5. Situation and Trends of Environment and Livelihood

5.1 Infrastructure

5.1.1 Transportation

1) Land Transportation

In 2005, Thailand had a road network of approximately 182,848.7 km, of which 64,156.2 km was under the highway network and 118,692.6 km under the rural road network as well as a network of 1,889 km of four-lane roads leading to all regions of the country. It is considered that the road network has covered all localities nationwide.

In Bangkok, there are expressways of 175.9 km and another 146.3 km under construction expected to be completed by 2009. Two lines of electric rail mass transit system have been operational and another four lines are expected to be completed in the near future to help ease the traffic problems in Bangkok.

Besides, there is a railway system of 5,359.6 km.

2) Waterway Transportation

In 2006, Thailand had seven principal harbours and 11 ports with an adequate potential for waterway transport of industrial products. However, some improvements in the infrastructure of the ports may be needed to cope with future economic expansion.

3) Air Transportation

At present, Thailand has five international airports: Bangkok, Chiang Mai, Hat Yai, Phuket and Chiang Rai. The Bangkok International Airport is capable of handling 10,143 international passengers per hour and 8,685 domestic passengers per hour during rush hours, or 36.5 million passengers per year, which is quite crowded. However, the government opened Suvarnnabhumi Airport in September 2006 as a modern air transport hub in this region, with a capacity to handle 30 million passengers in the first year and up to 100 million passengers when the entire airport is completed. This is considered that Thailand is well-prepared in terms of air transport infrastructure.

5.1.2 Telecommunications

Thailand's telecommunications have rapidly expanded, especially during the past decade. In 2006, there were 7,073,450 fixed-line telephone numbers and 40,052,612 mobile phones nationwide; a rate of 112.6 fixed-line phones per 1,000 population and 637.5 mobile phones per 1,000 population, and the rate of computer possession was 66 sets per 1,000 population (Table 4.12). The access to the Internet has increased from 30 persons in 1991 to 8.46 million persons in 2006, a use rate of 13.5% or 14,226.2 per 100,000 population. The number of Internet users in Bangkok is highest among all regions nationwide (Table 4.13). But in comparison with other countries, such as Singapore and Malaysia, Thailand's telecommunication infrastructure and Internet uses are lower (Tables 4.12 and 4.14).

Table 4.12 Telecommunication infrastructure in some countries, 1996-2004

Country	No. of fixed-line telephones per 1,000 population					No. of mobile phones per 1,000 population					No. of computers per 1,000 population				
	1996	1997	1999	2002	2004	1996	1997	1999	2002	2004	1996	1997	1999	2002	2004
Singapore	498.4	529.0	484.1	472	432	147.5	229	381.45	761.1	894.7	233	316	390.9	596	601
Malaysia	192.5	192.5	219.3	206	174	88.4	101.9	145.05	372.9	571.2	53	65	94.5	137	216
Thailand	78.6	85.5	101.9	99*	112.6**	27.8	34.5	138.6	346.8*	637.5**	22	28	40.4	43	66
Philippines	30.7	42.7	37.9	46	42	12.9	17.7	36.97	189.1	398.5	11	13	19.5	25	42
Indonesia	17.8	24.7	29.1	34	45	3.0	5.4	9.83	48.5	134.8	6	9	13.4	13	19
Sweden	684.1	685.4	694.5	750	715	281.8	358.1	590.08	900.3	1,084.7	286	353	510.4	687	776
U.S.A.	636.6	625.6	709.8	701	606	161.9	205.6	314.87	496.9	621.1	403	450	538.9	739	778
Norway	564.9	609.1	711.9	754	472	296.1	383.0	627.03	787.0	1,036.0	307	363	506.8	657	743

Source: IMD. The World Competitiveness Yearbook, 1999 and 2006.

Notes: 1. * Data for 2003.

2. ** Data for 2006.

3. Data on computer use per 1,000 population are data for 2005.

Table 4.13 Internet access by administrative jurisdiction and region Thailand, 2001, 2003, 2004, 2005 and 2006

Administrative jurisdiction and region	2001(1)		2003(2)		2004(2)		2005(2)		2006(2)	
	No. of Internet users	Use rate per 100,000 population	No. of Internet users	Use rate per 100,000 population	No. of Internet users	Use rate per 100,000 population	No. of Internet users	Use rate per 100,000 population	No. of Internet users	Use rate per 100,000 population
Whole Kingdom	3,536,001	6,163.7	6,031,300	10,434.1	6,971,528	11,891.8	7,084,201	11,990.6	8,465,823	14,226.2
- Municipal areas	2,341,433	12,361.5	3,807,900	19,897.3	4,155,737	21,427.9	3,807,055	21,230.5	4,242,901	23,370.9
- Non-municipal areas	1,194,568	3,108.7	2,223,400	5,750.2	2,815,791	7,177.6	3,277,146	7,964.0	4,222,921	10,211.6
Bangkok Metropolis	1,234,542	16,774.1	2,005,700	26,862.3	1,999,943	26,585.4	1,630,752	25,895.8	1,774,375	27,961.7
Central Plains	830,389	6,322.6	1,336,300	10,077.3	1,517,514	11,212.0	1,706,396	11,857.5	2,028,575	13,906.6
North	516,114	4,988.6	1,003,200	9,682.4	1,210,949	11,423.6	1,285,577	11,902.9	1,581,412	14,656.7
Northeast	559,193	2,937.4	1,070,100	5,586.5	1,485,725	7,687.2	1,660,707	8,411.9	2,103,780	10,599.5
South	395,763	5,283.3	616,000	8,147.4	757,396	9,914.3	800,769	10,200.5	977,680	12,316.2
Internet use rate (%)	5.7		9.5		11.1		11.4		13.5	

Sources: - Survey on Household's Usage of Information Technology Equipment and Appliances, 2001 and 2003, National Statistical Office.
- Survey on Information and Communication Technology (Households), Quarter 1, 2004. National Statistical Office.
- Survey on Information and Communication Technology (Households), Quarter 3, 2005. National Statistical Office.
- Survey on Information and Communication Technology (Households), 2006. National Statistical Office.

Notes: (1) Population aged 11 years and older.
(2) Population aged 6 years and older.

Table 4.14 Comparison of the Internet usage in Asia-Pacific countries, 1998, 2000, 2002, and 2005

Country	No. of Internet users (millions)				Internet use rate (percent)			
	1998	2000	2002	2005	1998	2000	2002	2005
Australia (2006)	4.0	8.42	10.63	14.66	22.2	43.9	54.4	71.8
Singapore	0.55	1.85	2.31	2.42	18.3	44.6	51.9	53.9
Hong Kong	1.1	3.46	4.35	4.88	18.3	48.7	59.6	70.3
New Zealand	0.55	1.49	2.06	3.20	15.3	39.0	52.7	78.4
Taiwan	3.0	6.4	11.6*	13.21	14.3	28.8	51.8	59.9
Japan	14.0	47.08	56	86.3	10.8	37.2	44.1	67.7
Korea	2.0	16.4	25.6	33.9	4.6	34.5	53.8	69.4
Thailand (2006)	0.67	2.3	4.8	8.46	1.1	3.7	7.7	13.5
Malaysia	0.4	3.7	5.7*	11.02	2.0	16.9	25.1	41.2
Philippines	0.2	2.0	4.5	7.82	0.3	2.4	7.7	8.7
China (2006)	1.5	22.5	45.8	123.0	0.1	1.7	3.5	9.3
Indonesia	0.1	1.45	4.4	16.0	0.1	0.6	1.9	7.3
India	0.4	5.0	7.0*	60.6	< 0.1	0.5	0.6	4.6
Vietnam (2006)	0.15	0.04	0.4*	13.10	< 0.1	< 0.1	0.5	15.4

Sources: - Internet Users Worldwide, 2001 and 2002.
- The World Fact Book, 2006-2007.

Notes: 1. Internet use rate $= \frac{\text{No. of Internet users}}{\text{Total population}} \times 100$

2. * Data for 2001.

