [2]	c	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373
Population at risk [3]	d	350,342	350,961	350,487	350,413	350,282	350,479	350,729	350,436	350,396	350,650
Excess morbidity cases	e	48,118	48,204	48,138	48,128	48,110	48,137	48,172	48,131	48,126	48,161

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.5.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2004- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable cod	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71
Change in risk of chronic bronchitis [2]	c	0.00530	0.00530	0.00530	0.00530	0.00530	0.00530	0.00530	0.00530	0.00530	0.00530
Population at risk [3]	d	558,732	559,720	558,963	558,845	558,637	558,951	559,350	558,882	558,818	559,223
Excess morbidity cases	e	2,960	2,965	2,961	2,961	2,959	2,961	2,963	2,961	2,960	2,963

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.5.6
Excess Respiratory Symptom Days
NCR, 2004- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71	57.71
Change in risk of chronic bronchitis [2]	c	15.81	15.81	15.81	15.81	15.81	15.81	15.81	15.81	15.81	15.81
Population at risk [3]	d	666,064	667,242	666,339	666,199	665,951	666,325	666,801	666,243	666,167	666,649
Excess morbidity cases	e	10,531,968	10,550,588	10,536,314	10,534,100	10,530,173	10,536,087	10,543,613	10,534,797	10,533,586	10,541,219

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 16.6
Value of Health Damages from PM_{10} Exposure by Income Decile
NCR, 2005- WITH DIESEL DESULPHURIZATION
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss	46	65	78	92	109	128	152	186	244	851	1,951
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.07	0.10	0.12	0.14	0.17	0.20	0.23	0.28	0.37	1.30	2.979
Cost of medication											
Total (3)	504	505	505	505	504	505	505	505	505	505	5,047
Chronic bronchitis	26	26	26	26	26	26	26	26	26	26	260
Lower respiratory illness	478	479	479	479	478	479	479	479	479	479	4,787
Respiratory symptom days	12.49	12.52	12.50	12.50	12.49	12.50	12.51	12.50	12.50	12.51	125
TOTAL = (1) + (2) + (3)	551	570	583	597	613	633	658	691	749	1,357	7,001

Notes:
Respiratory symptom days are *not included* in the valuation

Sources:
Supporting Tables 16.6.1 to 16.6.6.

Supporting Table 16.6.1
Value of Foregone Earnings Due to Mortality
NCR, 2005- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27
Change in Pr(M) due to red'n in PM	c	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,157,350	1,159,396	1,157,827	1,157,584	1,157,153	1,157,802	1,158,629	1,157,661	1,157,528	1,158,366
Excess mortality cases	f	608	609	608	608	608	608	609	608	608	609
Estimated present value of future average earnings [5]	g	76,218	105,901	128,178	151,435	178,962	209,926	250,199	305,623	400,833	1,397,907
Estimated value of productivity loss	h	46,359,437	64,527,521	77,995,826	92,128,104	108,834,371	127,736,693	152,350,590	185,943,880	243,842,388	851,017,072

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of *1996 figure.*
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g).

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 16.6.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2005- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27
Change in RAD per person per year	c	0.0598	0.0598	0.0598	0.0598	0.0598	0.0598	0.0598	0.0598	0.0598	0.0598
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total populatio	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581	1,581
WDL [7]	l	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242	1,242
Estimated average daily earnings [8]	m	57	79	96	113	134	157	187	229	300	1046
Estimated value of WDL	n	70,836	98,421	119,127	140,740	166,323	195,102	232,527	284,038	372,524	1,299,184

Notes
[1] See Supporting Table 7.10
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11)
[4] NCR figure
[5] 1992 figure
[6] Supporting Table 7.17
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14

Formula
(c) = (a/100) * (b)
(e) = (e) * (f) * (g) * (h)
(i) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data
Current Labor Statistics, December 1996, DOLE
DENR-NCR Office
Integrated Survey of Households, October 1995, NSO
Philippine Health Statistics 1992
Philippine Institute for Development Studies
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of Labor Statistics 1995, DOLE

Supporting Table 16.6.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2005- WITH DIESEL DESULPHURIZATION
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	57,083	478,473,591	3,511	26,016,395
2nd	57,184	479,319,506	3,518	26,062,391
3rd	57,107	478,671,021	3,513	26,027,130
4th	57,095	478,570,422	3,512	26,021,660
5th	57,074	478,392,036	3,511	26,011,961
6th	57,106	478,660,682	3,513	26,026,568
7th	57,147	479,002,603	3,515	26,045,160
8th	57,099	478,602,094	3,512	26,023,382
9th	57,092	478,547,065	3,512	26,020,390
10th	57,134	478,893,838	3,515	26,039,246

Notes:
[1/] From Supporting Table 7.8.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.8.5.

Supporting Table 16.6.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2005- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27
Change in risk of chronic bronchitis [2]	c	0.1577	0.1577	0.1577	0.1577	0.1577	0.1577	0.1577	0.1577	0.1577	0.1577
Population at risk [3]	d	361,903	362,543	362,053	361,977	361,842	362,045	362,303	362,000	361,959	362,221
Excess morbidity cases	e	57,083	57,184	57,107	57,095	57,074	57,106	57,147	57,099	57,092	57,134

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.6.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2005- WITH DIESEL DESULPHURIZATION
(In *pesos*)

	Variable cod	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in *PM10* [1]	b	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27
Change in risk of chronic bronchitis [2]	c	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608	0.00608
Population at risk [3]	d	577,170	578,191	577,409	577,287	577,072	577,396	577,809	577,325	577,259	577,677
Excess morbidity cases	e	3,511	3,518	3,513	3,512	3,511	3,513	3,515	3,512	3,512	3,515

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 16.6.6
Excess Respiratory Symptom Days
NCR, 2005- WITH DIESEL DESULPHURIZATION
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27	66.27
Change in risk of chronic bronchitis [2]	c	18.16	18.16	18.16	18.16	18.16	18.16	18.16	18.16	18.16	18.16
Population at risk [3]	d	688,044	689,261	688,328	688,184	687,927	688,314	688,805	688,229	688,150	688,649
Excess morbidity cases	e	12,494,184	12,516,273	12,499,339	12,496,713	12,492,054	12,499,069	12,507,996	12,497,540	12,496,103	12,505,158

Notes
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 16.7
Value of Health Damages from PM_{10} Exposure by Income Decile
NCR, 2006- WITH DIESEL DESULPHURIZATION
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1	53	73	89	105	124	145	174	212	278	969	2,222
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.08	0.11	0.13	0.16	0.18	0.22	0.26	0.31	0.41	1.43	3.284
Cost of medication											
Total (3)	649	650	649	649	649	649	650	649	649	650	6,493
Chronic bronchitis	33	34	33	33	33	33	34	33	33	33	335
Lower respiratory illness	616	617	616	616	615	616	616	616	616	616	6,158
Respiratory symptom days	14.07	14.10	14.08	14.07	14.07	14.08	14.09	14.08	14.07	14.08	141
TOTAL = (1) + (2) + (3)	702	724	738	754	773	795	823	861	927	1,620	8,718

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 16.7.1 to 16.7.6.

