

## 6. IMPROVING PUBLIC INFRASTRUCTURE

166. This chapter presents the responses given by enterprises in PICS 2007 regarding four public infrastructure sectors – transport, electricity, water, and telephone – as well as some concluding remarks about a possible policy agenda for these areas.

167. From 1998 to 2003 public investment spending in Thailand shrank. No significant investment in public infrastructure has occurred since the financial crisis of the late 1990s. The percentage of firms reporting inadequate and/or unreliable public infrastructure services as a major obstacle for business in all four sectors – transport, electricity, water, and telephone—was larger in 2007 than in 2004. Firms in the Northeastern, Southern, and Northern regions of Thailand face greater infrastructure constraints than other regions.

168. Inadequate and unreliable infrastructure causes high operational and logistical costs for enterprises; it is also a bottleneck for future growth. Unreliable infrastructure services—such as power outages that reduce capacity —also lower the incentives to invest. New public investment in infrastructure projects that have high expected rates of returns would help to alleviate these constraints, reduce business expenses enterprise costs and induce firm investments. Many private firms would participate in these projects as consultants, contractors or partners in public-private partnerships (PPPs). These infrastructure projects are also likely to create opportunities for property developers in connection with the mass transit system and rail track areas.

169. In the Northeast, better infrastructure services would facilitate trade and business expansion in the Greater Mekong sub-region (GMS).<sup>71</sup> They would promote economic activities there and trade between the Northeast and neighboring countries. As shown in Figure 47, the road network in the Northeast, which is smaller than in other regions of Thailand, is often impassable during the rainy season.<sup>72</sup> In the rural, mostly agricultural areas of the Northeast—where most of the poor reside—better roads and water system could help reduce farmers’ production and transportation costs.<sup>73</sup> Infrastructure development in the Northeast, which is situated in the middle of this region (see Figure 48), would also boost economic activities and trade among GMS countries.

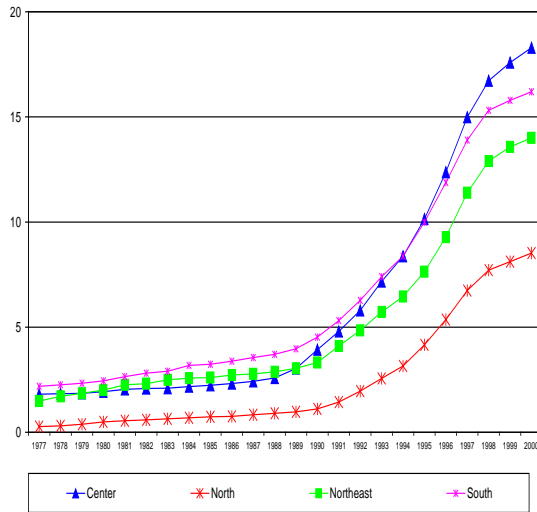
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<sup>71</sup> GMS includes Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam.

<sup>72</sup> See *Thailand Northeast Development* (2005), a joint NESDB - World Bank report.

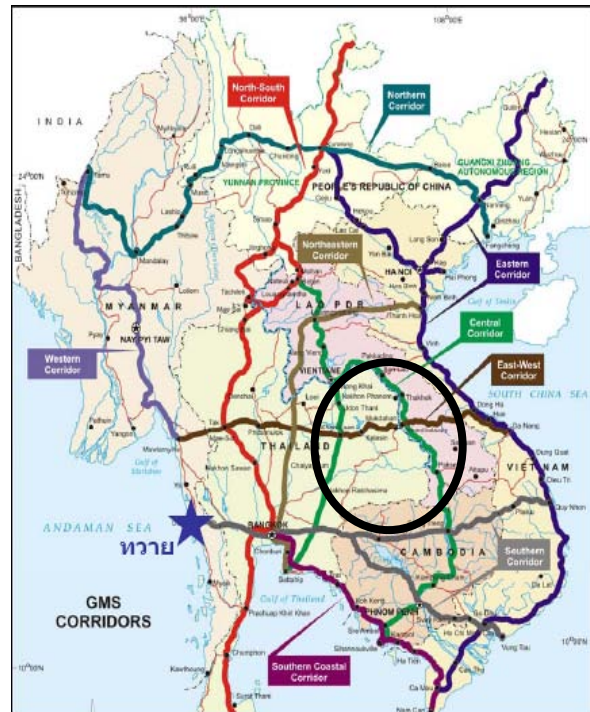
<sup>73</sup> The Northeast region of Thailand borders Cambodia and Lao PDR. Home to around one-half of the poor in Thailand, this region had a poverty head-count ratio of 16.8 percent in 2006.

**Figure 47. Length of Rural Roads (Per 100 Square Kilometers)**



Source: Northeast Development Report (2005), NESDB & World Bank

**Figure 48. Greater Mekong Sub-region (GMS) and Corridors**



Note: The circle shows the Northeast region of Thailand

170. Additional public investments can occur without significant fiscal risks. The government has had a balanced budget since 2005 and a deficit of 1.7 percent of GDP in 2007 (The 2008 deficit is expected to reach 2 percent of GDP). Public debt has been falling. It reached 37.5 percent of GDP at the end of 2007—well below the government-imposed ceiling of 50 percent. There seems to be room for spending or borrowing for greater public investment -- without running into fiscal risks. Moreover, the government is exploring greater use of public-private partnerships (PPPs) for public infrastructure.

171. PICS 2007 shows that the quality of some infrastructure services declined from 2004 to 2007. Logistical costs as a share of total production costs, for example, have increased, particularly in the Northeast, North and South. Power outages have also become more frequent and have led to an increase in losses. The number of days it takes to obtain water connections have also increased, ditto for the duration of interruptions in water supply and telephone service. The quality of infrastructure services is the highest in Bangkok and vicinity; in comparison, the Northeast, South, and North have the lowest ratings. Electricity, water, and telephone interruptions last longer in the Northeast than in other regions. It takes firms in the Northeast longer to obtain an electricity connection. As a result, their logistical costs represent a high share of their production costs and export earnings; this share is even higher in the North. The most frequent power outages and telephone interruptions occur in the South. Firms in this region take the longest time to obtain a fixed telephone line than in other regions. The average duration of interruptions for phone and water supply services are also high in the South – though lower than in the Northeast. The most frequent water supply interruptions are in the North; firms there

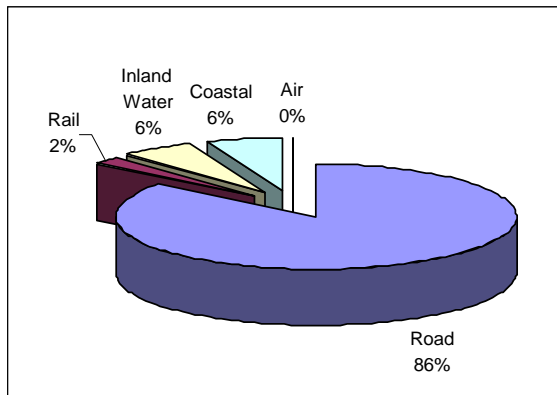
have the highest logistical cost as a share of their total production cost. Likewise, the North experiences the second longest wait to obtain a phone connection.

