

Present State and Outlook of China's Coal Industry[◆]

By Atsuo Sagawa^{*}, Koichi Koizumi^{**}

Introduction

China is the world's largest coal producer and consumer, producing 2.37 billion tons and consuming 23.9 billion tons in 2006. Its coal exports had peaked at a level above 90 million tons, making China the second largest coal-exporting country after Australia. However, China has been reducing coal exports and increasing imports on a tightening domestic supply/demand relationship since the second half of 2003. China's coal export reduction and import expansion have been one of the factors behind the tightening supply/demand relationship and price hikes in the world coal market, affecting coal imports into Japan, South Korea and Taiwan that had been increasing coal imports from China as an adjacent source.

This report covers the present state of coal supply and demand in China and analyzes three key points for anticipating the future development of the Chinese coal industry -- (1) coal policy (11th Five-year Plan), (2) coal supply and demand projections and (3) coal transportation infrastructure.

1. China's Coal Policy

Based on the three principles -- stable economic development, promotion of reform and opening-up, and construction of a harmonious society, the Chinese government's policy for national economic and social development (11th Five-year Plan) set six priorities -- (1) a shift to sustainable economic development, (2) optimization of industrial structure, (3) solutions to three agricultural problems, (4) promotion of urbanization, (5) promotion of harmonious development of regions and (6) realization of a harmonious society.

The realization of a harmonious society includes a key measure to harmonize economic development with resources and environmental loads, calling for a 20% cut from 2005 to 2010 in specific energy consumption and a 10% reduction in total emissions of major pollutants. The 11th Five-year Plan projects annual GDP growth at 7.5% and annual primary energy consumption growth at 3.5%.

1-1 Energy Policy

(1) Primary energy supply/demand

China's primary energy consumption grew at an average annual rate of 5.9% over 16 years between 1990 and 2006. The consumption has basically been increasing. Particularly, the average annual primary energy consumption growth was as high as 12.8% between 2002 and 2006, accompanying high economic growth. A

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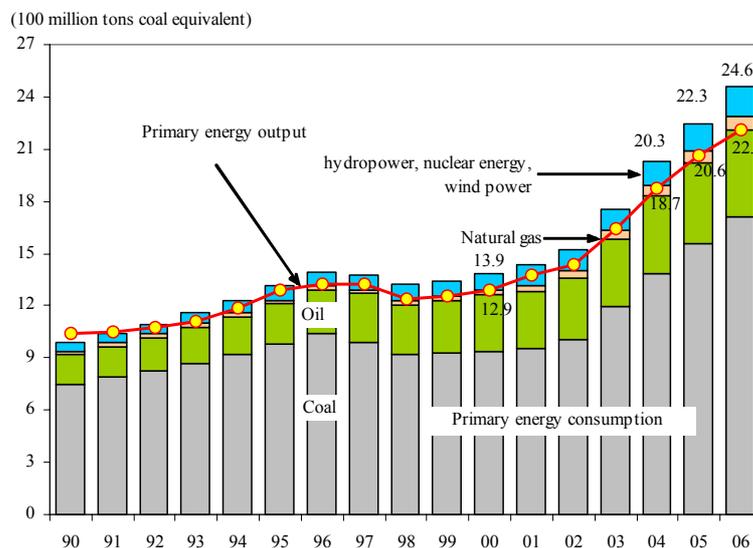
* Senior Economist, Coal Research Group, Strategy and Industry Research Unit, Institute of Energy Economics, Japan (IEEJ)

** Senior Engineer, Coal Research Group, Strategy and Industry Research Unit, Institute of Energy Economics, Japan (IEEJ)

breakdown of energy consumption shows that annual average growth between 2002 and 2006 stood at 13.3% for natural gas, 9.5% for oil and 14.0% for coal. Demand thus rose sharply for all energies (Figure 1-1).

The primary energy consumption had temporarily decreased due to a drop of coal consumption from 1996. The coal consumption decline from 1996 is viewed as representing structural primary energy demand changes including environmental pressures and rising demand for oil and natural gas by progress in motorization amid economic growth and improvements in living standards. Slower economic growth from 1996, rising inventories in coal-consuming industries, promotion of energy conservation and a crackdown on small coal mines since December 1998 also contributed to the coal demand decline. Coal's share of primary energy consumption continued declining from 1990 has been rising from 66.3% in 2002 to 69.4% in 2006. A factor behind the recovering share for coal is that demand for coal for electricity generation has increased rapidly on an expansion in demand for electricity.