Table 17
Fuel Tax Rates and Fuel Consumption
Before and Ater the Oil Industry Deregulation
NCR, 2001

	Type of Fuel	Consumption [1/] (In liters)	Tax Rate (In P/liter)
Before deregulation	Leaded premium	1,016	3.80
(1996)	Regular	27	4.00
	Unleaded	264	3.24
	Average gasoline tax [2/]		3.73
	Diesel	1,448	1.47
	Ratio of diesel-gasoline tax		**0.39**
After deregulation	Leaded premium	1,493	5.35
(2001)	Regular	41	4.80
	Unleaded	409	4.35
	Average gasoline tax		4.85
	Diesel	1,964	1.63
	Ratio of diesel-gasoline tax		**0.34**
Simulated new diesel tax rates [3/]	Leaded premium	1,493	5.35
(2001)	Regular	41	4.80
	Unleaded	409	4.35
	Average gasoline tax		4.85
	Diesel	1,945	**1.91**

Notes:

[1/] Fuel consumption data before deregulation was obtained from ERB.

Fuel consumption data after deregulation were obtained from Table 5.

[2/] Weighted average. Consumption levels used as weights.

[3/] Obtained by increasing diesel tax rates to obtain the pre-deregulation diesel-gasoline tax rate.

Sources of basic data:

Energy Regulatory Board

Manasan, et al. Use of Fuel Tax Differntiation in Vehicular Pollution Control in Metro Manila. 1997.

Table 18
Projected PM_{10} Emissions, Ambient Concentration, Health Damages and Costs
NCR, 2001-2006 - WITH DIESEL TAX RESTRUCTURING

	2001	2002	2003	2004	2005	2006
Diesel Fuel Consumption [1/]	1,945	2,068	2,198	2,336	2,484	2,640
PM_{10} Emissions [2/] (In tons)	16,359	17,555	18,842	20,229	21,722	23,330
Ambient Concentration (In mg/cu. m)	129.3	138.8	149.0	159.9	171.7	184.4
Health Damages [3/] (In million pesos)	2,167	2,704	3,376	4,216	5,268	6,586
Tax Revenues [4/] (In million pesos)	13,671	14,881	16,201	17,642	19,215	20,932

Notes:

[1/] See Supporting Table 18.1

[2/] See Supporting Table 18.4 to 18.5

[3/] See Table 19 and its Supporting Tables.

[4/] See Supporting Table 18.3.

Supporting Table 18.1
Estimation of Diesel Fuel Consumption after
Diesel Fuel Tax Restructuring
NCR, 2001-2006

		2001	2002	2003	2004	2005	2006
Original volume of sales [1/] (In million liters)	a	1,964	2,088	2,219	2,359	2,508	2,666
% Change in price [2/]	b	0.03	0.03	0.03	0.03	0.03	0.03
Own price elasticity [3/]	c	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)
Change in consumption [4/]	d	(19)	(20)	(21)	(23)	(24)	(26)
New Consumption [5/] (In million liters)	e	1,945	2,068	2,198	2,336	2,484	2,640

Notes:
[1/] From Table 5.
[2/] From Supporting Table 18.2
[3/] From World Bank (1994).
[4/] (d) = (a)*(b)*(c)
[5/] (e) = (a) + (d). No diesel consumption is expected to shift to gasoline consumption because gasoline is taxed more and is more expensive.

Supporting Table 18.2
Change in the Pump Price of Diesel
After Diesel Fuel Tax Restructuring

	Direct Oil Company Take	Specific tax [1/]	Wholesale Posted Price	Hauling Charge	Dealer's Mark-up	Pump Price
	(a)	(b)	(c) = (a) + (b)	(d)	(e)	(c) + (d) + (e)
Before tax Restructuring 1998	5.85	1.63	7.48	0.11	0.51	8.10
After Tax Restructuring [2/] 1998	5.85	1.91	7.76	0.11	0.51	8.38
					Change in pump price (In percent)	0.03

Notes:

[1/] From Table 18.

[2/] Assumed that pump price of diesel will remain relatively stable until 2001.

Supporting Table 18.3
Projected Fuel Consumption and Tax Revenues
NCR, 1998 to 2006 - DIESEL TAX RESTRUCTURING

	1998	1999	2000	2001	2002	2003	2004	2005	2006
Fuel consumption [1/]									
(In million liters)									
Gasoline	1,467	1,611	1,769	1,942	2,133	2,342	2,571	2,823	3,100
Leaded premium	1,128	1,238	1,359	1,493	1,639	1,800	1,976	2,170	2,382
Unleaded premium	309	339	372	409	449	493	541	594	652
Regular	31	34	37	41	45	49	54	59	65
Diesel	1,635	1,738	1,848	1,945	2,068	2,198	2,336	2,484	2,640
Tax rates [3/]									
(In pesos per liter)									
Leaded premium	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
Unleaded premium	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Regular	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Diesel	1.6	1.6	1.6	1.9	1.9	1.9	1.9	1.9	1.9
Tax revenues [4/]	10,189	11,095	12,083	13,671	14,881	16,201	17,642	19,215	20,932
(In million pesos)									
Leaded premium	6,033	6,624	7,273	7,986	8,768	9,628	10,571	11,607	12,745
Unleaded premium	1,343	1,475	1,620	1,778	1,952	2,144	2,354	2,585	2,838
Regular	148	163	178	196	215	236	259	285	313
Diesel	2,665	2,833	3,012	3,711	3,945	4,193	4,457	4,738	5,037

Notes:

[1/] See Supporting Table 7.1.

[2/] ENRAP estimate based on relationship between PM_{10} emission and ambient concentration in 1996. WHO standard is 37.46 mg/cu.m.

[3/] Tax rates are those stipulated under R.A. 8184: Fuel Tax Restructuring Act of 1996 except for diesel. See Table 17.

[4/] Tax rate * fuel consumption

Sources of basic data:

Department of Energy.
Energy Regulatory Board.
Land Transportation Office.

Supporting Table 18.4

Estimation of PM_{10} Emissions with Diesel Tax Restructuring

NCR, 1998

Type of Vehicle and Fuel	Average distance travelled [1/] (km/year)	Emission factor [1/] (g/li)	Vehicle Stock [2/] 2001	2002	2003	2004	2005	2006	Emissions [3/] (In tons) 2001	2002	2003	2004	2005	2006
									15,870	16,870	17,933	19,063	20,263	21,540
Cars	9,002	0.63	30,319	32,229	34,259	36,418	38,712	41,151	171	181	193	205	218	232
UV	30,006	0.91	354,159	376,471	400,189	425,401	452,201	480,690	9,709	10,320	10,970	11,662	12,396	13,177
Buses	37,507	1.52	11,778	12,520	13,309	14,148	15,039	15,986	673	716	761	809	860	914
Trucks	37,507	1.52	93,027	98,888	105,118	111,740	118,780	126,263	5,318	5,653	6,009	6,387	6,790	7,217
								Adjusted [4/]	11,639	12,373	13,152	13,981	14,862	15,798
								Plus Gasoline [5/]	4,720	5,182	5,690	6,248	6,860	7,532
								TOTAL	16,359	17,555	18,842	20,229	21,722	23,330

Notes:

[1/] From Supporting Table 6.3. Distance travelled is adjusted using the adjustment factor in *Supporting Table 18.6*.