## TRANSPORT AND LOGISTICAL INFRASTRUCTURE

172. The vast majority of domestic freight in Thailand gets transported over roads (see Figure 49). The road network is 180,000 kilometers long compared with some 4,129 kilometers of railroad. Thailand's road density is low (with a ratio of road kilometers per km<sup>2</sup> of arable land of 0.11) compared to other countries in the region (see Figure 50). However, almost all Thai roads are paved (98.5 percent) which compares very well with lower-middle or high-income countries such as the United States (64.5 percent). However, the surface quality of major highways has deteriorated in recent years due to inadequate maintenance budgets and frequent truck violations regarding axle-load limits.

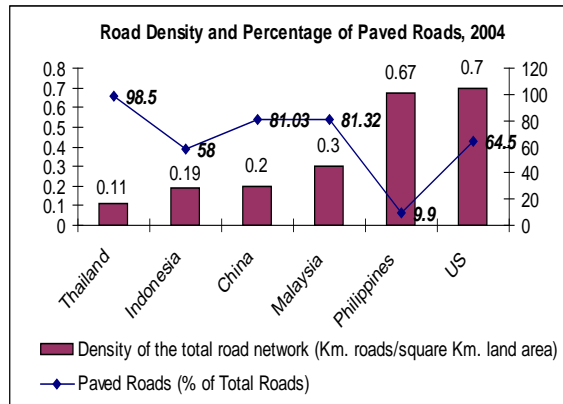
173. Rail is not widely used for the transportation of passengers or freight. The existing rail network has the following problems: The network does not cover the country's production base. Just six percent of the rail system is double or triple-track and it covers only 47 out of 76 provinces. Important routes face such difficulties as limits on capacity and quality constraints, such as sub-standard rail widths and different track configurations in the rail network. Furthermore, rail tracks have been poorly maintained, which compromises efficiency.

**Figure 49. Domestic Freight by Different Modes of Transportation**



Source: Ministry of Transport

**Figure 50. Road Kilometers per Arable Land Area**

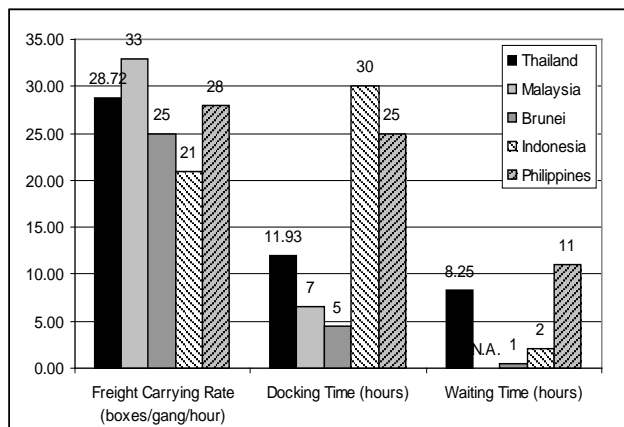


Source: IRF, World Road Statistics, 2006

174. Sea freight transport has come up to international standards, especially the Laem Chabang deep sea port. Nevertheless, authorities have paid less attention to inland waterway transportation. In 2006, coastline and inland waterways accounted for six percent of total domestic freight transport; sea accounted for 96 percent of international freight transport. There are eight international deep sea ports in Thailand; the major ones are in Bangkok and Laem Chabang in the East. In general, these ports are of good quality in terms of freight-carrying rates and docking times. However, some ports (including Laem Chabang) are operating at excess capacity; freight-carrying rates are lower and docking times are higher (see Figure 51). Other ports, notably in the South, are underused; these ports would need investment to expand their capacity and quality.

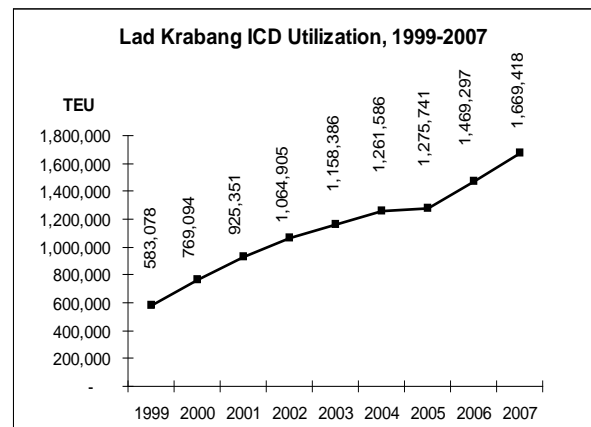
175. The inland container depot (ICD) capacity is insufficient. When the Thai economy shifted from one based on resources (e.g., logs and minerals) to an economy based on medium or high-technology merchandise for export, the pattern of freight transport also changed. Freight transport in the country has moved toward containerization as evidenced by the rapid growth in demand for ICD. Since 2001 the Lad Krabang ICD and a major ICD in Bangkok have been overused. The capacity of Lad Krabang was upgraded to 1,000,000 TEU/year,<sup>74</sup> but the new capacity exceeded it in 2007 when total traffic volume was more than 1.6 million TEU (see Figure 52).

**Figure 51. Performance Indicators of Laem Chabang Port**



Source: NESDB, A Study on Infrastructure Development Strategy for Enhancing Competitiveness

**Figure 52. Lad Krabang's ICD Utilization (Twenty-Foot Equivalent Units)**



Source: State Railway of Thailand

176. Businesses' logistical costs have increased, mainly due to the increase in fuel prices.<sup>75</sup> Secondary contributors were pressures resulting from low density and quality of roads and rail, congestion in major ports, and insufficient depot capacity. From 2004 to 2007 the production of manufactured goods grew by 20 percent, exports by 58 percent; the demand for logistics has increased as well. At the same time, because of the lack of investment in infrastructure, the supply of logistical services has not expanded at the same rate. Production establishments, located far from their domestic buyers or ports for exports—as in the Northeast, North, and South—face higher logistical costs.<sup>76</sup>

177. Firms, particularly in the North, Northeast, and South, report that logistical costs have risen. The average logistical cost as a share of total product costs rose from 4.3 percent in 2004 to 5.7 percent in 2007. The increase was similar for exporting firms and

<sup>74</sup> A "TEU" is a twenty-foot equivalent unit.