Besides, Thailand has got its own Thaicom satellites, cable TV systems, and free TV systems, making the communication system more expansive. However, the access to various media is still inequitable, but the trends are getting better (Table 4.15).

Table 4.15 Percentage of households with radios, TV sets and telephones, 1990-2004

Area	Radios					TV sets					Telephones				
	1990	1994	1998	2002	2004	1990	1994	1998	2002	2004	1990	1994	1998	2002	2004
Whole Kingdom	72.6	70.8	75.5	68.9	63.6	61.3	80.3	88.7	91.6	93.0	5.8	10.1	21.9	29.2	23.9
Bangkok and peripheral provinces	79.4	80.3	86.6	80.8	78.3	80.7	83.8	90.4	92.5	93.5	24.5	33.1	59.2	59.6	50.7
Municipal areas	81.2	81.1	85.5	76.2	68.6	84.6	89.3	92.9	94.0	95.2	16.5	29.4	49.8	40.8	39.7
Sanitary districts	76.0	74.6	78.5	-	-	70.8	86.3	90.5	-	-	4.2	12.2	28.7	-	-
Outside municipal and sanitary districts	69.8	67.0	71.4	64.1	58.5	53.6	77.6	87.6	90.6	92.2	0.9	2.4	9.3	11.0	12.9

Source: Reports on Household Socio-Economic Surveys, 1990, 1994, 1998, 2002, and 2004, NSO.

Note: In 2000, all sanitary districts were upgraded to municipalities; thus, there have been no data for sanitary districts since then.

The expansion of communication networks in Thailand is related to global development and part of evolution in the "globalization" or borderless world era.

In addition, advertisement business expansion through various media is annually worth tens of billions of baht. This business sector has strongly affected Thai people's consumption behaviours. New sales patterns have been created, especially **direct sales**, through various media, which are more difficult to control than those through shopping outlets.

People's behaviours in accepting information have also shifted from radio to television sources. The 2003 media survey conducted by NSO revealed that there were as many as 54.7 million TV viewers (94.5%), compared with only 24.8 million radio listeners (24.8%). Urban people were more interested in information about economic, social, political and health conditions than, previously, in entertainment programmes. In particular, new programme patterns such as live phone-in and discourse programmes, resulting in the emergence of new communities using media as a means for interaction, for example, Jo So 100 community, TV game show communities, and various other radio programme communities.

5.1.3 Public Utilities

1) Electricity. In 2005, approximately 99.0% (68,375 villages) of all villages across the country had a moderate or good level of electricity supply. Only 721 villages (1.0%) had not yet had access to the electricity system (Table 4.16).

Table 4.16 Villages with electricity, 1992-2005

Year	No. of Villages with available information	villages with electricity				Villages without electricity	
		Good level[1]		Moderate level[2]			
		No.	Percent	No.	Percent	No.	Percent
1992	59,354	54,719	92.2	2,466	4.2	2,169	3.6
1994	59,059	55,590	94.1	1,675	2.8	1,794	3.0
1996	60,215	57,523	95.5	1,198	2.0	1,494	2.5
1999	63,230	56,483	89.3	5,678	9.0	1,069	1.7
2001	66,193	60,128	90.8	4,698	7.1	1,367	2.1
2003	68,496	60,613	88.5	7,096	10.4	787	1.1
2005	69,096	64,807	93.8	3,568	5.2	721	1.0

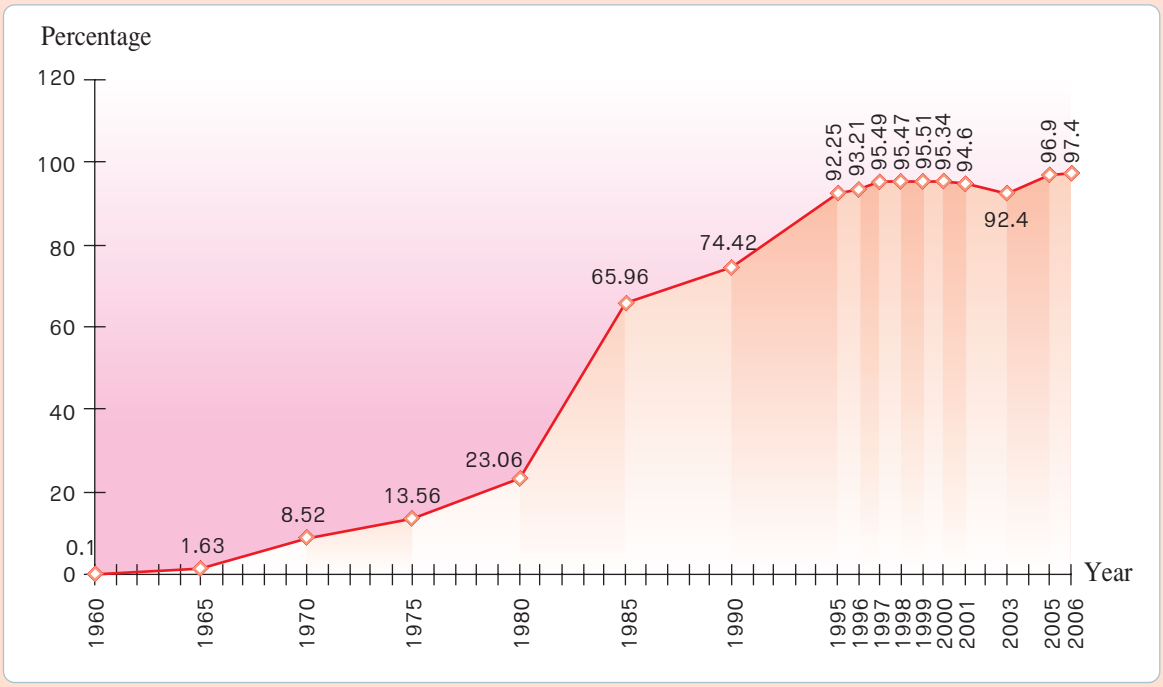
Source: Thai Rural Villages, 1992-2005, from Ko Cho Cho 2 Kho Database. Information Centre for Rural Development, Ministry of Interior.

Notes: [1] Good level: more than half of households in the village have electricity.

[2] Moderate level: less than half of households in the village have electricity.

2) Drinking Water. In 2006, 97.4% of households had adequate and safe drinking water (Figure 4.20) and 97.5% of them had adequate water for domestic use all year round.

Figure 4.20 Proportion of households with adequate and drinking water, 1960-2006



Sources: Data for 1960-2000 were derived from the Department of Health, MoPH.

Data for 2001, 2003, and 2005 were derived from Thai Rural Villages in 2001, 2003, and 2005. Information Centre for Rural Development, Ministry of Interior.

Data for 2006 were derived from the 2006 Basic Minimum Needs Report, Information Centre for Rural Development, Ministry of Interior.

Such changes in infrastructure have an impact on Thai people's health as follows:

(1) More problems of traffic accidents and higher number of vehicles as a result of transportation expansion with more roads and vehicles (see Chapter 5, section 2.6 on accident-related injuries).

(2) Disparities in access to health information as the Thai communication infrastructure is a lot inferior to those in other countries; certain segments of the population may not have access to health information, particularly those living in rural areas, compared with those in urban areas.

5.2 Biodiversity

Thailand's biodiversity is abundant in terms of genetics, species and ecological systems with about 15,000 species of plants and 25,000 species of animals, 7,800 species of bacteria, fungi and other microorganisms, and 15 eco-systems (National Resources and Environment Capital for Sustainable Development in the 10th National Development Plan, NESDB). So they have exploited lavishly without effective management and control measures. As a result, natural resources and biodiversity

have been deteriorated rapidly resulting in the distinction of as many as 14 animal species and the near-distinction of 684 animal/plant species, as well as in the deterioration of some eco-systems.

Thailand became the 188th member state of the Convention on Biological Diversity on 29 January 2004; so other member countries can now have access to the genetic resources of Thailand. Some countries have tried to take away some animal and plant species of Thailand's nature for research purposes, which may lead to the registration of intellectual property right. Thus, the government has to develop strong measures for protecting the country's interests in the long run. In addition, a good management system has to be established to link with a foreign country that owns the technology and Thailand that owns natural resources and local wisdom so as to safeguard the nation's benefits to the maximum extent possible.