[2/] From Table 5.

[3/] SS_{ij} (vehicle stock* average distance* emission factor), i=vehicle type, j=fuel type

[4/] Lower diesel consumption also means less SO_2. 25% of SO_2 is sulfates, which are in the form of particulate matter. (See Supporting Table 18.5)

[5/] From Supporting Table 6.4.

Sources of basic data:

Environmental Management Bureau.

Air Emission Inventory for Motor Vehicles in *Metro Manila, 1991. ADB.*

Land Transportation Office.

Supporting Table 18.5
Computation of Change in Sulfates
NCR, 1998-2006 - WITH DIESEL TAX RESTRUCTURING

Year	Sulphur Content [1/] (% weight)	Density [2/] (kg/li)	Volume of diesel sales [3/] (liters)	SO_2 emissions [4/] (tons)	Sulfates [5/] (tons)	PM_{10} emissions [6/] (tons)	PM_{10} emissions less sulfates (tons)
2001	0.5	0.87	1,945	16,923	4,231	15,870	11,639
2002	0.5	0.87	2,068	17,989	4,497	16,870	12,373
2003	0.5	0.87	2,198	19,122	4,781	17,933	13,152
2004	0.5	0.87	2,336	20,327	5,082	19,063	13,981
2005	0.5	0.87	2,484	21,608	5,402	20,263	14,862
2006	0.5	0.87	2,640	22,969	5,742	21,540	15,798

Notes:

1/ Sulphur content of diesel has been lowered starting 1996 from 0.7% (in Metro Manila, 0.8% in other areas) to 0.5%.

2/ Diesel density is 7.05 lbs/gallon

3/ From Table 5.

4/ Formula: fuel consumption * density * sulphur content (in%) * 2

5/ 0.25 of SO_2 = sulfates (TEC 1993)

6/ From Supporting Tables 18.4.

Sources of basic data:

Orbeta and Indab. 1995. ENRAP III. Volume 5. Refinement of Accounts.

Energy Regulatory Board

Supporting Table 18.6
Implied Diesel Fuel Consumption by Vehicle Type
Based from the Process Rates
NCR, 2001-2006

	2001	2002	2003	2004	2005	2006
Type of Vehicle [1/]						
Cars	30,319	32,229	34,259	36,418	38,712	41,151
UVs	354,159	376,471	400,189	425,401	452,201	480,690
Buses	11,778	12,520	13,309	14,148	15,039	15,986
Trucks	93,027	98,888	105,118	111,740	118,780	126,263
Average distance travelled [2/] (km/vehicle/yr)						
Cars	12,000	12,000	12,000	12,000	12,000	12,000
UVs	40,000	40,000	40,000	40,000	40,000	40,000
Buses	50,000	50,000	50,000	50,000	50,000	50,000
Trucks	50,000	50,000	50,000	50,000	50,000	50,000
Fuel Efficiency [2/] (km/li)						
Cars	17.49	17.49	17.49	17.49	17.49	17.49
UVs	12.02	12.02	12.02	12.02	12.02	12.02
Buses	3.76	3.76	3.76	3.76	3.76	3.76
Trucks	3.76	3.76	3.76	3.76	3.76	3.76
Implied Fuel Consumption [3/] (In million liters)						
Cars	21	22	24	25	27	28
UVs	1,179	1,253	1,332	1,416	1,505	1,600
Buses	157	166	177	188	200	213
Trucks	1,237	1,315	1,398	1,486	1,580	1,679
TOTAL	2,593	2,756	2,930	3,115	3,311	3,519
Actual Fuel Consumption [4/] (In million liters)	1,945	2,068	2,198	2,336	2,484	2,640
Adjustment factor [5/]	0.75	0.75	0.75	0.75	0.75	0.75

Notes:

[1/] From Table 5.

[2/] From Supporting Table 6.3.

[3/] SS (vehicle stock* average distance)/ fuel efficiency ; i=vehicle type, j=fuel type
i j

[4/] From Table 18.1

[5/] Actual fuel consumption/implied fuel consumption.

Table 19
Projected Health Damages Associated with PM_{10} Exposure
NCR, 1998-2006 - WITH DIESEL TAX RESTRUCTURING
(In million pesos)

Health Effect	1998	1999	2000	2001	2002	2003	2004	2005	2006
Mortality	894	1,024	1,111	844	972	1,117	1,282	1,468	1,678
Morbidity									
Cost of work days lost	1.71	1.90	2.00	1.47	1.64	1.82	2.02	2.24	2.48
Cost of medication	942	1,236	1,530	1,322	1,731	2,257	2,932	3,798	4,905
Chronic Bronchitis	49	64	79	68	89	116	151	196	253
Lower Respiratory Illness	893	1,172	1,452	1,254	1,642	2,141	2,781	3,602	4,652
TOTAL	1,838	2,261	2,644	2,167	2,704	3,376	4,216	5,268	6,586

Notes:
1998 estimate assumes the following:
1) 9.8% and 6.3% annual growth rate of gasoline-and diesel-fed vehicle stock since 1996.
2) 1.12% growth rate of income.
3) 3.3% NCR population growth rate.
4) Post deregulation and post- tax restructuring fuel tax rates.
5) No other pollution control policy.
6) Reduction of sulphur content to 0.3% and 0.2% in 2000 and 2005, respectively.
See Supporting Tables 19.1 to 19.6 for the breakdown of health effects by income decile.

Table 19.1
Value of Health Damages from PM10 Exposure by Income Decile
NCR, 2001 - WITH DIESEL TAX RESTRUCTURING
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	20	28	34	40	47	55	66	80	105	368	844
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.03	0.05	0.06	0.07	0.08	0.10	0.11	0.14	0.18	0.64	1.467
Cost of medication											
Total (3)	132	132	132	132	132	132	132	132	132	132	1,322
Chronic bronchitis	7	7	7	7	7	7	7	7	7	7	68
Lower respiratory illness	125	126	125	125	125	125	126	125	125	125	1,254
Respiratory symptom days	5.65	5.66	5.65	5.65	5.65	5.65	5.65	5.65	5.65	5.65	57
TOTAL = (1) + (2) + (3)	152	160	166	172	179	188	198	213	238	501	2,167

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 19.1.1 to 19.1.6.