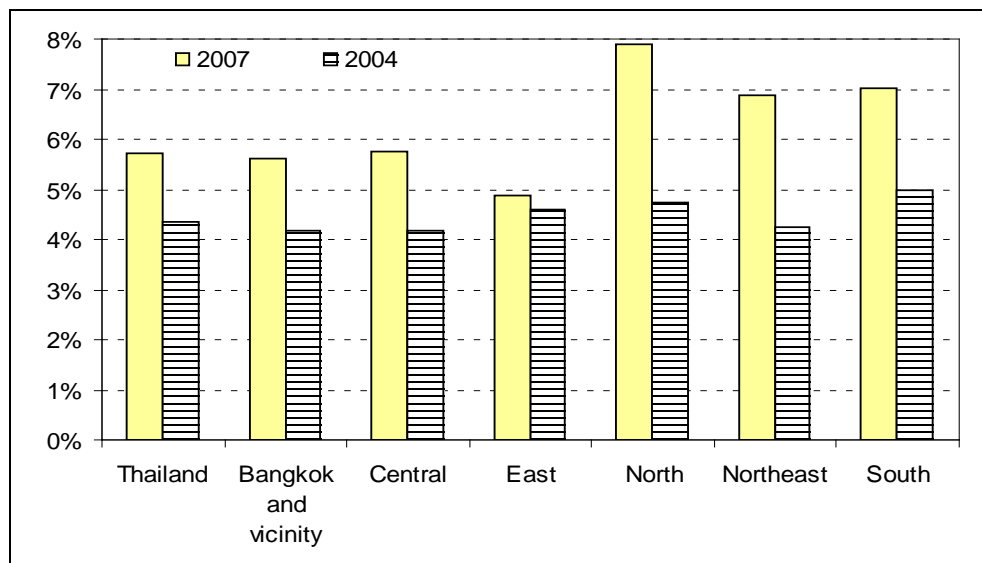
<sup>75</sup> The retail price of diesel increased by 76 percent between 2004 and 2007.

<sup>76</sup> Generally, firms are in the region where raw materials for their production are abundant. More than one-half of firms located in the Northeast, for example, are in the textile and garment industries; silk and labor are abundant there. Firms in the North are mostly in the food processing industry to take advantage of the fruits and vegetables produced there. Firms in the South are also mostly in the sea-food processing industry.

non-exporting firms. However, because of the additional export-related logistical costs in 2007, these costs were 6.0 percent for exporting firms compared to 5.5 percent for non-exporting firms, the share for exporting firms was higher than those selling domestically. Firms in all regions experienced this increase but the uptick in the East was very small. The largest increases were in the North, Northeast, and South (see Figure 53).

178. In 2007, firms in the North, Northeast, and South had higher logistical costs than other regions. In the Northeast, the higher costs occurred in the food processing, furniture and wood products, textiles, and rubber and plastic industries; the regional mean was 6.9 percent. In the North and South, food processing and furniture and wood products had the highest costs. The share of logistical costs in total production costs was lowest in the Eastern region; firms there are closer to their domestic customers and to ports and airports.

**Figure 53. Share of Logistic Costs in Total Product Costs by Region**

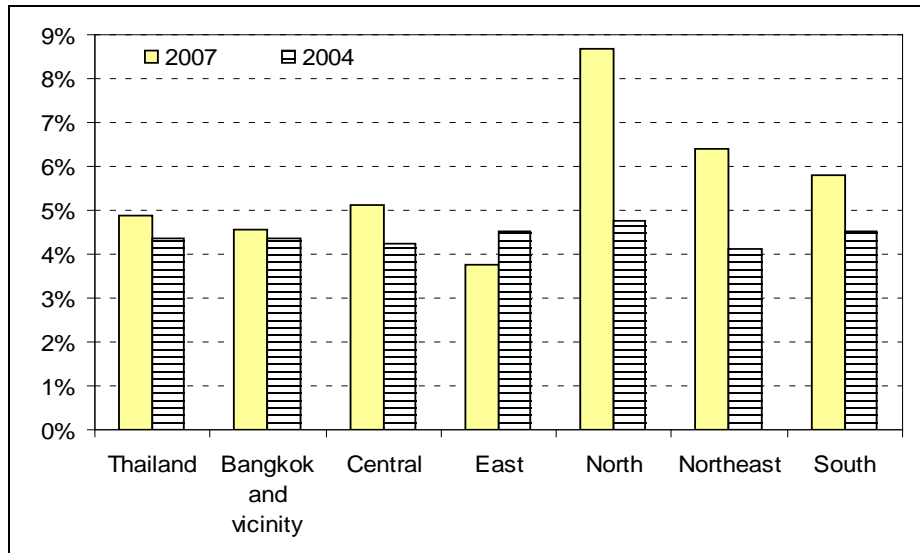


Source: Thailand PICS 2004 and 2007

179. As a share of export earnings, logistical costs in the North, Northeast, and South regions increased from 2004 to 2007. On average, the share was 4.9 percent in 2007 compared to 4.4 percent in 2004. Export firms in those three regions have the highest logistical costs as a share of export earnings compared to other regions. Their 2007 shares went up from 2004, by more than in other regions (see Figure 54). In the Eastern, Central, and Bangkok regions, the share of logistical costs to export earnings has remained more or less similar to 2004. In 2007, this share among exporting textile firms was highest in the Northeast (10 percent); in the North, in food processing (11 percent) and furniture/wood products (9 percent); and in the South, firms in food processing (7.5 percent). This is consistent with the national averages for food processing, furniture and wood products, and textile, the three industries with the highest share of logistical costs to export earnings – 7.7, 5.7, and 5.3 percent, respectively. They are also the industries in which those cost shares increased the most from 2004 to 2007 (see Figure 55). One-fifth