Besides, the consumption of health products has been on a rising trend including the use of medicinal plants for health care and medicine production. Thus, this is a good opportunity to raise the level of knowledge of health care using local wisdom and creating value-added herbal products. The government has to promote and support research and development on Thai herbal medicine to raise the quality up to the international standards.

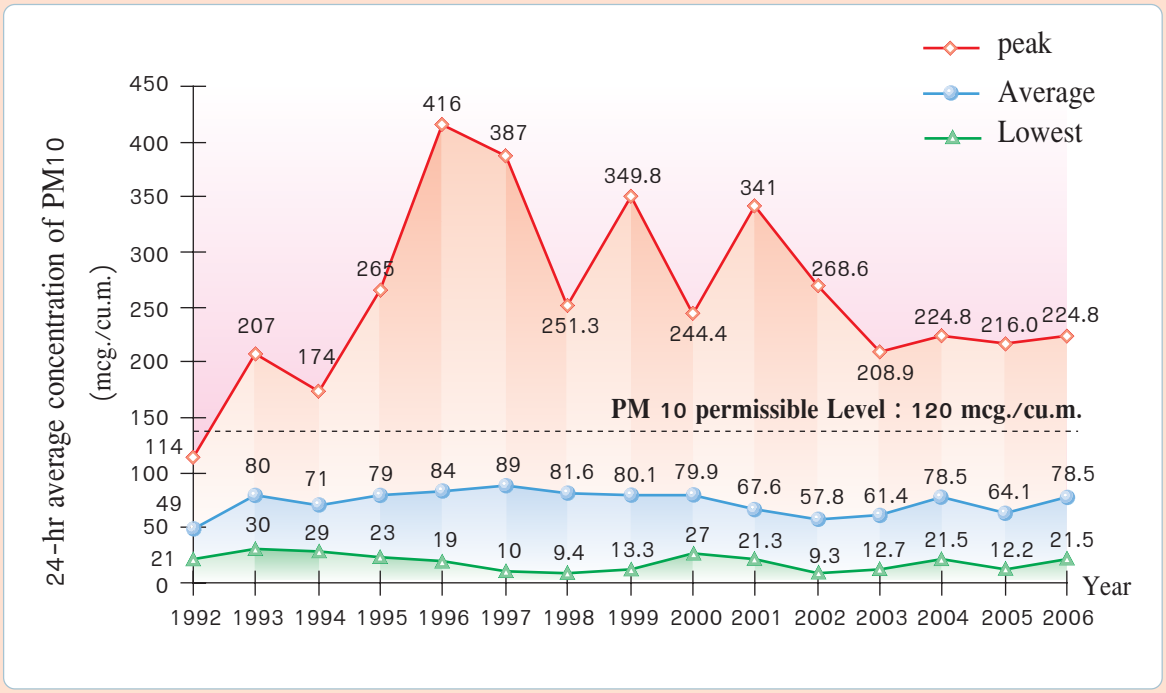
5.3 The Environment

5.3.1 Air Pollution

According to the Air Quality Monitoring programme conducted in Bangkok Metropolis and its vicinity as well as in other major cities, it has been found that dust is still a major problem, and the levels of carbon monoxide and ozone are occasionally higher than the maximum permissible levels. The levels of other pollutants such as lead and sulfur dioxide are within the allowable limits.

As the major cause of air pollution problem in Bangkok, dust or suspended particulate matter is particularly dispersed every where and near the roads; the problem seems to be more serious at places near the sources of pollution, i.e. motor vehicles and construction sites. In 2006, it was found that the 24-hr total average amounts of dust particles on the roadsides in Bangkok had been declining since 1997 due to decreased industrial and construction activities resulting from the economic crisis. During 1992-2006, the 24-hr average concentrations of particulate matter of less than 10 microns (PM10) on the roadsides of Bangkok were higher than the maximum permissible level at all monitoring stations (Figure 4.21), while the levels of carbon monoxide, sulfur dioxide and lead were found to be lower than the maximum allowable levels.

Figure 4.21 24-hr average concentration of <10-micron particulate matter on roadsides in Bangkok, 1992-2006



Source: Pollution Control Department, Ministry of Natural Resources and Environment.

In other provincial cities, the Pollution Control Department conducted the air quality measurement in 36 stations covering 20 provinces nationwide in 2006 and found that the 24-hr average peaks of PM10 detected were higher than the maximum permissible level in almost all areas (maximum permissible concentration for 24-hr average PM10 is 120 mcg./cu.m.). The highest PM10 pollution was detected at 298.2 mcg./cu.m. in Saraburi province, but the concentrations of nitrogen oxide, sulfur dioxide and carbon monoxide were still within the maximum permissible levels.

The major air pollutant in the area of Mae Moh, Lampang Province, is sulfur dioxide from lignite combustion in the electricity generation process. During 1996-1998, the number of times of the 1-hr average sulfur dioxide concentration found over the maximum permissible level declined from 51 to 16. In particular, during 1999-2006 no air samples were found to have the 1-hr average sulfur dioxide concentration over the permissible level, as the sources of pollutant had been under control. However, the PM10 pollution was still a problem, at 252.6 mcg./cu.m. in 2006.

The deteriorating quality of air has negatively affected the people's health as a result of inhaling PM10 dust. A study in six major cities in Thailand (Bangkok, Chiang Mai, Nakhon Sawan,

Khon Kaen, Nakhon Ratchasima and Songkhla) reveals that annually there are 2,330 premature deaths and 9,626 cases of bronchitis, with a health care cost of 28,009.6 million baht, or 2,000 baht/case/year; Bangkok having the highest proportion of healthcare cost, 65.0% of all costs for the six cities.[5]

5.3.2 Water Polution

At present, the quality of various waterways tends to be deteriorating, but the water is still usable for agricultural and industrial purposes, except for the lower stretches of the Chao Phraya and Tha Chin Rivers in the Central Plains, where the water is heavily polluted and the rivers can be used only for transportation purposes.

A report on water quality surveillance on 49 waterways and four stagnant water reservoirs (Kwan Phayao, Boraphet, Nong Han and Songkhla Lakes) in 1992-2006 revealed that overall the water quality was better than before; the proportion of samples with good water quality rose from 6.25% in 1992 to 36.67% in 2002, but fell slightly to 21.0% in 2006; the proportion of those with satisfactory quality rose from 18.75% in 1992 to 53.0% in 2006 - the water from such sources can be used for human consumption after proper treatment and disinfection (Table 4.17).

For the Chao Phraya River, during 1992-2005, the water quality was at the good and satisfactory levels, rising from 11.68% in 1994 to 61.0% in 2005, but in 2006 the proportion of samples with poor and very poor quality rose to 71.0% (Table 4.17). However, the problems encountered were the higher contents of coliform and faecal coliform bacteria, high levels of pollution in terms of organic chemical substances, and low levels of dissolved oxygen.

[5] Quoted in Thailand Health Profile 2002-2004, pp. 109-110.

Table 4.17 Percentage of water samples with various water-quality levels from the Chao Phraya and other rivers, 1992-2006

Year	Quality of other rivers				Quality of Chao Phraya river			
	Good	Satisfactory	Poor	Very poor	Good	Satisfactory	Poor	Very poor
1992	6.25	18.75	75.00	0.00	0.00	5.88	17.65	76.47
1993	8.33	19.44	61.11	11.11	0.00	12.50	50.00	37.50
1994	4.35	32.61	60.87	2.17	3.65	8.03	33.58	54.74
1995	10.87	21.74	56.52	10.87	4.17	15.28	36.11	44.44
1996	9.43	30.19	56.60	3.77	0.00	15.28	31.94	52.78
1997	20.75	35.85	37.74	5.66	3.70	16.67	31.48	48.15
1998	30.19	49.06	15.09	5.66	19.44	26.39	27.78	26.39
1999	20.75	35.85	39.62	3.77	12.04	24.07	34.26	29.63
2000	27.78	38.89	27.78	5.56	15.63	31.25	31.25	21.88
2001	18.52	40.74	33.33	7.41	31.94	22.22	26.39	19.44
2002	36.67	20.00	40.00	3.33	8.33	31.94	27.78	31.94
2003	32.0	31.00	31.0	6.0	25.0	32.0	13.0	30.0
2004	23.0	51.0	21.0	5.0	6.0	17.0	6.8	10.0
2005	17.0	49.0	29.0	5.0	35.0	26.0	35.0	4.0
2006	21.0	53.0	23.0	3.0	3.0	26.0	48.0	23.0

Source: Pollution Control Department, Ministry of Natural Resources and Environment.