Supporting Table 19.1.1
Value of Foregone Earnings Due to Mortality
NCR, 2001 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12
Change in Pr(M) due to red'n in PM	c	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,016,397	1,018,194	1,016,816	1,016,603	1,016,224	1,016,794	1,017,521	1,016,670	1,016,553	1,017,290
Excess mortality cases	f	275	275	275	275	275	275	275	275	275	275
Estimated present value of future average earnings [5]	g	72,897	101,286	122,593	144,836	171,164	200,779	239,297	292,306	383,368	1,336,996
Estimated value of productivity loss	h	20,046,094	27,902,081	33,725,855	39,836,736	47,060,624	55,234,100	65,877,294	80,403,231	105,438,888	367,984,804

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1998.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.1.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2001 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12
Change in RAD per person per year	c	0.0308	0.0308	0.0308	0.0308	0.0308	0.0308	0.0308	0.0308	0.0308	0.0308
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Labor force participation rate [4]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed *morbidity cases*	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	814	814	814	814	814	814	814	814	814	814
WDL [7]	l	610	640	610	640	640	640	640	640	640	640
Estimated average daily earnings [8]	m	55	76	92	108	128	150	179	219	287	1000
Estimated value of WDL	n	34,878	48,460	58,655	69,297	81,893	96,062	111,490	139,852	183,420	639,681

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference *in ambient PM_{10} concentration* and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
*(j) = (i) * (d)*
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.1.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2001 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	25,808	125,362,910	1,588	6,815,688
2nd	25,853	125,584,545	1,590	6,827,738
3rd	25,818	125,414,638	1,588	6,818,500
4th	25,813	125,388,280	1,588	6,817,067
5th	25,803	125,341,542	1,587	6,814,526
6th	25,818	125,411,929	1,588	6,818,353
7th	25,836	125,501,514	1,589	6,823,224
8th	25,815	125,396,579	1,588	6,817,518
9th	25,812	125,382,161	1,588	6,816,735
10th	25,830	125,473,017	1,589	6,821,674

Notes:

1/ From Supporting Table 7.4.4.

2/ Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).

3/ From Supporting Table 7.4.5.

Supporting Table 19.1.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2001 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	*1st*	*2nd*	*3rd*	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12
Change in risk of chronic bronchitis [2]	c	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812
Population at risk [3]	d	317,827	318,389	317,958	317,892	317,773	317,952	318,179	317,913	317,876	318,106
Excess morbidity cases	e	25,808	25,853	25,818	25,813	25,803	25,818	25,836	25,815	25,812	25,830

Notes:
[1] *See Supporting Table 7.10.*
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.1.5

Excess Morbidity Cases from Chronic Bronchitis

NCR, 2001 - WITH DIESEL TAX RESTRUCTURING

(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12
Change in risk of chronic bronchitis [2]	c	0.00313	0.00313	0.00313	0.00313	0.00313	0.00313	0.00313	0.00313	0.00313	0.00313
Population at risk [3]	d	506,877	507,773	507,086	506,980	506,791	507,075	507,438	507,013	506,955	507,322
Excess morbidity cases	e	1,588	1,590	1,588	1,588	1,587	1,588	1,589	1,588	1,588	1,589

Notes:

[1] See Supporting Table 7.10.

[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).

[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:

(c) = (a) * (b)

(e) = (c) * (d)

Sources of basic data:

DENR-NCR Office.

Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.1.6
Excess Respiratory Symptom Days
NCR, 2001 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12	34.12
Change in risk of chronic bronchitis [2]	c	9.35	9.35	9.35	9.35	9.35	9.35	9.35	9.35	9.35	9.35
Population at risk [3]	d	604,248	605,316	604,497	604,370	604,145	604,484	604,916	604,410	604,341	604,779
Excess morbidity cases	e	5,648,690	5,658,677	5,651,021	5,649,833	5,647,727	5,650,899	5,654,936	5,650,207	5,649,558	5,653,651

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline, (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c). .

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 19.2
Value of Health Damages from PM10 Exposure by Income Decile
NCR, 2002 - WITH DIESEL TAX RESTRUCTURING
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	23	32	39	46	54	64	76	93	121	424	972
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.04	0.05	0.07	0.08	0.09	0.11	0.13	0.16	0.20	0.71	1.636
Cost of medication											
Total (3)	173	173	173	173	173	173	173	173	173	173	1,731
Chronic bronchitis	9	9	9	9	9	9	9	9	9	9	89
Lower respiratory illness	164	164	164	164	164	164	164	164	164	164	1,642
Respiratory symptom days	6.44	6.45	6.44	6.44	6.43	6.44	6.44	6.44	6.44	6.44	64
TOTAL = (1) + (2) + (3)	196	206	212	219	227	237	249	266	295	598	**2,704**

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 19.2.1 to 19.2.6.

Supporting Table 19.2.1
Value of Foregone Earnings Due to Mortality
NCR, 2002 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63
Change in Pr(M) due to red'n in PM	c	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,049,938	1,051,794	1,050,371	1,050,151	1,049,759	1,050,349	1,051,099	1,050,220	1,050,099	1,050,860
Excess mortality cases	f	313	314	313	313	313	313	314	313	313	314
Estimated present value of future average earnings [5]	g	73,714	102,421	123,966	146,458	173,081	203,028	241,977	295,580	387,661	1,351,970
Estimated value of productivity loss	h	23,094,342	32,144,926	38,854,275	45,894,388	54,216,755	63,633,105	75,894,724	92,629,503	121,472,131	423,941,291

Notes:
[1] *Based on WHO air quality* guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.2.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2002 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63
Change in RAD per person per year	c	0.0340	0.0340	0.0340	0.0340	0.0340	0.0340	0.0340	0.0340	0.0340	0.0340
RAD per person per chronis bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	898	898	898	898	898	898	898	898	898	898
WDL [7]	l	705	705	705	705	705	705	705	705	705	705
Estimated average daily earnings [8]	m	55	77	93	110	129	152	181	221	290	1011
Estimated value of WDL	n	38,897	54,615	65,415	77,284	91,334	107,134	127,686	155,971	204,561	713,410

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.2.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2002 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	29,403	164,092,586	1,809	8,921,330
2nd	29,455	164,382,693	1,812	8,937,102
3rd	29,415	164,160,295	1,809	8,925,011
4th	29,409	164,125,794	1,809	8,923,135
5th	29,398	164,064,617	1,808	8,919,809
6th	29,414	164,156,749	1,809	8,924,818
7th	29,435	164,274,011	1,811	8,931,193
8th	29,411	164,136,656	1,809	8,923,726
9th	29,407	164,117,784	1,809	8,922,700
10th	29,429	164,236,710	1,810	8,929,165

Notes:
[1/] From Supporting Table 7.5.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.5.5.