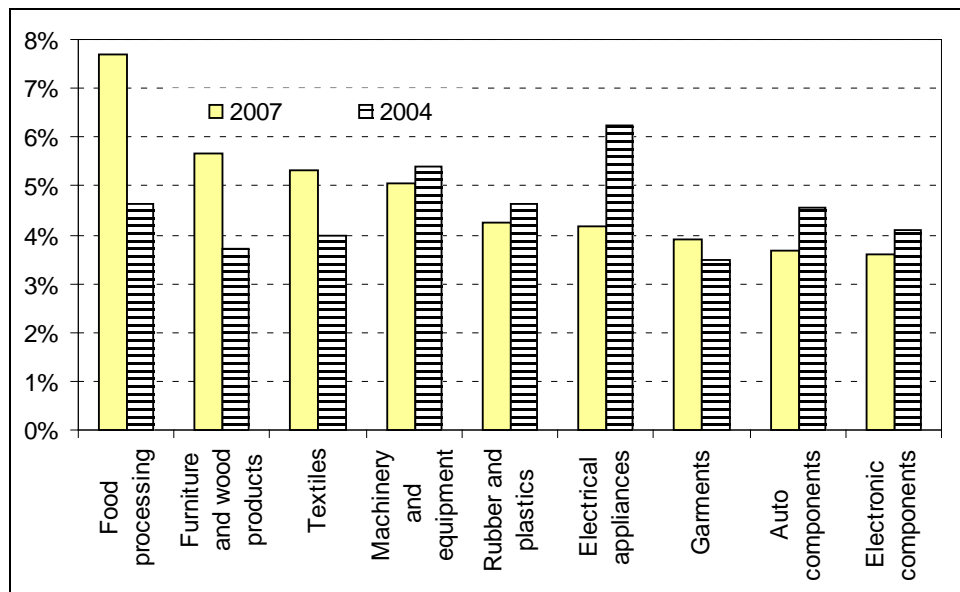
of food processing firms and one-sixth in textiles reported that the high transportation and shipping costs were an obstacle to exporting.

**Figure 54. Share of Transport and Logistical Costs in Total Export Earnings, by Region**



Source: Thailand PICS 2004 and 2007

**Figure 55. Share of Transport and Logistical Costs in Total Export Earnings, by Industry**



Source: Thailand PICS 2004 and 2007

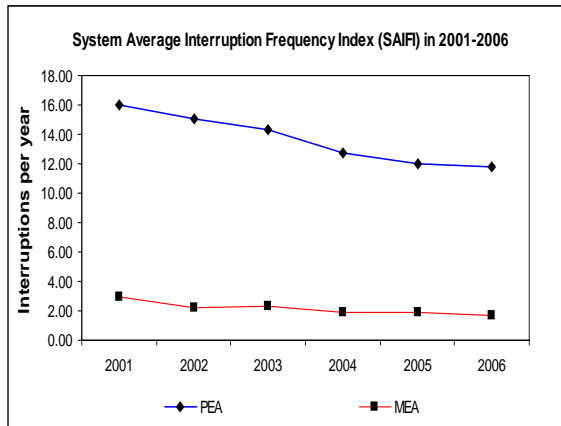
### ELECTRICITY

180. The electricity network covers 99 percent of the country; more than 90 percent of the population has access to electricity. Electricity is produced by the state-owned

Electricity Generating Authority of Thailand (EGAT), Electricity Generating Company, independent power producers (IPPs), and small power producers (SPPs).<sup>77</sup> All the electricity that is generated is purchased by EGAT. EGAT then transmits it to the Provincial Electricity Authority (PEA), the Metropolitan Electricity Authority (MEA)<sup>78</sup> and to a few large consumers.<sup>79</sup> PEA and MEA directly distribute electricity to smaller users for industrial, commercial, and residential purposes.<sup>80</sup>

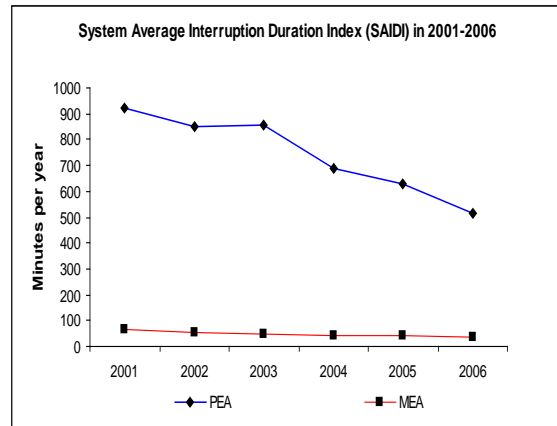
181. The overall quality of electricity service has improved, but the differences between Bangkok and other regions are high. The standard average interruption frequency index (SAIFI) and the standard average interruption duration index (SAIDI) have increased in the past few years. This indicates that the quality of electricity service has improved. The indices are much lower in metropolitan Bangkok (see Figure 56). In 2006, the SAIFI was seven times higher in the provinces (PEA) than in Bangkok and vicinity (MEA); the SAIDI was 10 times in the provinces (see Figure 57).

**Figure 56. Quality of Transmission Services (SAIFI)**



Source: MEA and PEA, 2006

**Figure 57. Quality of Transmission Services (SAIDI)**



Source: MEA and PEA, 2006

182. Data from PICS 2004 and 2007 indicate that electricity outages are most frequent in the Southern region; the duration per outage is longest in the Northeast. Table 22 shows the number of power outages was 18 times a year in 2004 and 19 times in 2007. The average outage duration declined from 2.4 hours to 2.2 hours. Businesses in Bangkok and the vicinity enjoy more reliable electrical service than other regions. Power outages from the public grid are less severe in Bangkok than other regions (about 15.5 times per year, lasting about two hours each time); they result in the lowest production loss. Power outages are most frequent in the South, where interruptions take place 52 times per year, each lasting an average of an hour. In the Northeast, there were 20 outages per year on

<sup>77</sup> In 2006, IPPs and SPPs generated about 52 percent of total power. Imported electricity is very small by comparison.

<sup>78</sup> The MEA distributes electricity to users in Bangkok and Vicinity, PEA to the rest of the country.

<sup>79</sup> A few small power producers sell electricity directly to users in their neighbourhood but their share is minimal.

<sup>80</sup> Industry was the largest user in 2006, representing 45 percent of total consumption. The commercial sector was next at 25 percent, followed by the residential sector at 21 percent.

average, which lasted about four hours each (this duration was twice that in Bangkok). The frequency of outages is the same in the Northeast as in the East; the duration of each outage is one hour less in the East than in the Northeast.