Water pollution is detrimental to the public health and results in high healthcare costs. It was estimated that in 1999 the economic cost for the care of patients with diarrhoea, dysentery and typhoid was US$ 23 million or 0.02% GDP; US$ 7.5 million being the hospitalization cost (Table 4.18) including US$ 4.96 million for outpatient care and US$ 2.64 million for inpatient care (Table 4.19).

Table 4.18 Economic and health costs due to diarrhoea, dysentery and typhoid, 1999

Type of cost	Costs in million US dollars			
	Diarrhoea	Typhoid	Dysentery	Total
Total hospital costs	6.97	0.17	0.46	7.59
Loss of wages due to illness	0.45	0.06	0.03	0.53
Loss of wages due to premature deaths	14.34	0.06	0.54	14.94
Total	**21.75**	**0.28**	**1.03**	**23.06**

Source: Siripen Supakankunti, Pirus Pradithavani, and Tanawat Likitkererat. Valuing Health and Economic Costs of Water Pollution in Thailand, May 2001. (Draft in Thailand Environment Monitor: Water Resource Quality. The World Bank, 2001).

Table 4.19 Costs of patient hospitalization, 1999

Disease	Patient hospitalization costs in million US dollars				
	Outpatient, total	Outpatient, per case	Inpatient, total	Inpatient, per case	Inpatient & outpatient, total
Diarrhoea	4.69	4.5	2.28	24.0	6.97
Typhoid	0.03	9.7	0.14	32.5	0.17
Dysentery	0.24	4.5	0.22	31.5	0.46
Total	**4.96**		**2.64**		**7.59**

Source: Siripen Supakankunti, Pirus Pradithavani, and Tanawat Likitkererat. Valuing Health and Economic Costs of Water Pollution in Thailand, May 2001. (Draft in Thailand Environment Monitor: Water Resource Quality. The World Bank, 2001).

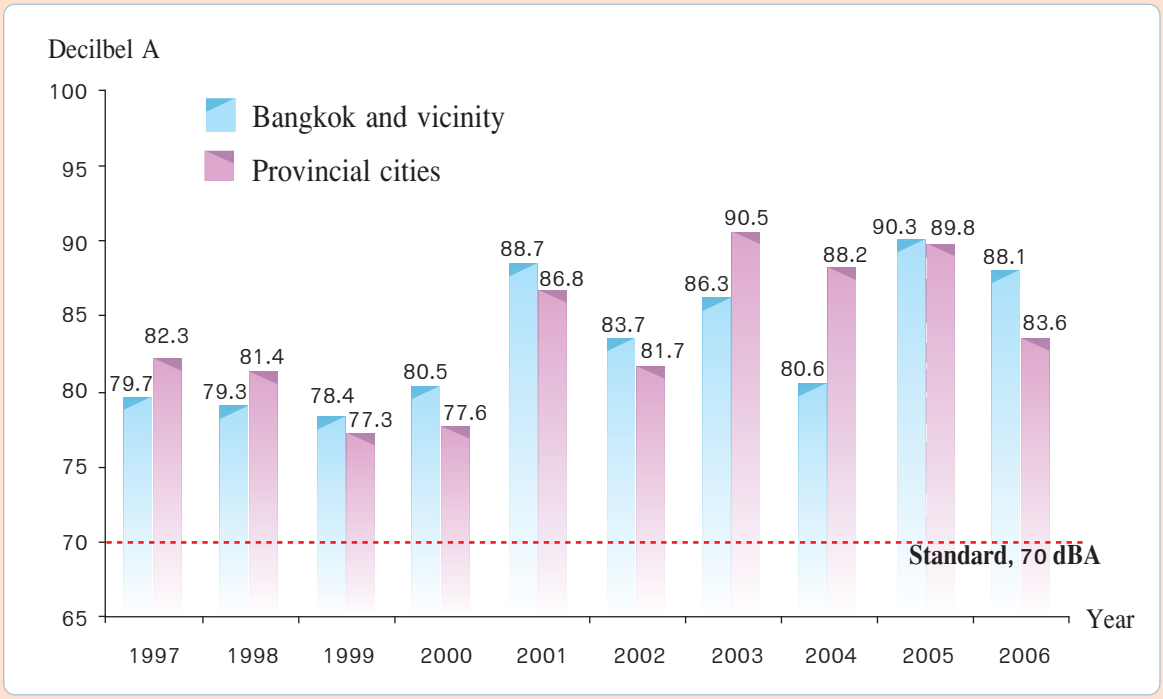
5.3.3 Noise Pollution

The most serious source of noise pollution is road traffic especially on major roads in Bangkok, its vicinity and other major cities with traffic congestions. A report on noise level monitoring in 1997-2006 of the Pollution Control Department revealed that, at 17 air quality and noise monitoring stations in 11 provinces, almost all stations had 24-hr average continuous equivalent noise levels (Leq)[6] higher than the maximum permissible level (Figure 4.22).

[6] Noise level in Leq 24-hr is an average value of continuous noise or sound energy for a 24-hr period.

The rising noise pollution has caused hearing loss among the people. A study conducted by Andrew W. Smith[7] reveals that the noise level exceeding 80 decibels is dangerous to hearing ability and Schuttz (1978)[8] indicates that the noise exceeding 70 decibels will cause severe annoyance in 22% to 95% of the people.

Figure 4.22 Noise levels (Leq 24-hr) on roadsides in Bangkok, its vicinity and major provincial cities, 1997-2006



Source: Pollution Control Department, Ministry of Natural Resources and Environment.

5.3.4 Pollution from Hazardous Substances

Most hazardous substances are imported for use in the industrial and agricultural sectors. In 1994-2003, the proportions of chemical imports for industrial and agricultural uses were 60.3% and 38.5%, respectively; only 1.2% were for household use. In 2006, the amounts of chemical imports for both sectors were 7.4 million tons and 3.7 million tons, respectively (Table 4.20). While there is a lack of good transportation, warehousing and use systems, such chemicals are released to the environment causing pollution and detrimental health effects. The Thailand Environment Monitor for 2004 revealed that there were high levels of cadmium contamination exceeding the maximum permissible level in soil and agricultural products along Mae Tao Creek in Mae Sot district of Tak province. The examination of 9,000 local residents in that area revealed that 13.9% of them had a rather

[7] Quoted in Thailand Health Profile, 1999-2000, pp. 113-114.

[8] Quoted in Thailand Health Profile, 1999-2000, pp. 113-114.

high level of urinary cadmium content, having a high risk of chronic kidney disease related to cadmium poisoning. Besides, there have been a number of frequent and serious chemical accidents, 23 reported in 2006 with a total of 215 injuries and 3 deaths.

Moreover, the health impact of increased chemical use in the industrial and agricultural sectors includes pesticide poisoning mostly among farmers (see Chapter 5, occupational and environmental diseases). In the future, it is likely that there will be more patients with chemical poisoning as the toxic substance will be accumulated in the body of affected people; their symptoms will occur in the long run such as abnormalities in the central nervous, immunology and gastrointestinal systems and cancer.