Supporting Table 19.2.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2002 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63
Change in risk of chronic bronchitis [2]	c	0.0896	0.0896	0.0896	0.0896	0.0896	0.0896	0.0896	0.0896	0.0896	0.0896
Population at risk [3]	d	328,316	328,896	328,451	328,382	328,260	328,444	328,679	328,404	328,366	328,604
Excess morbidity cases	e	29,403	29,455	29,415	29,409	29,398	29,414	29,435	29,411	29,407	29,429

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket *defined by Ostro (17 years* and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR *1990-2050, NSO.*

Supporting Table 19.2.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2002 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63
Change in risk of chronic bronchitis [2]	c	0.00345	0.00345	0.00345	0.00345	0.00345	0.00345	0.00345	0.00345	0.00345	0.00345
Population at risk [3]	d	523,604	524,530	523,820	523,710	523,515	523,809	524,183	523,745	523,685	524,064
Excess morbidity cases	e	1,809	1,812	1,809	1,809	1,808	1,809	1,811	1,809	1,809	1,810

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the *WHO air quality guideline.* (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.2.6
Excess Respiratory Symptom Days
NCR, 2002 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63	37.63
Change in risk of chronic bronchitis [2]	c	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31	10.31
Population at risk [3]	d	624,188	625,292	624,446	624,315	624,082	624,432	624,878	624,356	624,284	624,736
Excess morbidity cases	e	6,435,563	6,446,940	6,438,218	6,436,865	6,434,466	6,438,079	6,442,678	6,437,291	6,436,551	6,441,215

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. *(Supporting Table 7.10)*.
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 19.3
Value of Health Damages from PM10 Exposure by Income Decile
NCR, 2003 - WITH DIESEL TAX RESTRUCTURING
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	27	37	45	53	62	73	87	106	140	487	1,117
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.04	0.06	0.07	0.09	0.10	0.12	0.14	0.17	0.23	0.79	1.820
Cost of medication											
Total (3)	226	226	226	226	226	226	226	226	226	226	2,257
Chronic bronchitis	12	12	12	12	12	12	12	12	12	12	116
Lower respiratory illness	214	214	214	214	214	214	214	214	214	214	2,141
Respiratory symptom days	7.32	7.33	7.32	7.32	7.31	7.32	7.32	7.32	7.32	7.32	73
TOTAL = (1) + (2) + (3)	252	263	270	278	288	299	313	332	365	714	3,376

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 19.3.1 to 19.3.6.

Supporting Table 19.3.1
Value of Foregone Earnings Due to Mortality
NCR, 2003 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41
Change in Pr(M) due to red'n in PM	c	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,084,586	1,086,504	1,085,034	1,084,806	1,084,401	1,085,010	1,085,785	1,084,877	1,084,753	1,085,539
Excess mortality cases	f	356	357	356	356	356	356	357	356	356	356
Estimated present value of future average earnings [5]	g	74,539	103,568	125,354	148,099	175,020	205,302	244,687	298,891	392,003	1,367,112
Estimated value of productivity loss	h	26,546,763	36,950,337	44,662,680	52,755,234	62,321,729	73,145,748	87,240,382	106,476,878	139,631,249	487,317,146

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] *Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).*

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.3.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2003 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41
Change in RAD per person per year	c	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374	0.0374
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419	5,419
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	988	988	988	988	988	988	988	988	988	988
WDL [7]	l	776	776	776	776	776	776	776	776	776	776
Estimated average daily earnings [8]	m	56	77	94	111	131	151	183	224	293	1023
Estimated value of WDL	n	43,281	60,140	72,792	85,999	101,631	119,216	142,085	173,560	227,630	793,861

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.3.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2003 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	33,424	213,943,100	2,056	11,631,586
2nd	33,483	214,321,340	2,060	11,652,150
3rd	33,438	214,031,378	2,057	11,636,385
4th	33,431	213,986,397	2,056	11,633,939
5th	33,418	213,906,634	2,056	11,629,603
6th	33,437	214,026,755	2,057	11,636,134
7th	33,461	214,179,641	2,058	11,644,446
8th	33,433	214,000,558	2,057	11,634,709
9th	33,429	213,975,953	2,056	11,633,372
10th	33,453	214,131,008	2,058	11,641,802

Notes:

[1/] From Supporting Table 7.6.4.

[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).

[3/] From Supporting Table 7.6.5.

Supporting Table 19.3.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2003 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41
Change in risk of chronic bronchitis [2]	c	0.0986	0.0986	0.0986	0.0986	0.0986	0.0986	0.0986	0.0986	0.0986	0.0986
Population at risk [3]	d	339,150	339,750	339,290	339,219	339,092	339,283	339,525	339,241	339,202	339,418
Excess morbidity cases	e	33,424	33,483	33,438	33,431	33,418	33,437	33,461	33,433	33,429	33,453

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.3.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2003 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41
Change in risk of chronic bronchitis [2]	c	0.00380	0.00380	0.00380	0.00380	0.00380	0.00380	0.00380	0.00380	0.00380	0.00380
Population at risk [3]	d	540,883	541,839	541,106	540,993	540,791	541,095	541,481	541,028	540,966	541,358
Excess morbidity cases	e	2,056	2,060	2,057	2,056	2,056	2,057	2,058	2,057	2,056	2,058

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.3.6
Excess Respiratory Symptom Days
NCR, 2003 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41	41.41
Change in risk of chronic bronchitis [2]	c	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.35
Population at risk [3]	d	644,786	645,926	645,052	644,917	644,677	645,039	645,499	644,960	644,885	645,353
Excess morbidity cases	e	7,315,692	7,328,626	7,318,711	7,317,173	7,314,446	7,318,553	7,323,781	7,317,657	7,316,816	7,322,118

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 19.4
Value of Health Damages from PM10 Exposure by Income Decile
NCR, 2004 - WITH DIESEL TAX RESTRUCTURING
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	30	42	51	61	71	84	100	122	160	559	1,282
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.05	0.07	0.08	0.10	0.11	0.13	0.16	0.19	0.25	0.88	2.021
Cost of medication											
Total (3)	293	294	293	293	293	293	293	293	293	293	2,932
Chronic bronchitis	15	15	15	15	15	15	15	15	15	15	151
Lower respiratory illness	278	278	278	278	278	278	278	278	278	278	2,781
Respiratory symptom days	8.30	8.31	8.30	8.30	8.30	8.30	8.31	8.30	8.30	8.31	83
TOTAL = (1) + (2) + (3)	324	336	345	354	365	377	394	415	454	853	**4,216**

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 19.4.1 to 19.4.6.

Supporting Table 19.4.1
Value of Foregone Earnings Due to Mortality
NCR, 2004 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48
Change in Pr(M) due to red'n in PM	c	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,120,377	1,122,358	1,120,840	1,120,604	1,120,186	1,120,816	1,121,616	1,120,678	1,120,549	1,121,361
Excess mortality cases	f	404	405	404	404	404	404	405	404	404	404
Estimated present value of future *average earnings* [5]	g	75,374	104,728	126,758	149,757	176,980	207,601	247,428	302,238	396,394	1,382,424
Estimated value of productivity loss	h	30,455,463	42,390,841	51,238,737	60,522,825	71,497,874	83,915,604	100,085,507	122,154,352	160,190,316	559,068,893

Notes:
[1] Based on WHO air quality guideline and high estimates of *Ostro's dose-response function* (Supporting Table 7.10).
[2] This is the difference *in ambient* PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at *the median age* of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO
Yearbook of *Labor Statistics*, 1995, DOLE.