**Table 22. Time to Obtain Electrical Connection and Power Outages**

	Number of days to obtain an electrical connection		Times per month experiencing power outages or surges from the public grid		Average duration per power outage or surge from the public grid (hours)		Percent of production value lost due to power interruptions from public grid	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	23.3	- 3.2	1.5	+ 0.1	2.2	- 0.2	1.8	+ 0.3
Bangkok and vicinity	23.8	- 2.8	1.3	+ 0.3	1.9	- 0.4	1.5	+ 0.1
Central	21.7	- 6.9	1.5	+ 0.2	2.4	- 0.3	2.0	+ 0.2
East	23.0	+ 0.2	1.7	+ 0.1	3.1	+ 0.4	2.2	+ 0.2
North	<i>14.6</i>	- 25.6	1.5	- 0.3	1.1	- 0.8	2.2	+ 1.2
Northeast	24.1	+ 7.4	1.7	+ 0.2	3.8	+ 1.8	2.0	+ 1.1
South	<i>50.7</i>	+ <i>17.4</i>	3.8	+ 0.9	1.1	- 1.5	3.2	+ 1.7
Small	18.5	+ 0.1	1.2	+ 0.0	2.0	- 0.5	2.0	+ 0.3
Medium	21.9	- 6.5	1.7	+ 0.2	2.1	- 0.5	1.9	+ 0.3
Large	27.6	- 0.4	1.7	+ 0.2	2.6	+ 0.4	1.5	+ 0.2

Source: Thailand PICS 2004 & 2007

Note: Figures in *italics* denote samples that have fewer than 10 firms

183. Power outages have resulted in losses except when the business owns a generator. In 2007, the average loss was 1.8 percent of total production compared to 1.5 percent in 2004. The loss was highest for firms in the South where the outages are most frequent. It particularly affected food processing firms where the outages cost about 4.6 percent of total value. In other regions, losses incurred by the food processing industry ranged between 1.3 and 2.0 percent. Poor electricity service also disproportionately affects smaller firms. The latter experience less frequent and shorter power outages, but they cost more in relative terms than large firms because small firms lack back-up facilities during outages. From an international business perspective, Thailand has a small share of firms that have a power generator (except in the South where electricity is less reliable). See Table 23 which compares Thailand with a number of similar countries. In 2007, 8.3 percent of firms in Thailand (but 25 percent in the South) own, share or rent a power generator. Firms with a generator tend to use it to supplement electricity supplied by the public grid as well as a backup facility during outages. Table 23 shows that the few firms in Thailand with generators use them as an additional source of electrical power (11 percent of total power consumption, compared with an international average of 6.5 percent). This is particularly true in the food processing industry where food quality is sensitive to power interruptions. One-third of food processing businesses own generators and 20 percent of their total electrical consumption comes from them. In contrast, in South Africa, which has reliable electricity services, few firms own a generator. Those that do use it only during power outages.

**Table 23. Share of Firms that Own a Power Generator in Selected Countries**

	Share of firms that own a generator		Percent of electricity consumption from own or shared generator
<b>Thailand</b>	<b>8.3</b>	South Africa	0.2
South Africa	9.5	China	1.5
Brazil	17.0	Brazil	1.6
China	18.3	Vietnam	2.7
<b>World mean</b>	<b>28.4</b>	Philippines	3.7
Vietnam	34.6	<b>World mean</b>	<b>6.5</b>
Philippines	36.6	<b>Thailand</b>	<b>11.2</b>
Indonesia	39.1	Indonesia	12.4
India	63.6	India	19.1

Source: World PICS (2002-2005) and Thailand PICS 2007

Notes: The data are in 2002 for India; 2003 for Brazil, China, Indonesia, the Philippines, and South Africa; in 2005 for Vietnam; and in 2007 for Thailand. The sample used to calculate the international mean has 39 countries.

184. The time required to be connected to the grid has fallen, but it's still higher than in other countries (Table 24). On average, firms had to wait 23 days for an electrical connection in 2007, about three days less than in 2004. Except in the North and the South, where the sample size was small and results should be viewed with caution,<sup>81</sup> the time it takes to obtain an electrical connection was similar across all regions. Compared to 2004, the waiting time in the Central region decreased but it increased in the Northeast. In general, larger firms experienced longer delays, but the regional composition for large firms is not very different from smaller firms. From a comparative perspective, Thailand lags behind countries like South Korea where it takes only 4.2 days to be connected to the grid. Nevertheless, Thailand is in a reasonable position compared to the world average of 20 days. Once the connection is made, electricity services in Thailand are more reliable in the sense that production losses caused by power interruptions are less than the world average. The availability and quality of electrical services in Thailand is comparable to that of Vietnam, a relatively less developed country.

<sup>81</sup> For this question, there are only nine firms surveyed in the North and six firms in the South. The number of days changed dramatically between PICS 2004 and 2007 in these two regions; the small sample size had a significant effect on the results.

**Table 24. Time to Obtain an Electrical Connection and Production Value Loss Due to Power Interruptions in Selected Countries**

	<b>Number of days to obtain an electrical connection</b>		<b>Percent of production value lost due to power interruptions from public grid</b>
South Korea	4.2	South Africa	0.9
Turkey	6.1	<b>Thailand</b>	<b>1.8</b>
South Africa	6.3	China	1.9
Philippines	8.2	Vietnam	1.9
Indonesia	14.6	Turkey	2.3
<b>World mean</b>	<b>19.9</b>	Brazil	2.5
Vietnam	21.9	<b>World mean</b>	<b>3.2</b>
<b>Thailand</b>	<b>23.3</b>	Indonesia	4.2
Brazil	25.6	Philippines	7.1
India	81.6	India	9.0

Source: World PICS (2002-2005) and Thailand PICS 2007.

Notes: The data are in 2002 for India; 2003 for Brazil, China, Indonesia, the Philippines, and South Africa; in 2005 for Germany, South Korea, Turkey, and Vietnam; and in 2007 for Thailand. The sample used to calculate the world mean for days to obtain an electrical connection contains 71 countries and 67 countries for the share of lost production value.

## WATER SUPPLY

185. The supply of piped water service in Thailand is the responsibility of several agencies, mainly the Metropolitan Waterworks Authority (MWA) and the Provincial Waterworks Authority (PWA). MWA and PWA are responsible for the production and distribution of water. MWA is responsible for water in metropolitan Bangkok. MWA's pipe network covered 95 percent of the area and 91 percent of the population in 2006. PWA provides water services to 73 provinces; it served 88 percent of the population of those provinces. In addition, local authorities supply non-piped water to rural populations. Some areas are also served by private water suppliers.