Table 4.20 Amounts of imported chemical substances, 1994-2006

Chemical substances	Imported amount (tons)											
	1994	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1. For industrial use	4,874,115	5,020,611	4,822,042	4,602,197	5,006,919	6,031,927	5,547,467	6,356,872	6,785,320	6,699,363	7,118,639	7,458,183
• Inorganic chemical	839,228	966,346	1,050,327	836,241	1,080,753	1,777,212	1,200,203	1,331,981	1,527,059	1,623,335	1,786,195	1,797,061
• Organic chemical	2,152,448	2,391,862	2,159,141	2,275,283	2,280,271	2,362,797	2,313,657	2,640,466	2,866,077	3,163,521	3,422,214	3,473,087
• Colouring agents	111,468	99,302	100,151	68,971	87,427	107,855	104,806	125,674	137,679	164,592	155,033	157,177
• Paints and vanishes	47,112	29,628	37,624	21,051	24,866	32,018	133,258	37,672	87,632	64,803	44,873	43,097
• Anti-knock additives	42,843	49,016	44,878	33,058	36,785	34,066	35,157	35,984	38,608	45,335	44,814	42,709
• Plastic pallets	692,895	656,835	622,876	571,376	712,857	787,681	744,459	875,167	947,317	1,054,543	1,071,108	1,072,864
• Films, foils and plastic tapes	54,564	58,399	64,307	51,666	91,401	82,987	80,682	91,422	104,951	113,774	123,589	133,590
• Other chemicals	933,557	769,223	742,738	744,551	692,559	847,311	935,245	1,218,506	1,075,997	469,460	470,799	738,698
2. For agricultural use	3,047,576	3,188,235	3,033,190	2,905,710	3,610,583	3,378,739	3,510,837	3,736,767	4,787,320	3,993,174	3,666,432	3,782,886
• Pesticides	29,718	32,248	42,240	32,197	48,995	50,272	54,428	67,414	69,732	99,841	78,654	101,901
• Fertilizers	3,017,858	3,155,987	2,990,950	2,873,513	3,561,588	3,328,467	3,456,409	3,669,353	4,717,588	3,893,333	3,587,778	3,680,985
3. For household use	90,562	84,515	95,225	68,475	89,595	116,333	139,078	132,490	159,910	n.a	n.a	n.a
• Medicines	7,886	9,732	10,592	6,929	10,574	13,726	13,240	19,239	19,958	n.a	n.a	n.a
• Vitamins and hormones	3,282	3,752	3,763	2,938	3,844	5,223	5,397	5,590	5,783	5,111	6,100	6,526
• Other medical and pharmceutical products	15,747	4,734	5,018	3,253	4,235	6,557	18,043	6,069	6,517	n.a	n.a	n.a
• Soap and detergents	48,934	54,308	55,700	43,010	55,563	67,381	80,376	75,163	94,774	14,895	18,146	30,381
• Cosmetics	14,713	11,989	20,152	12,345	15,379	23,446	22,022	26,429	32,878	22,937	23,952	25,673
Total imports	8,012,253	8,293,361	7,950,457	7,576,382	8,707,097	9,526,999	9,197,382	10,226,129	11,732,550	n.a	n.a	n.a
Increase from previous year (Percent)	n.a	+3.5	- 8.9	- 4.7	+14.9	+9.4	-3.4	+11.2	+14.8	n.a	n.a	n.a

Source: Department of International Trade Negotiations, Ministry of Commerce.

Note: n.a.= Not Available

For 2001, the data were adjusted, according to the most recent report of the Department of Internatinnal Trade Negotiations, Ministry of Commerce.

Since 2004, the data have been adjusted and imported goods under "other chemical products"regrouped as soap and detergents and cosmetics, resulting in data changes.

Since 2004, no data are sailable for imports in the categories of medicines, medical products and other pharmaceutical due different counting units.

5.3.5 Pollution from Hazardous Wastes

The amount of hazardous wastes in Thailand increased from 0.9 million tons in 1990 to 1.8 million tons in 2006; of this amount, 1.4 million tons (77.8%) were released from the industrial sector and 0.4 million tons (22.2%) from residential communities. The amount of such industrial wastes is on the rise, whereas the capacity for hazardous waste treatment according to the sanitation principles has not been efficiently in place. In 2005, only 20% of hazardous wastes were sent for proper disposal, resulting in large amounts of such waste being illegally dumped into the environment with detrimental effects to the public health.

5.4 Environmental Sanitation

5.4.1 Housing Sanitaion

The number of Thailand's slum communities has risen from 1,587 in 1994 to 1,802 in 1997 and 2,696 in 2006, an increase of 13.5% and 49.6%, respectively. In 2006, there were 439,235 slum households, of which 34.1% (919 slums) were located in Bangkok Metropolis, 21.4% (577 slums) in Bangkok's vicinity, and 44.5% (1200 slums) in provincial areas. The number of low-income communities in all regions of Thailand has increased significantly except for Bangkok (Housing Information Division, National Housing Authority).

Regarding rural households, according to the 2006 survey on basic minimum needs (BMN), more households have had a better environmental condition. The number of durable households has risen from 90.6% in 1993 to 98.5% in 2006. The number of households with hygienic conditions has risen from 69.4% in 1992 to 89.3% in 2001, and to 97.3% in 2006.

The rapid increase in the number of slums has resulted in health-related environmental problems such as a lack of safe drinking water. Coupled with unhygienic behaviours, the incidence of diarrhoeal disease has been rising over the past 20 years, particularly among children under 5 years of age, from 3,031.3 per 100,000 population in 1984 to 10,476.55 per 100,000 population in 2006.

5.4.2 Safety in the Workplaces

In 2006, 36.2 million Thais or 55.6% of the nation's population were in the workforce and employed, including 13.7 million (37.8%) in the formal sector and 22.5 million (61.2%) in the non-formal sector.

In the formal sector, most of the workers in business workplaces were employees with only elementary schooling. So they could not protect or take care of themselves from occupational illnesses. The occupational injuries had a tendency to rise from 2% 1976 to 4.7% in 1993; the rate remained steady in the period after 1994 and then dropped to only 2.4% in 2006. But the number of deaths due to occupational injuries dropped steadily from 44.9 per 100,000 workers in 1979 to 11.19

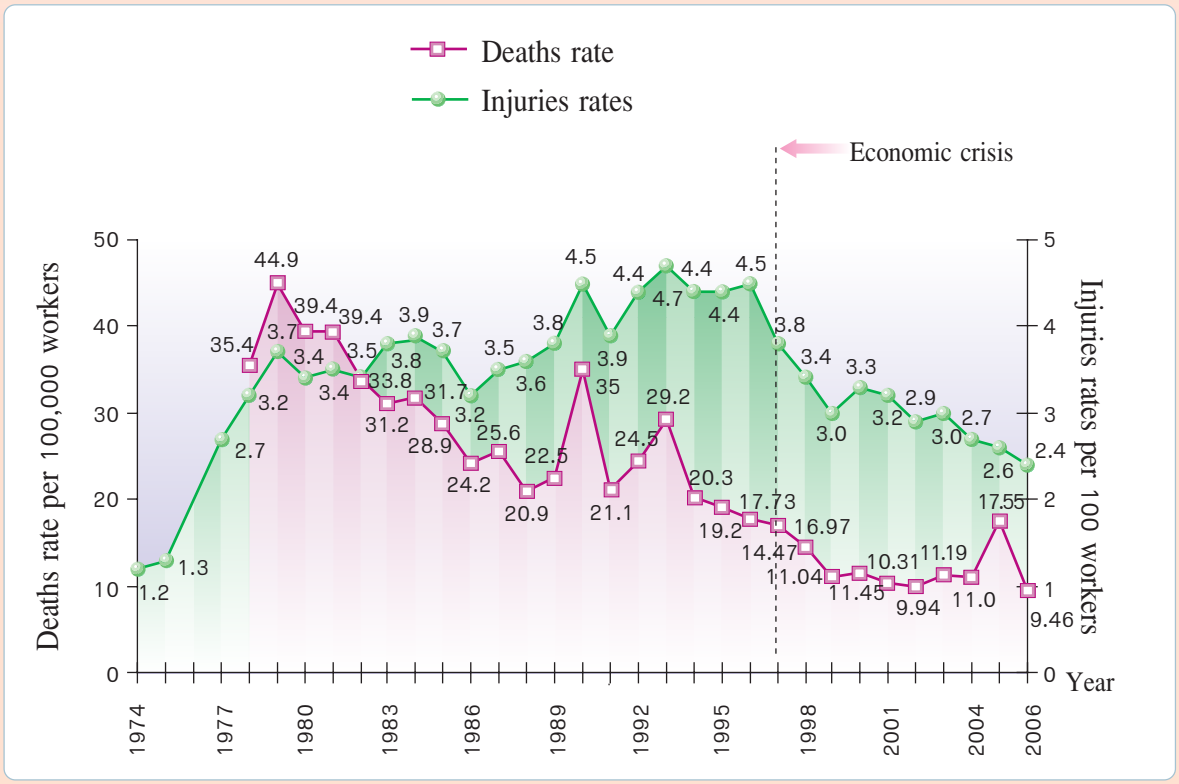
per 100,000 workers in 2003, but rose to 17.55 in 2005 (Table 4.21) and dropped to 9.46 in 2006 (Figure 4.23). The rate is considered to be high, compared with those in developed/industrialized countries such as England with a mortality of 1.3 per 100,000 workers and Finland with 4 per 100,000 workers (Chuchai Supawongse, Environmental Situation and Impact on Health in Thailand, 1996).