Supporting Table 19.4.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2004 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48
Change in RAD per person per year	c	0.0411	0.0411	0.0411	0.0411	0.0411	0.0411	0.0411	0.0411	0.0411	0.0411
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [5]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,085	1,085	1,085	1,085	1,085	1,085	1,085	1,085	1,085	1,085
WDL [7]	l	853	853	853	853	853	853	853	853	853	853
Estimated average daily earnings [8]	m	56	78	95	112	132	155	185	226	297	1034
Estimated value of WDL	n	48,071	66,791	80,812	95,509	112,870	132,400	157,798	192,754	252,803	881,654

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.4.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2004 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	37,921	277,961,687	2,333	15,112,126
2nd	37,988	278,453,108	2,337	15,138,844
3rd	37,936	278,076,381	2,334	15,118,362
4th	37,928	278,017,940	2,333	15,115,185
5th	37,914	277,914,309	2,332	15,109,550
6th	37,935	278,070,375	2,334	15,118,035
7th	37,962	278,269,008	2,335	15,128,835
8th	37,931	278,036,339	2,333	15,116,185
9th	37,926	278,004,371	2,333	15,114,447
10th	37,954	278,205,823	2,335	15,125,399

Notes:
[1/] From Supporting Table 7.7.4.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.7.5.

Supporting Table 19.4.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2004 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48
Change in risk of chronic bronchitis [2]	c	0.1082	0.1082	0.1082	0.1082	0.1082	0.1082	0.1082	0.1082	0.1082	0.1082
Population at risk [3]	d	350,342	350,961	350,487	350,413	350,282	350,479	350,729	350,436	350,398	350,650
Excess morbidity cases	e	37,921	37,988	37,936	37,928	37,914	37,935	37,962	37,931	37,926	37,954

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.4.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2004 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48
Change in risk of chronic bronchitis [2]	c	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417	0.00417
Population at risk [3]	d	558,732	559,720	558,963	558,845	558,637	558,951	559,350	558,882	558,818	559,223
Excess morbidity cases	e	2,333	2,337	2,334	2,333	2,332	2,334	2,335	2,333	2,333	2,335

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.4.6
Excess Respiratory Symptom Days
NCR, 2004 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48	45.48
Change in risk of chronic bronchitis [2]	c	12.46	12.46	12.46	12.46	12.46	12.46	12.46	12.46	12.46	12.46
Population at risk [3]	d	666,064	667,242	666,339	666,199	665,951	666,325	666,801	666,243	666,167	666,649
Excess morbidity cases	e	8,299,884	8,314,558	8,303,309	8,301,564	8,298,469	8,303,129	8,309,060	8,302,113	8,301,158	8,307,174

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 19.5
Value of Health Damages from PM10 Exposure by Income Decile
NCR, 2005 - WITH DIESEL TAX RESTRUCTURING
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	35	49	59	69	82	96	115	140	183	640	1,468
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.21	0.28	0.98	2.241
Cost of medication											
Total (3)	380	380	380	380	380	380	380	380	380	380	3,798
Chronic bronchitis	20	20	20	20	20	20	20	20	20	20	196
Lower respiratory illness	360	361	360	360	360	360	360	360	360	360	3,602
Respiratory symptom days	9.40	9.42	9.40	9.40	9.40	9.40	9.41	9.40	9.40	9.41	94
TOTAL = (1) + (2) + (3)	415	429	439	449	462	476	495	520	563	1,021	5,268

Notes:
Respiratory symptom days are not included in the valuation

Sources:
Supporting Tables 19.5.1 to 19.5.6.

Supporting Table 19.5.1
Value of Foregone Earnings Due to Mortality
NCR, 2005 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (mg/scm) [2]	b	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86
Change in Pr(M) due to red'n in PM	c	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,157,350	1,159,396	1,157,827	1,157,584	1,157,153	1,157,802	1,158,629	1,157,661	1,157,528	1,158,366
Excess mortality cases	f	458	458	458	458	458	458	458	458	458	458
Estimated present value of future average earnings [5]	g	76,218	105,901	128,178	151,435	178,962	209,926	250,199	305,623	400,833	1,397,907
Estimated value of productivity loss	h	34,879,293	48,548,353	58,681,456	69,314,111	81,883,349	96,104,825	114,623,499	139,897,970	183,458,875	640,276,844

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings of individuals at the median age of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.5.2
Value of Work Days Lost Due to Chronic Bronchitis
NCR, 2005 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86
Change in RAD per person per year	c	0.0450	0.0450	0.0450	0.0450	0.0450	0.0450	0.0450	0.0450	0.0450	0.0450
RAD per person per chronic bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [5]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190	1,190
WDL [7]	l	935	935	935	935	935	935	935	935	935	935
Estimated average daily earnings [8]	m	57	79	96	113	131	157	187	229	300	1046
Estimated value of WDL	n	53,294	74,049	89,627	105,888	125,136	146,788	171,945	213,700	280,275	977,462

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] The average RAD due to chronic bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WDL = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
(k) = (j) * (c)
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.5.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2005 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	42,948	360,007,604	2,642	19,572,771
2nd	43,024	360,644,078	2,647	19,607,374
3rd	42,965	360,156,152	2,643	19,580,847
4th	42,956	360,080,460	2,642	19,576,732
5th	42,940	359,946,241	2,641	19,569,434
6th	42,964	360,148,373	2,643	19,580,424
7th	42,995	360,405,637	2,645	19,594,411
8th	42,959	360,104,291	2,643	19,578,027
9th	42,954	360,062,886	2,642	19,575,776
10th	42,985	360,323,801	2,644	19,589,962

Notes:
[1/] From Supporting Table 7.84.
[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).
[3/] From Supporting Table 7.8.5.

Supporting Table 19.5.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2005 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86
Change in risk of chronic bronchitis [2]	c	0.1187	0.1187	0.1187	0.1187	0.1187	0.1187	0.1187	0.1187	0.1187	0.1187
Population at risk [3]	d	361,903	362,543	362,053	361,977	361,842	362,045	362,303	362,000	361,959	362,221
Excess morbidity cases	e	42,948	43,024	42,965	42,956	42,940	42,964	42,995	42,959	42,954	42,985

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (17 years and below) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.5.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2005 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86
Change in risk of chronic bronchitis [2]	c	0.00458	0.00458	0.00458	0.00458	0.00458	0.00458	0.00458	0.00458	0.00458	0.00458
Population at risk [3]	d	577,170	578,191	577,409	577,287	577,072	577,396	577,809	577,325	577,259	577,677
Excess morbidity cases	e	2,642	2,647	2,643	2,642	2,641	2,643	2,645	2,643	2,642	2,644

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.5.6
Excess Respiratory Symptom Days
NCR, 2005 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in PM10 [1]	b	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86	49.86
Change in risk of chronic bronchitis [2]	c	13.66	13.66	13.66	13.66	13.66	13.66	13.66	13.66	13.66	13.66
Population at risk [3]	d	688,044	689,261	688,328	688,184	687,927	688,314	688,805	688,229	688,150	688,649
Excess morbidity cases	e	9,400,207	9,416,826	9,404,086	9,402,109	9,398,605	9,403,883	9,410,600	9,402,732	9,401,651	9,408,463

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13e).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 19.6
Value of Health Damages from *PM10 Exposure* by Income Decile
NCR, 2006 - WITH DIESEL TAX RESTRUCTURING
(In million pesos)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Total
Mortality											
Value of productivity loss (1)	40	56	67	79	94	110	131	160	210	732	1,678
Morbidity											
Value of work days lost											
Chronic bronchitis (2)	0.06	0.08	0.10	0.12	0.14	0.16	0.19	0.24	0.31	1.08	2.481
Cost of medication											
Total (3)	490	491	490	490	490	490	491	490	490	491	4,905
Chronic bronchitis	25	25	25	25	25	25	25	25	25	25	253
Lower respiratory illness	465	466	465	465	465	465	465	465	465	465	4,652
Respiratory symptom days	10.63	10.65	10.63	10.63	10.63	10.63	10.64	10.63	10.63	10.64	106
TOTAL = (1) + (2) + (3)	530	547	558	570	584	600	622	651	700	1,224	6,586

Notes:
Respiratory symptom days *are not* included in the valuation

Sources:
Supporting Tables 19.6.1 to 19.6.6.