186. It takes 26 days for enterprises in Thailand to obtain a water connection—three days longer than in 2004 (see Table 25). Unlike electricity, access to water varies considerably by region.<sup>82</sup> It takes up to 41 days in the East but only 19 days in Bangkok and vicinity. The longer delay in the East could be due to the lack of physical infrastructure or it could be that one-half of the firms there are large; their size could prolong the water connection process. Connection to the water supply in Thailand takes longer than in other countries in the region. In Indonesia it takes 13 days and in Vietnam 17.5 days. In more advanced economies, such as South Africa, it takes only 4.5 days.

<sup>82</sup> That is when the sample size is sufficiently large. For this variable, only a few firms in the North, Northeast, and South responded.

**Table 25. Time to Obtain Public Water Connection and Reliability of Water Supply**

	Number of days to obtain a water connection		Times per month experiencing insufficient water supply		Average duration per time of insufficient water supply (hours)	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	25.7	+ 3.0	0.4	0.0	9.4	+ 2.2
Bangkok and vicinity	19.3	- 3.8	0.3	0.0	10.4	+ 3.2
Central	28.8	+ 0.9	0.4	0.0	6.2	- 0.9
East	40.9	+ 26.4	0.3	- 0.1	7.3	- 0.2
North	<i>0.7</i>	- 32.8	1.2	+ 1.1	5.9	-2.3
Northeast	3.2	- 10.1	0.2	- 0.3	22.6	+ 17.5
South	50.0	+ 31.5	0.2	0.0	17.9	+ 10.0
Small	19.2	+ 2.0	0.3	0.0	7.3	+ 0.5
Medium	22.5	- 2.3	0.3	- 0.1	12.4	+ 4.5
Large	32.9	+ 9.1	0.4	+ 0.1	8.8	+ 2.0

Source: Thailand PICS 2004 & 2007

Note: Figures in *italics* denote samples that have fewer than 10 firms.

187. Water shortages have increased from 2004 to 2007, especially in the Northeast, North, and South. In 2007, as in 2004, water shortages occurred about once every two months (see Table 25). However, the average duration of each water shortage increased from seven hours to more than nine hours. The situation is especially bad in the Northeast and South, where the duration increased by 17.5 and 10 hours, respectively. In the North, the frequency of shortages increased significantly (from 1.2 times a year in 2004 to 14 times in 2007). This could reflect a lower quality of infrastructure services. Or it could mean the supply of water declined as demand increased.

188. Firms' use of public piped water has increased sharply. Water shortages have emerged as a result of restrictions in the private use of groundwater. The share of the water supply from public sources has increased from 59 percent in 2004 to 78 percent in 2007. The supply of water from private wells (groundwater) and private services dropped by more than 50 percentage-points (see Table 26). This is particularly true for the Central and Bangkok regions. The government has discouraged the use of groundwater by businesses for environmental reasons. They have done so by substantially raising groundwater user charges which made the relative price of groundwater (per cubic square meter) higher than public sources.<sup>83</sup> In response, firms reduced their use of groundwater and turned instead to public water sources.<sup>84</sup> The purchase of groundwater from private water vendors has also declined.

<sup>83</sup> The Metropolitan Water Works Authority (responsible for sourcing, producing, and distributing water in Bangkok) has a target of reducing groundwater usage by 700,000 cubic meters per day.

<sup>84</sup> Textile firms, for example, have tended to use groundwater. Instead they have turned to piped public water. These firms are located mostly in the Central and Bangkok regions.

189. In regions where water is less widely available or reliable (Northeast, North and South), firms rely on their own water sources and private vendors. In 2007, more than 60 percent of water consumption came from groundwater and private vendors combined. Firms in the East rely least on public water sources and most on private vendors. They tend to be large firms on industrial estates in the Eastern Seaboard and they can purchase water from the estates.

190. Despite an increase in the share of public sources, the reliance on individual tanks and private vendors remains high in Thailand relative to other countries. Water from public sources accounts for 78 percent of total water consumption by enterprises, compared to 98 percent in South Africa. The share of water from individual tanks (31 percent) and private vendors (12 percent) are also higher in Thailand than in 24 other countries (26.9 and 8.0 percent, respectively).

**Table 26. Water Supply Sources  
(in Percent)**

Share of firm's water supply from...	Public sources		Own well or tank		Purchase from private vendors	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	77.6	+ 18.9	31.3	- 52.3	12.0	- 60.6
Bangkok and vicinity	93.0	+ 9.2	10.7	- 65.2	5.0	- 80.6
Central	75.3	+ 35.9	35.9	- 53.1	14.1	- 64.8
East	39.7	- 8.6	45.7	- 21.4	33.2	- 38.2
North	53.4	+ 16.3	65.0	- 26.9	3.7	+ 3.7
Northeast	58.7	+ 13.0	53.7	- 33.8	10.3	- 64.7
South	22.7	+ 8.9	87.6	- 8.2	1.9	- 13.1
Small	87.9	+ 18.5	25.7	- 63.9	9.8	- 79.8
Medium	77.0	+ 19.1	30.6	- 56.9	11.7	- 57.3
Large	65.6	+ 12.6	36.8	- 41.6	14.3	- 57.2

Source: Thailand PICS 2004 & 2007

Note: The sum of water from public sources, own wells or tanks, and private vendors do not add up to 100 percent because of the different number of respondents in each category.

### FIXED-LINE TELEPHONE

191. Thailand's telecommunications sector has come a long way in terms of availability and affordability. Mobile communications dominate the telecom sector in Thailand. There are about 43 million mobile subscribers and 7 million fixed lines. Growth in the mobile market remains strong compared to a stagnant fixed market. By the end of 2007, the total number of fixed lines connected was 7.2 million, which represented 82 percent of line capacity. The tele-density rate was 11.47 lines per 100 residents.<sup>85</sup> The penetration rate has been sluggish in recent years; during the five-year period of 2001-2006, it increased 2.3 percent. This increase was due mostly to the exponential growth of the cellular mobile market.

<sup>85</sup> The tele-density rate is based on a population of 62.8 millions in 2006.