Table 4.21 Number and rate of occupational deaths and injuries in the workplaces, 1974-2006

Year	No. of workers covered	Workers injured		Deaths		Disabilities		Loss of some organs		Temporary absenteeism	
		No.	Percent	No.	Rate Per 100,000	No.	Rate Per 100,000	No.	Rate Per 100,000	No.	Rate Per 100,000
1974	272,848	3,200	1.2	95	34.8	-	-	401	146.9	2,704	991.0
1975	349,814	4,605	1.3	← Data not available →							
1976	496,700	10,136	2.0	← Data not available →							
1977	570,000	15,335	2.7	← Data not available →							
1978	590,640	19,134	3.2	209	35.4	9	1.5	1,119	18.9	17,797	3,013.2
1979	659,041	24,370	3.7	296	44.9	8	1.2	1,104	16.8	22,962	3,484.1
1980	745,513	25,334	3.4	294	39.4	13	1.7	1,191	16.0	23,836	3,197.3
1981	797,270	27,723	3.5	314	39.4	10	1.3	1,275	16.0	26,124	3,276.7
1982	824,565	28,323	3.4	279	33.8	14	1.7	1,085	131.2	26,945	3,267.8
1983	873,059	33,213	3.8	272	31.2	5	0.6	514	62.3	32,422	3,713.6
1984	994,190	39,182	3.9	315	31.7	20	2.0	1,305	131.3	37,542	3,776.1
1985	1,091,318	39,119	3.7	315	28.9	18	1.7	1,159	106.2	37,627	3,447.8
1986	1,179,812	37,445	3.2	285	24.2	10	0.8	978	82.9	36,172	3,065.9
1987	1,232,555	42,811	3.5	315	25.6	10	0.8	1,158	93.9	41,328	3,353.0
1988	1,346,203	48,912	3.6	282	20.9	7	0.5	1,179	87.6	47,444	3,524.3
1989	1,661,651	62,766	3.8	373	22.5	15	0.9	1,582	95.2	60,796	3,658.8
1990	1,826,995	80,065	4.5	640	35.0	30	1.6	1,509	82.6	77,886	4,263.1
1991	2,751,868	102,273	3.9	581	21.1	9	0.3	2,141	77.8	99,542	3,617.3
1992	3,020,415	131,800	4.4	740	24.5	15	0.5	2,010	66.5	129,035	4,272.1
1993	3,355,805	156,543	4.7	980	29.2	10	0.3	5,436	161.9	150,122	4,473.5
1994	4,248,414	186,394	4.4	863	20.3	23	0.5	4,548	107.0	180,960	4,259.5
1995	4,903,736	216,525	4.4	940	19.2	17	0.4	5,469	111.5	209,909	4,280.6
1996	5,425,422	245,616	4.5	962	17.73	18	0.3	5,042	92.93	239,574	4,416.1
1997	6,084,822	230,376	3.8	1,033	16.97	29	0.4	5,272	86.64	224,042	3,681.9
1998	5,418,182	186,445	3.4	784	14.47	19	0.3	3,692	68.14	181,956	3,358.1
1999	5,679,567	172,087	3.0	627	11.04	14	0.2	3,437	60.51	168,009	2,958.1
2000	5,417,041	179,566	3.3	620	11.45	16	0.3	3,516	64.91	175,414	3,238.2
2001	5,884,652	189,621	3.2	607	10.31	20	0.3	3,510	59.65	185,484	3,152.0
2002	6,541,105	190,979	2.9	650	9.94	14	0.2	3,424	52.54	186,891	2,857.2
2003	7,033,907	210,673	3.0	787	11.19	17	0.2	3,821	54.32	206,048	2,929.35
2004	7,831,463	215,534	2.7	861	11.00	23	0.3	3,775	48.20	210,875	2,692.66
2005	8,225,477	214,235	2.6	1,444	17.55	19	0.2	3,425	41.64	209,347	2,545.10
2006	8,537,801	204,257	2.4	808	9.46	21	0.2	3,413	39.97	200,015	2,342.70

Source: Workers' Compensation Office, Ministry of Labour.

Figure 4.23 Rates of occupational deaths and injuries in the workplaces, 1974-2006



Source: Ministry of Labour.

For non-formal labour force, most of the workers are in the agricultural sector, self-employed, home-based workers, etc., who are not taken care of by the government as expected. Among home-based workers, the problems of unsafe working conditions increased from 2.8% in 1999 to 33.2% in 2002 and 39.9% in 2005, most of which were related to eye-sight, working postures and dust inhalation (Work Surveys, 1999, 2002, and 2005, National Statistical Office).

Although at present the government has expanded the universal healthcare scheme to about 94% of the population, efforts should be rapidly undertaken to ensure that the uncovered sector of the population have access to the state health services.

5.4.3 Food and Water Supply

1) Food Safety

At present, people's food consumption culture has shifted from eating home-cooked food to eating out and eating pre-cooked or semi-cooked or ready-to-eat food. Cooking food rapidly in large quantities may involve unhygienic practices and unsanitary conditions of food establishments. The 2005 survey of 1,035 pre-cooked food samples, undertaken by the Department of Health, from food-stalls and supermarkets in 15 provinces revealed that 44.2 % of the foods were contaminated with

bacteria and did not meet the food standards. The 2006 study on the situation of food establishments revealed that only 60.2% (37,393 out of 62,140) of the restaurants and 65.2% (56,767 out of 87,075) of food-stalls met the "Clean Food Good Taste" criteria, and 59.6% (928 out of 1,557) of fresh markets met the healthy market standards.

Besides, it has been found that more chemicals are used in cooking, some without proper technical information, some even use toxic chemicals as evidenced in the toxic chemical residues being found in some fresh vegetables and fruits and fresh food over the permissible levels. The 2003-2006 food safety project report revealed that before the implementation of the project a lot of chemical residues were found in the food, but after the campaign against the use of 6 chemicals in food, it was found that, among fresh food, the contamination levels have decreased. However, high levels are noticed for meat-reddening substance and insecticides, especially in meats and agricultural products (Table 4.22).

Table 4.22 Chemical contamination of fresh foods in fresh markets nationwide under the Food Safety Project, 2003-2006

Chemical substance	Before project implementation		Project launch (2003)			2004			2006		
	Food samples		Food samples			Food samples			Food samples		
				Contaminated			Contaminated			Contaminated	
	Tested	Contaminated	Tested	No.	%	Tested	No.	%	Tested	No.	%
1. Meat-reddening	2,132	96.0	1,111	115	10.4	8,515	731	8.5	2,997	65	2.2
2. Bleaching agent	3,256	10.0	4,812	83	1.7	46,785	935	2.0	14,338	2	0.01
3. Fungicides	2,099	7.2	4,315	206	4.8	45,614	1,260	2.8	15,378	88	0.6
4. Borax	3,184	42.0	6,695	46	0.7	64,138	538	0.8	31,287	160	0.5
5. Formalin	2,471	10.0	3,800	46	1.2	38,342	735	1.9	13,743	206	1.5
6. Insecticides	2,268	20.3	8,437	508	6.0	80,540	4,383	5.4	82,049	2,580	3.1

Source: Food Safety Operations Centre, Ministry of Public Health.