Supporting Table 19.6.1
Value of Foregone Earnings Due to Mortality
NCR, 2006 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Change in PM_{10} (ug/scm) [2]	b	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58
Change in Pr(M) due to red'n in PM	c	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071
Crude death rate [3]	d	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Population at risk [4]	e	1,195,542	1,197,656	1,196,036	1,195,784	1,195,339	1,196,010	1,196,864	1,195,863	1,195,726	1,196,592
Excess mortality cases	f	517	518	518	518	517	518	518	518	518	518
Estimated present value of future average earnings [5]	g	77,072	107,087	129,614	153,131	180,967	212,278	253,091	309,046	405,323	1,413,564
Estimated value of productivity loss	h	39,884,732	55,515,404	67,102,684	79,261,203	93,634,220	109,896,585	131,072,827	159,974,373	209,786,593	732,161,351

Notes:
[1] Based on WHO air quality guideline and high estimates of Ostro's dose-response function (Supporting Table 7.10).
[2] *This is the difference in ambient PM_{10}* concentration and the WHO air quality guideline (Supporting Table 7.10).
[3] Crude death rate for 1995 was used due to unavailability of 1996 figure.
[4] Population at risk is total NCR population (See Supporting Table 7.13d).
[5] Estimated value of future earnings *of individuals at the median age* of the average life expectancy at birth (Supporting Table 7.15).

Formula:
(c) = (a/100) * (b)
(f) = (c) * (d/1000) * (e)
(h) = (f) * (g)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE
DENR-NCR Office
Integrated Survey of Households, October 1995, NSO.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.6.2
Value of Work Loss Days Due to Chronic Bronchitis
NCR, 2006 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903	0.0903
Change in PM_{10} [2]	b	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58
Change in RAD per person per year	c	0.0493	0.0493	0.0493	0.0493	0.0493	0.0493	0.0493	0.0493	0.0493	0.0493
RAD per person per chronis bronchitis episode [3]	d	14	14	14	14	14	14	14	14	14	14
Morbidity cases due to chronic bronchitis [4]	e	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449	5,449
Share of 15 years old and above to total population [5]	f	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873	0.6873
Employment rate [6]	g	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Labor force participation rate [6]	h	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Estimated number of employed morbidity cases	i	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887	1,887
Estimated total RAD	j	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423	26,423
Estimated total excess											
RAD	k	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
WLD [7]	l	1,023	1,023	1,023	1,023	1,023	1,023	1,023	1,023	1,023	1,023
Estimated average daily earnings [8]	m	58	80	97	115	135	159	189	231	303	1057
Estimated value of WLD	n	58,996	81,970	99,215	117,216	138,522	162,491	193,661	236,562	310,258	1,082,029

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the *WHO air quality guideline*. (Supporting Table 7.10).
[3] *The average* RAD due to chronc bronchitis is 14 days (Supporting Table 7.11).
[4] NCR figure.
[5] 1992 figure.
[6] Supporting Table 7.17.
[7] WLD = RAD * (5.5/7)
[8] See Supporting Table 7.14.

Formula:
(c) = (a/100) * (b)
(i) = (e) * (f) * (g) * (h)
(j) = (i) * (d)
*(k) = (j) * (c)*
(l) = (k) * (5.5/7)
(n) = (l) * (m)

Sources of basic data:
Current Labor Statistics, December 1996, DOLE.
DENR-NCR Office.
Integrated Survey of Households, October 1995, NSO.
Philippine Health Statistics 1992.
Philippine Institute for Development Studies.
Philippine Statistical Yearbook, 1996.
Projected Population for NCR 1990-2050, NSO.
Yearbook of Labor Statistics, 1995, DOLE.

Supporting Table 19.6.3
Cost of Medication for Lower Respiratory Illness and Chronic Bronchitis
NCR, 2006 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

Income Decile	Lower Respiratory Illness		Chronic Bronchitis	
	Number of Excess Morbidity Cases [1/]	Total Cost of Medication [2/] (In pesos)	Number of Excess Morbidity Cases [3/]	Total Cost of Medication [2/] (In pesos)
1st	48,567	464,965,166	2,988	25,279,068
2nd	48,653	465,787,200	2,993	25,323,760
3rd	48,587	465,157,023	2,989	25,289,498
4th	48,577	465,059,264	2,988	25,284,183
5th	48,559	464,885,914	2,987	25,274,759
6th	48,586	465,146,976	2,989	25,288,952
7th	48,621	465,479,243	2,991	25,307,017
8th	48,580	465,090,042	2,988	25,285,857
9th	48,575	465,036,566	2,988	25,282,949
10th	48,610	465,373,549	2,990	25,301,270

Notes:

[1/] From Supporting Table 7.9.4.

[2/] Number of excess morbidity cases * minimum cost of medication (Supporting Table 7.12).

[3/] From Supporting Table 7.9.5.

Supporting Table 19.6.4
Excess Morbidity Cases from Lower Respiratory Illness
NCR, 2006 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238	0.00238
Change in PM10 [1]	b	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58
Change in risk of chronic bronchitis [2]	c	0.1299	0.1299	0.1299	0.1299	0.1299	0.1299	0.1299	0.1299	0.1299	0.1299
Population at risk [3]	d	373,846	374,507	374,000	373,922	373,782	373,992	374,259	373,947	373,904	374,174
Excess morbidity cases	e	48,567	48,653	48,587	48,577	48,559	48,586	48,621	48,580	48,575	48,610

Notes:
[1] See Supporting Table 7.10.
[2] This is the *difference in ambient* PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those below 15 years old for NCR since the age bracket defined by Ostro (*17 years and below*) is not available (Supporting Table 7.13a).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.6.5
Excess Morbidity Cases from Chronic Bronchitis
NCR, 2006 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918	0.0000918
Change in PM10 [1]	b	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58
Change in risk of chronic bronchitis [2]	c	0.00501	0.00501	0.00501	0.00501	0.00501	0.00501	0.00501	0.00501	0.00501	0.00501
Population at risk [3]	d	596,217	597,271	596,463	596,338	596,115	596,450	596,876	596,377	596,309	596,741
Excess morbidity cases	e	2,988	2,993	2,989	2,988	2,987	2,989	2,991	2,988	2,988	2,990