192. PICS data show that fixed line telephone services for businesses improved from 2004 to 2007. The number of days to obtain a phone line declined. In 2007, it took 11 fewer days to obtain a fixed phone line than in 2004. However, each phone interruption lasts longer. In 2004 and 2007, the number of phone interruptions was low -- once every two months -- but the duration of each interruption increased by 2.5 hours (see Table 27).

**Table 27. Time to Obtain Fixed Telephone Line and the Frequency and Duration of Telephone Interruptions**

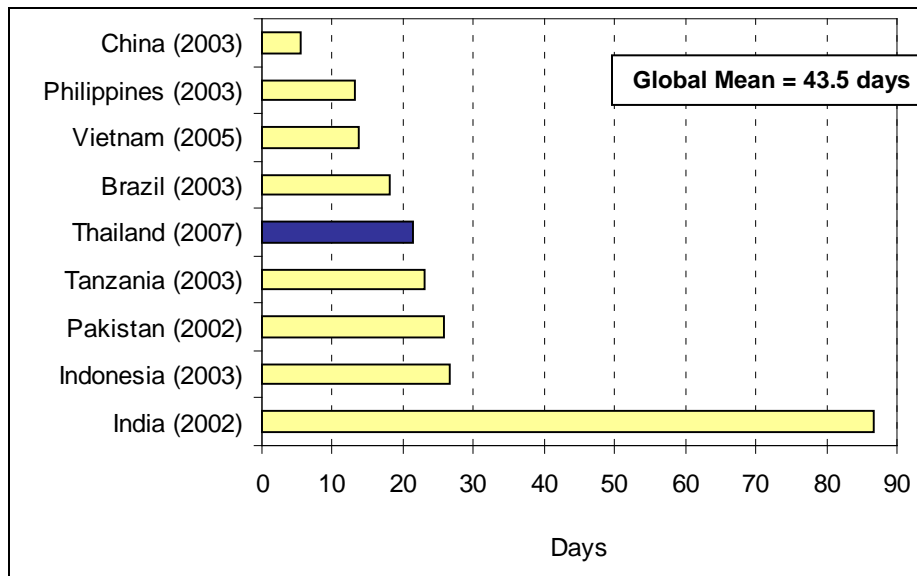
	Number of days to obtain a fixed telephone line		Times per month experiencing telephone interruptions		Average duration per telephone interruption (hours)	
	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04	PICS 2007	Chg from PICS 04
Thailand	21.3	-11.0	0.5	-0.1	19.5	+2.6
Bangkok and vicinity	18.5	-0.5	0.3	0.0	15.0	+1.2
Central	26.0	-37.5	0.4	-0.1	15.5	-3.9
East	12.2	-16.7	0.5	-0.2	22.4	+2.0
North	35.0	+4.1	0.8	+0.4	17.5	+11.6
Northeast	15.7	-7.1	1.0	+0.5	59.8	+40.8
South	39.7	-2.0	1.4	-0.2	34.9	+10.7
Small	22.2	-49.1	0.5	+0.1	13.9	-5.9
Medium	19.0	-5.6	0.5	-0.2	18.4	+2.1
Large	23.4	1.4	0.4	-0.1	29.2	+13.3

Source: Thailand PICS 2004 & 2007

193. Telephone infrastructure seems to be reasonably good compared to other countries, but it varies by region. Fixed-line telephone services were easier for businesses to obtain in 2007 than in 2004, except in the North. The number of days it took to obtain a fixed phone line was 21 days in 2007 compared to 32 days in 2004. This number has declined everywhere except in the North (where it took 4 more days in 2007 than in 2004). The number of days declined sharply in the Central and Eastern regions (see Table 27).

194. Compared to other countries, Thailand's performance is average. For example, businesses in South Korea, China, Philippines, Vietnam, and Brazil take less than 21 days on average to obtain a fixed phone line, but it takes longer in Indonesia, India, Pakistan and Tanzania (see Figure 58).

**Figure 58. Cross-Country Comparison of Days Needed to Obtain a Fixed Telephone Line**

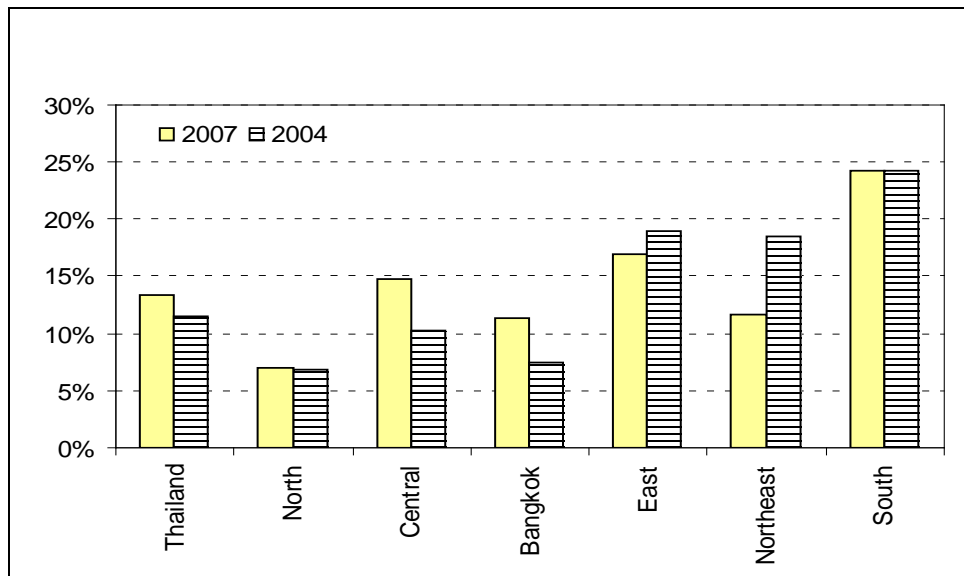


Source: World PICS (2002-2005) and Thailand PICS 2007

195. In 2007, investment climate indicators regarding fixed telephone in the South and the Northeast were below those in other regions. Bangkok had the best indicators. Firms in the South had a longer wait than in other regions to obtain a phone line (40 days). They also experienced more frequent interruptions, each lasting an average of about 1.5 days (see Table 27). Firms in the Northeast do not take a long time to obtain a line, but they have the slowest repair service of all regions. The duration of each phone interruption is 2.5 days. Firms in the North take a long time to obtain a phone line (35 days), but they have short interruptions (once a month on average with each interruption lasting less than a day). Firms in the Central region had to wait almost a month to obtain a phone line, but they had the lowest number of interruptions and the shortest duration of any region including the North. The telephone infrastructure is the best in Bangkok. It is easiest to obtain a fixed line phone connection. Bangkok also has the least number of interruptions per year and the shortest duration of phone interruptions. Firms in the East (most of them large and located in industrial estates in the Eastern Seaboard) experienced phone interruptions, each lasting almost a day on average—the number of these interruptions was greater than in Bangkok and in the Central and North regions.