However, despite the MoPH's stringent monitoring and control measures, the problems of chemical residues are still widespread even in fruits for domestic consumption and for export, 4.0% to 8.2% were found to be contaminated. And in imported fruits and vegetables, 2.9% of them were found to have residues higher than the permissible levels (Table 4.23).

Table 4.23 Monitoring of chemical safety in fresh vegetables and fruits, 2004-2006

Type	Chemical tested for	No. of samples tested	Results	Agency responsible	Year of study
1) Vegetables in Bangkok	Insecticides	903	74 samples (8.2%) exceeding MPL	FDA	2005
2) Vegetables and fruits of vendors	Pesticides, borax, anti-fungals, whitening agent synthetic coloring agents	2,048	677 samples (33.1%) with residues, 40 samples (5.9%) exceeding MPL	National Brain Bank Institute	2005
3) Imported vegetables and fruits	Pesticides	1,746	376 samples (21.5%) with residues, 11 samples (2.9%) exceeding MPL	DOA	2004-2006
4) Twelve vegetables and fruits for export	Pesticides	79,343	18,407 samples (23.2%) with residues, 737 samples (4.0%) exceeding MPL	DOA	2003-2006

Sources: - Food Safety Operations Centre, MoPH.
- Department of Agriculture (DOA), Ministry of Agriculture and Cooperatives.

Note: MPL = maximum permissible level

Such situation had a negative impact on consumer's health. Consuming unsafe unhygienic food resulted in a rising incidence of food poisoning from 4.35 per 100,000 population in 1976 to 216.26 per 100,000 population in 2006. With a high level accumulated toxic chemicals in the body, there will be an increased risk of cancer, mutation and infant deformity.

2) Water Supply Safety

Based on the Survey of Water Supply Situations of Thai People during 1986-2001, most Thais preferred rainwater for drinking, followed by artesian-well water and tap water. And in 2005, a similar preference was also found for rain water but followed by bottled water, which will play a more dominant role in the future, and tap water. Almost half of urban residents preferred bottled water, followed by tap water, whereas half of rural residents preferred rainwater, followed by bottled water (Table 4.24).

Table 4.24 Percentage of drinking water sources of Thai people by residential area, 1986-2005

Source of drinking water*	1986	1995			2000			2001			2005		
	Whole country	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
No. of surveyed households	3,181	809	3,260	4,069	5,291,871	10,645,933	15,937,804	27,183	143,904	171,087	50,000	32,000	82,000
Bottled water	n.a	23.4	8.2	11.2	40.6	9.2	19.5	35.5	9.7	13.7	48.8	20.0	29.0
Tap water	15.8	27.6	9.4	13.0	36.4	16.8	23.2	26.1	16.1	17.7	36.0	15.3	21.7
Rainwater	39.2	42.2	52.2	50.2	16.1	51.0	39.6	27.5	51.3	47.6	10.7	49.6	37.4
Artesian wells/ Private wells	26.2	27.0	52.5	47.4	6.7	21.9	16.9	9.7	21.8	19.9	3.7	14.2	11.0
Artesian wells/ Public wells													
Natural water sources	19.0	0.9	2.7	2.3	0.2	1.1	0.8	0.2	0.6	0.5	0.1	0.4	0.2

Sources: 1. Data for 1986 and 1995 were derived from Reports on the 3rd and 4th National Nutrition Surveys. Department of Health, MoPH.
2. Data for 2000 were derived from the Population and Household Census. National Statistical Office.
3. Data for 2001 were derived from the Provincial Health Status Survey, 2001. Bureau of Policy and Strategy, MoPH.
4. Data for 2005 were derived from the report on Population Change Survey, 2005-2006. National Statistical Office.

Note: * More than one answer can be made.

With regard to the quality of drinking water in Thailand, the survey conducted by the Department of Health, MoPH, during 1995-2005, revealed that most water samples did not meet the drinking water standards, except for those of the Metropolitan Waterworks Authority, about 70% of which met the standard. This is mainly because of contamination with bacteria and chemicals such as cadmium, iron, lead and manganese, including unacceptable physical quality, i.e. turbidity and colour levels being higher than maximum allowable standards (Table 4.25).

Regarding the quality of bottled water, according to a survey conducted by the Food and Drug Administration and some Provincial Public Health Offices during 1995-2006, 71.7% of the water samples tested met the drinking water standards; no differences in terms of contamination were found among the water with and without FDA-licence logo. It was also found that only 57.3% of ice-cube samples tested met the standard (Table 4.24).

Besides, the report on domestic water quality surveillance of the Department of Health on water at restaurants, food-stalls, households and schools reveals that as high as 65% to 93% of water samples do not meet the drinking water standards (Table 4.26).

With this kind of problem, the people who use such unsafe/substandard water will be at risk of gastrointestinal diseases such as diarrhoea, dystery, etc.

Table 4.25 Quality of water for domestic use in Thailand, 1995-2006

Water type	1995		1996		1997		1998		1999		2000		2001		2002		2004		2005		2006	
	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard	Samples tested	Samples meeting standard
Tap water, MWA	45	38 (84.4)	27	NA	75	56 (74.7)	118	81 (68.6)	81	70 (86.4)	-	-			-	-	-	-	-	-	-	-
Tap water, PWA	129	95 (73.6)	547	276 (50.4)	1,470	713 (48.5)	1,568	1,397 (89.1)	532	294 (55.3)					120	92 (76.7)	90	70 (77.8)	230	180 (80.4)	24	11 (45.8)
Tap water, municipality waterworks	8	3 (37.5)	68	10 (14.7)	68	-	51	18 (35.3)	161	89 (55.3)	900	442 (49.1)	570	504 (88.4)	203	171 (84.2)						
Tap water, sanitary district waterworks	43	22 (51.2)	327	90 (27.5)	496	232 (46.8)	370	164 (44.3)	51	18 (35.3)					-	-	-	-	-	-	-	-
Tap water, village waterworks	209	102 (48.8)	1,683	399 (23.7)	465	108 (23.2)	3,925	1,103 (28.1)	5,041	2,039 (40.4)	4,246	1,507 (35.5)	2,673	2,297 (85.9)	1,318	760 (57.7)	-	-	-	-	22	1 (4.5)
Shallow-well water	n.a.	n.a.	365	37 (10.1)	222	28 (12.6)	191	78 (40.8)	125	54 (43.2)	26	7 (26.9)	-	-	-	-	-	-	-	-	-	-
Artesian-well water	65	27 (41.5)	438	377 (86.1)	355	15 (4.2)	258	62 (24.0)	277	112 (40.4)	280	102 (36.4)	-	-	174	50 (28.7)	46	22 (47.8)	54	11 (20.4)	6	-
Rainwater	65	23 (35.4)	495	98 (19.8)	121	6 (5.0)	298	104 (34.9)	90	27 (30.0)	69	19 (27.5)	-	-	-	-	30	4 (13.3)	-	-	15	2 (13.3)
Bottled water	1,462	968 (66.2)	407	286 (70.3)	3,225	2,837 (88.0)	4,496	3,167 (70.4)	3,766	2,329 (61.8)	1,033	788 (76.3)	3,551	2,383 (67.1)	2,996	2,121 (70.8)	2,065	1,543 (74.7)	1,113	926 (83.2)	466	381 (81.7)
Ice cubes	32	9 (28.1)	42	30 (71.4)	187	170 (90.9)	401	203 (50.6)	335	174 (51.9)	285	138 (48.4)	299	156 (52.2)	273	170 (62.3)	380	248 (65.3)	218	121 (48.8)	129	54 (41.9)

Sources: Department of Health, MoPH.
Planning and Technical Administration Division and Food Control Division, FDA, MoPH.