Notes:
[1] See Supporting Table 7.10.
[2] This is the difference in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 25 years old for NCR (Supporting Table 7.13b).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Supporting Table 19.6.6
Excess Respiratory Symptom Days
NCR, 2006 - WITH DIESEL TAX RESTRUCTURING
(In pesos)

	Variable code	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Dose-response coefficient [1]	a	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740	0.2740
Change in *PM10* [1]	b	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58	54.58
Change in risk of chronic bronchitis [2]	c	14.96	14.96	14.96	14.96	14.96	14.96	14.96	14.96	14.96	14.96
Population at risk [3]	d	710,750	712,007	711,043	710,894	710,629	711,028	711,536	710,941	710,859	711,374
Excess morbidity cases	e	10,630,149	10,648,943	10,634,536	10,632,301	10,628,337	10,634,306	10,641,902	10,633,004	10,631,782	10,639,486

Notes:
[1] See Supporting Table 7.10.
[2] *This is the difference* in ambient PM_{10} concentration and the WHO air quality guideline. (Supporting Table 7.10).
[3] Population at risk are those above 19 years old for NCR (Supporting Table 7.13c).

Formula:
(c) = (a) * (b)
(e) = (c) * (d)

Sources of basic data:
DENR-NCR Office.
Projected Population for NCR 1990-2050, NSO.

Table 20
Comparison of Projected Private Health Damages and Private Costs
BASELINE LEVEL AND ALTERNATIVE POLICIES
NCR, 1998-2006
(In million pesos)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Source Table
Health Damages										
Baseline level	1,838	2,261	2,644	3,263	4,034	4,992	6,187	7,678	9,540	Table 7
With Anti-Smoke Belching Program	0	0	0	0	0	0	0	0	0	
With Diesel Desulphurization	1,838	2,261	2,245	2,785	3,459	4,299	5,349	7,001	8,718	Table 16
With Diesel Tax Restructuring	1,838	2,261	2,644	2,167	2,704	3,376	4,216	5,268	6,586	Table 19
Private Costs										
Baseline level	10,189	11,095	12,083	13,161	14,339	15,625	17,030	18,564	20,240	Table 6
With Anti-Smoke Belching Program	2,313	2,489	2,679	2,884	3,106	3,346	3,605	3,886	4,189	Table 14
With Diesel Desulphurization	0	0	166	177	188	200	212	426	453	Table 15
With Diesel Tax Restructuring	10,189	11,095	12,083	13,671	14,881	16,201	17,642	19,215	20,932	Table 18

Table 21
Comparison of Projected Incremental Private Net Benefits
from Different Policies
NCR, 1998-2006
(In million pesos)

			1998	1999	2000	2001	2002	2003	2004	2005	2006
Health Benefits [1/]											
With Anti-Smoke Belching Program			1,838	2,261	2,644	3,263	4,034	4,992	6,187	7,678	9,540
With Diesel Desulphurization			0	0	399	478	575	693	838	677	822
With Diesel Tax Restructuring			0	0	0	1,096	1,329	1,617	1,972	2,410	2,954
Incremental Private Costs [2/]											
With Anti-Smoke Belching Program			2,313	2,489	2,679	2,884	3,106	3,346	3,605	3,886	4,189
With Diesel Desulphurization			0	0	166	177	188	200	212	426	453
With Diesel Tax Restructuring			0	0	0	509	542	576	612	651	692
Private Net Benefits (In million pesos)		NPV									
With Anti-Smoke Belching Program	(15%)	5,189	(475)	(227)	(35)	379	927	1,646	2,582	3,792	5,350
	(12%)	6,272									
With Diesel Desulphurization	(15%)	1,325	0	0	232	301	387	493	626	251	368
	(12%)	1,505									
With Diesel Tax Restructuring	(15%)	3,342	0	0	0	586	788	1,041	1,360	1,760	2,262
	(12%)	3,907									

Notes:

[1/] Health benefits are avoided health damages due to the policy.

[2/] See Table 20. For the anti-smoke belching program and diesel desulphurization, incremental private costs are those indicated inTable 20. For the diesel tax restructuring, incremental costs are *incremental tax burden* relative to the baseline level.

Table 22
Comparison of Projected Incremental Government Revenues and Costs
from Different Alternatives to Reduce Transport PM_{10} Emissions
NCR, 1998-2006
(In million pesos)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Source Table
Government Benefits										
Anti-Smoke Belching Program	94	102	111	121	131	143	156	169	185	Table 14.2
Diesel Desulphurization	0	0	0	0	0	0	0	0	0	
Diesel Tax Restructuring										
MEB = 1.0	0	0	0	509	542	576	612	651	692	Table 20
MEB = 0.5	0	0	0	255	271	288	306	325	346	
Government Costs										
Anti-Smoke Belching Program	187	203	221	241	262	285	311	338	369	Table 14.2
Diesel Desulphurization	0	0	0	0	0	0	0	0	0	
Diesel Tax Restructuring	0	0	0	0	0	0	0	0	0	
Government Net Benefits										
Anti-Smoke Belching Program	(93)	(102)	(111)	(120)	(131)	(143)	(155)	(169)	(184)	
Diesel Desulphurization	0	0	0	0	0	0	0	0	0	
Diesel Tax Restructuring										
MEB = 1.0	0	0	0	509	542	576	612	651	692	
MEB = 0.5	0	0	0	255	271	288	306	325	346	

Notes:
Assumes that government enforcement costs in implementing diesel desulphurization and tax restructuring are zero

Table 23
Comparison of Projected Social Net Benefits
from Different Alternatives to Reduce Transport PM_{10} Emissions
NCR, 1998-2006

	NPV (15%)	NPV (12%)	1998	1999	2000	2001	2002	2003	2004	2005	2006
Private Net Benefits [1] (In million pesos)											
Anti-Smoke Belching Program			(475)	(227)	(35)	379	927	1,646	2,582	3,792	5,350
Diesel Desulphurization			0	0	232	301	387	493	626	251	368
Diesel Tax Restructuring			0	0	0	586	788	1,041	1,360	1,760	2,262
Government Net Benefits [2] (In million pesos)											
Anti-Smoke Belching Program			(93)	(102)	(111)	(120)	(131)	(143)	(155)	(169)	(184)
Diesel Desulphurization			0	0	0	0	0	0	0	0	0
Diesel Tax Restructuring											
MEB = 1.0			0	0	0	509	542	576	612	651	692
MEB = 0.5			0	0	0	255	271	288	306	325	346
Social Net Benefits (In million pesos)	(15%)	(12%)									
Anti-Smoke Belching Program	4,509	5,520	(569)	(329)	(146)	259	797	1,504	2,427	3,623	5,166
Diesel Desulphurization	1,325	1,505	0	0	232	301	387	493	626	251	368
Diesel Tax Restructuring											
MEB = 1.0	5,008	5,824	0	0	0	1,096	1,329	1,617	1,972	2,410	2,954
MEB = 0.5	4,175	4,866	0	0	0	841	1,058	1,329	1,666	2,085	2,608

Notes:
[1] From Table 21.
[2] From Table 22.