196. The largest percentage of firms that cited telecommunication infrastructure as a severe constraint to their business operations was in the South (25 percent of firms compared to no more than one-sixth in other regions). A large share of firms in the Eastern and the Central regions (where two-fifths of all survey respondents are located) cited telecommunication infrastructure as a major constraint to their business operation. In Bangkok where telecommunication services are the best, 10 percent of firms said that telecom services are a severe constraint to their business operations (see Figure 59).

**Figure 59. Percentage of Firms that Perceive Inadequate or Unreliable Telephone Service as Severe Constraint to Business Operations and Expansion, 2007 and 2004**



Source: Thailand PICS 2004 & 2007

### CONCLUDING REMARKS

197. Investing in improvements in public infrastructure would reduce the cost of doing business and provide incentives for private investment. The following remarks on possible developments in transportation, electricity, water, and telecommunications draw on World Bank and NESDB (2008) and NESDB (2008).<sup>86</sup>

#### Transport

198. Thailand relies more on roads than rail for freight and passenger transport. Rail is an energy-efficient alternative and should complement the road system. An integrated road, rail, and water infrastructure would reduce energy costs and increase transportation. A modal shift would reduce logistical costs. The challenge is to find the right mix of transportation to achieve greater efficiency for the whole system.

199. The future of transportation will be affected by regional integration. Cargo from the southern part of China, transported through the Chiangsaen Port, has grown significantly. Thailand also faces increased competition from Vietnam and Malaysia to become the gateway for the region. With shifts in regional logistical patterns and greater integration of trade and transportation networks in regions such as the Greater Mekong Sub-region (GMS) and the IMT (Indonesia-Malaysia-Thailand) Growth Triangle, developments in the transportation system will determine if Thailand will reap the

<sup>86</sup> NESDB (2008), *Infrastructure Situations in Thailand*, Mimeo, and World Bank and NESDB (2008), *Infrastructure Annual Report 2008*, Mimeo. See also Asian Development Bank (2008), *The Sustainable Development of Southern Thailand: Working Paper 1: Needs, Constraints, and Opportunities*, and World Bank (2008), Thailand Economic Monitor.

benefits of regional integration. The development of transport networks in the Northeast—situated in the middle of the GMS—would facilitate trade with other GMS countries, and in the South, trade between the Southern provinces of Thailand and IMT countries.

### **Electricity**

200. The demand for electricity, which has risen rapidly, calls for new investments. In the past 20 years, the aggregate demand for electricity has expanded six-fold. This demand is in line with the growth of industrial, commercial, and residential users. Between 2002 and 2006, peak demand has also gone up every year, which has added pressure to the system. Investments are especially needed in regions like the Northeast where industrial production has grown quickly over recent decades.

201. Enhancements are also needed in the regulatory framework to promote greater competition and to improve tariffs and services. The power and natural gas industries in Thailand remain monopolies; the privatization of EGAT and further liberalization of the electricity sector has been delayed. EGAT, MEA and PEA retain monopoly control over power generation and distribution. EGAT also dominates the market as the single buyer in the electricity sector. This situation suggests that efficiency in the electricity and natural gas industries is suboptimal. For example, the average electricity retail tariff was US\$ 0.09 at the end of 2006. Household and industrial tariffs in Thailand are quite similar. In comparison to average electricity retail tariffs in middle- and high-income countries, Thai industrial tariffs are high; household tariffs are more competitive.

### **Water**

202. There is an urgent need to find new sources to produce water. Growing demand for piped public water can be expected, given the increase in economic activity and the need to replace groundwater use, especially in industrial areas. The government's policy of reducing firms' use of groundwater, while commendable from an environmental standpoint, has led to a greater demand for public water.<sup>87</sup>

203. Water loss is also an important issue. Water leakage stems from inadequate maintenance of water pipes, poor quality and outdated pipelines. The rate of water loss—at 30 and 26 percent in MWA and PWA, respectively—is lower than in other countries in the region.

204. The policy of price controls is a constraint for PWA's operations and investments. It forces the company to rely on government subsidies. The pricing policy warrants reconsideration to increase PWA's operational flexibility. That would enable PWA to expand service coverage and improve service quality and still remain affordable. Private participation could play an increasing role in the water sector to complement state investment. Private investment in water utilities could receive incentives, especially in the industrial and tourism sectors. These two sectors have special demand and supply requirements. For example, supplying water to the islands requires special techniques in

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<sup>87</sup> In 2006, the MWA produced and supplied 4.7 million cubic meters per day to residents in Bangkok and its vicinity, which represents 84 percent of its total capacity. The PWA, which serves the remaining 73 provinces, supplied 1.9 million cubic meters per day or 74 percent of its capacity.

water production and demand. Private operators could service these demands which are expected to increase.

### **Telecommunications**

205. A clearer direction in policy and a better regulatory framework would make investment in the telecommunications sector easier. It would allow more service providers to enter the sector. Creation of the National Telecommunications Commission (NTC) has led to better regulation and important benefits to the public (see Box 2). However, the NTC still needs to address and implement actions on a broader scale. Its effectiveness has been limited by several factors, particularly uncertainty surrounding the regulatory environment. Another limitation has been the untimely appointments of its commissioners and restrictions on foreign ownership. Further liberalization of the sector would bring about more competition and better services.

#### **Box 2: The National Telecommunications Commission**

The 1997 Constitution mandated the liberalization of the telecom sector. A significant transformation of the sector's institutional landscape occurred in 2004 with the establishment of the National Telecommunications Commission (NTC). Policy, regulations and operations are clearly established under the new governing structure. The Ministry of Information and Communication Technology (MICT) sets policies; it also supervises the Telephone Organization of Thailand (TOT) and Communications Authority of Thailand (CAT), two former state-owned enterprises which are now corporations. The National Telecommunications Commission (NTC) acts as an independent regulator. It is also responsible for a master plan on telecommunications development. As a regulator, NTC's functions are: granting licenses, spectrum management, supervising network usage and network connection, controlling the standard of networks and equipment, allocating radio frequency, consumer protection, ensuring fair competition, and enforcing the law.