Notes:
1. The figures in ( ) are percentages.
2. For 2006, results form a study of the Department of Health.
3. MWA=Metropolitan Waterworks Authority; PWA=Provincal Waterworks Authority.

Table 4.26 Monitoring of quality of water for domestic use, 2004

Type of water	Analysis type	Samples analyzed	Results = Percentage and no. of samples (in parentheses) and standard meeting	Agency responsible	Year of analysis
1. Drinking water in 950-ml, sealed bottles, and water provided to customers free of charge at restaurants and food-stalls	Chemical, physical, and bacterial	233	6.9% (16) meeting standards 93.1% (217) sub-standard 84.5% (197) with bacterial contamination	DOH	2004
2. Drinking water in 950-ml, sealed bottle, and 20-litre tap water, rainwater, artesian-well water and shallow-well water in households	Chemical, physical, and bacterial	121	14.9% (18) meeting standards 85.1% (103) sub-standard 71.1% (86) with bacterial contamination	DOH	2004
3. Tap water and drinking water in 20-litre sealed bottles in schools in Bangkok	Chemical, physical, and bacterial	44	84.1% (37) meeting standards 15.9% (7) sub-standard, all with bacterial contamination	DOH	2004
4. Tap water, asterian-well water, shallow-well water rainwater and drinking water in 20-litre sealed bottles in schools in provincial areas	Chemical, physical, and bacterial	294	34.7% (102) meeting standards 65.3% (192) sub-standard, all with bacterial contamination	DOH	2004

Sources: - Quality of Water Supply at Restaurants, Foodstalls, and Households, Department of Health, 2004.

- Situation of Water Supply Management and Quality in Schools, Department of Health, 2004.

5.4.4 Solid Waste and Sewage

In 2006, there were an estimated 14.59 million tons of solid wastes nationwide, of which about 3.06 million tons (21.0%) were generated in Bangkok, 4.71 million tons (32.3%) in municipal areas, and 6.82 million tons (46.7%) in non-municipal/sanitary district areas. Between 1992 and 2006, the total amount of solid wastes increased on average by 2.1% each year, mostly in Bangkok Metropolis and municipalities nationwide. Since 2001 the amount of solid wastes in non-municipal

areas has been slightly higher than that in municipal areas (Table 4.27). Solid waste disposal capacity is still limited; the Bangkok Metropolitan Administration is able to collect almost all of its solid wastes, but municipalities and non-municipal areas can collect only half of their wastes. Such conditions have an impact on the quality of life of provincial residents as they are offended by the putrid smell of such wastes; and a lot of such residents have health problems.

Table 4.27 Amount of solid wastes, 1992-2006

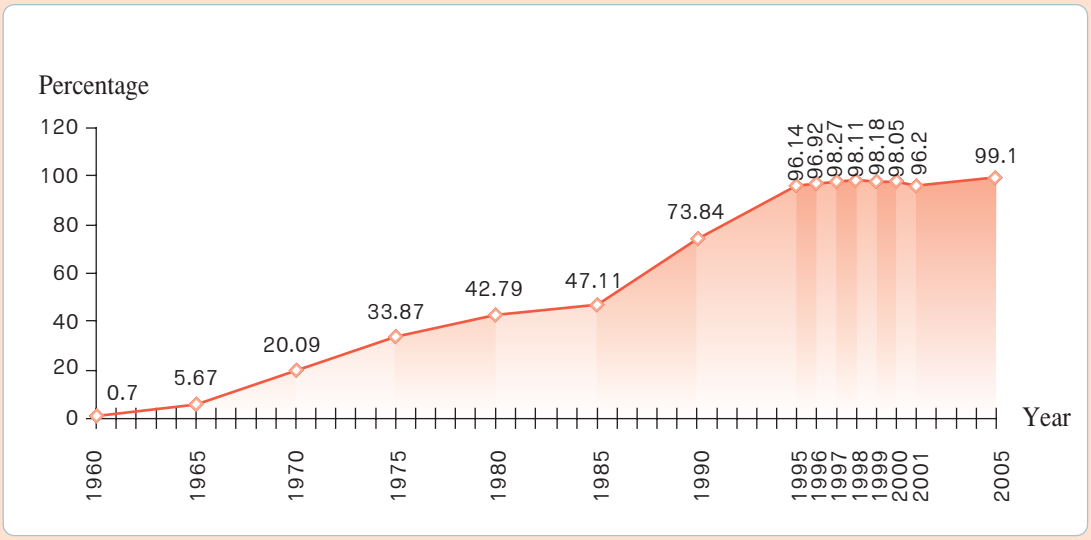
Area / Year	Bangkok		Municipal areas including Pattaya City		Sanitary districts		Outside municipal/sanitary district areas		Total	
	Amount (million tons)	Change (percent)	Amount (million tons)	Change (percent)	Amount (million tons)	Change (percent)	Amount (million tons)	Change (percent)	Amount (million tons)	Change (percent)
1992	2.19	-	1.16	-	1.62	-	5.81	-	10.78	-
1993	2.57	+ 17.3	1.25	+ 7.7	1.51	- 6.8	5.85	+ 0.7	11.18	+ 3.7
1994	2.56	- 0.4	2.05	+ 64.0	1.53	+ 1.3	5.91	+ 1.0	12.05	+ 7.8
1995	2.63	+ 2.7	2.30	+ 12.2	1.69	+ 10.5	5.96	+ 0.8	12.58	+ 4.4
1996	2.95	+ 12.2	2.43	+ 5.6	1.78	+ 5.3	5.97	+ 0.2	13.13	+ 4.4
1997	3.26	+ 10.5	3.0	+ 23.4	1.75	- 1.7	5.5	- 7.9	13.51	+ 2.9
1998	3.10	- 4.9	2.71	- 9.7	1.74	- 0.6	6.04	+ 9.8	13.59	+ 0.6
1999	3.28	+ 5.8	4.50	+ 66.0	-	-	6.04	-	13.82	+ 1.7
2000	3.33	+ 1.5	4.3	- 4.44	-	-	6.3	+ 4.3	13.93	+ 0.8
2001	3.40	+2.1	4.34	+0.9	-	-	6.36	+1.0	14.10	+1.2
2002	3.51	+3.2	4.37	+0.7	-	-	6.43	+1.1	14.31	+1.5
2003	3.41	-2.8	4.42	+1.1	-	-	6.50	+1.1	14.33	+0.1
2004	3.41	-	4.56	+3.2	-	-	6.60	+1.5	14.57	+1.7
2005	3.04	-10.8	4.61	+1.1	-	-	6.67	+1.1	14.32	-1.7
2006	3.06	+0.6	4.71	+2.2	-	-	6.82	+2.2	14.59	+1.9

Source: Waste & Hazardous Substance Management Bureau, Pollution Control Department.

Note: In 1999, all sanitary districts were upgraded to municipalities; since then only the figures for municipal areas appear.

Regarding human waste or night soil from urban households, problems are found to be related to its unsanitary transportation and disposal. In 2006, 99.1% of rural households had sanitary latrines as shown in Figure 4.24. Nationwide, 61.3% (46 provinces) of all 75 provinces had 100% of their households with sanitary latrines (Department of Health, 1999). However, a survey on latrine use of Thai people in 2001 revealed that 97.9% of them regularly used a sanitary latrine while at home; but when using public toilets, only 47.1% had a hygienic behaviour (Table 4.28).

Figure 4.24 Percentage of households with sanitary latrines, 1960-2005



Sources: - 1960-2000 from the Department of Health, MoPH.
- 2001 from the Provincial Health Status Survey, 2001. Bureau of Policy and Strategy, MoPH.
- 2005 from the Report on Population Characteristics from the Population Change Survey, 2005-2006. Bureau of Policy and Strategy, MoPH.

Table 4.28 Latrine use behaviour of Thai people, 2006

Description	Correct use (percent)	Incorrect use (percent)
1. Flushing the toilet	94.9	5.1
2. Disposal of toilet paper	78.3	21.7
3. Handwashing	47.1	52.9
4. Sitting on the toilet	83.0	17.0
Correct behaviour in 4 aspects	**47.1**	**52.9**

Source: Department of Health, MoPH.