Figure 1-1 China's Primary Energy Production and Consumption



Source: *China Statistical Yearbook 2007*, China Statistics Press

(2) 11th Five-year Plan for Energy Development

The basic policy of the 11th Five-year Plan for Energy Development states: "Be based on domestic energy sources. Give top priority to energy conservation. Promote diversification of energy supply while being based on coal resources. Optimize the energy supply and demand structure. Build systems for stable, economical, clean and safe energy supply."

As for primary energy supply and demand in 2010, the plan project total consumption at 2.7 billion tons coal equivalent, of which coal accounts for 66.1% or 1.78 billion tons. It is estimated that the coal share will decline from 69.1% in 2005, while coal consumption will increase by 0.23 billion tons from 1.55 billion tons coal equivalent in 2005. Primary energy production is projected at 2.45 billion tons coal equivalent, of which coal captures 74.7% or 1.83 billion tons coal equivalent (Table 1-1).

Table 1-1 Consumption and Production Projections under the 11th Five-year Plan for Energy Development

(100 million tons coal equivalent, %)

	Consumption		Production	
		Share		Share
Coal	17.8	66.1	18.27	74.7
Oil	5.5	20.5	2.76	11.3
Natural gas	1.4	5.3	1.22	5.0
Nuclear	0.2	0.9	0.24	1.0
Hydropower	1.8	6.8	1.83	7.5
Other renewable energies	0.1	0.4	0.12	0.5
Primary energy total	27.0	100.0	24.46	100.0

Note: Consumption and production for each energy is based on each percentage share.

Source: *11th Five-year Plan for Energy Development*

1-2 Coal policy

(1) Problems in coal industry

Coal consumption account for nearly 70% of primary energy consumption and the coal industry has played a role as an important basic sector for the national economy and social development. At the same time, it has been plagued with issues including the absence of the coal sector's rationality in the industrial structure, frequent accidents, wasteful use of coal consumption and lagging environmental efforts as below. As coal demand expands in the future, China will have to solve these problems with a view to stable coal supply.

Short proven reserves (recoverable reserves): When coal demand was slack in the second half of the 1990s, coal exploration operations were stagnant and the government failed to positively encourage coal exploration. In addition, coal mines in operation have produced coal beyond their design capacities to catch up the coal demand since 2003 and shortened their mine life. Therefore, coal reserves for future production, or recoverable reserves, have turned out to be short.

Sloppy or excessive production: Sloppy production has been a serious problem with small coal mines. Since small coal mines have limited production to lower-cost portions, their coal recovery rates have reportedly been limited to only 10% to 15%. Over recent years, key state-run coal mines have expanded production beyond their design capacities, prompting their coal recovery rates to decline.

Coal production structure (small coal mines' production share): Small coal mines are less conscious about safety and have adopted inefficient production technologies. As a result, they are less safe than others and waste resources remarkably. Although China has tried to consolidate these small coal mines, a faster-than-expected rise in coal demand has led to a sharp increase in production at small coal mines and then the share of production at small coal mines account for near 40%. In the future, China will have to further consolidate inappropriate small coal mines and adjust the production structure.

Coal mine safety: The number of deaths per million tons in coal output, though improving, stood at 2.81 persons per million tons, exceeding far above the average for major coal-producing countries in the world. Low mechanization rates, fewer coal mine engineers and less educated workers are seen as factors behind frequent accidents.

Coal resources development order: The national resources control division has taken charge of coal resources control. In many regions, control operations are limited to issuance of certificates. Coal resources control

accompanying development has thus been insufficient.

Production cost hikes: Many coalmining companies have improved their earnings as the coal market has expanded with prices rising. As coal prices have reached reasonable levels, however, materials prices have soared to push up coal production costs. In addition, safety costs and environment expenditures have also increased. These cost hikes are exerting financial pressures on coal production companies.

Transportation issues: Coal transportation via railways, which accounts for more than 50% of coal consumption, has long been under constraints. Shanxi, Shaanxi and western Inner Mongolia account for 45% of China's coal production. Coal transportation from these production sites to consumption regions will continue increasing.

Environmental issues: Massive coal production can cause subsidence, groundwater vein destruction and piles of coal waste to affect the ecological system at production sites. Coal consumption leads to serious air pollution. Eco-system destruction has resulted from coal production over the past half century. Environmental conservation measures have failed to be taken as coal mine operators have little room to finance such measures. Air pollution in coal-consuming regions is the most serious among environmental issues in China. Both central and local governments have been toughening restrictions on coal utilization.

(2) 11th Five-year Plan for Coal Industry Development

The 11th Five-year Plan for Coal industry put forward a coal industry development policy calling for consolidation, integration and orderly development of the coal industry, innovation and completion of coal industry systems, enhance control and secure safety, realignment of coal mines and optimization of industrial structure, scientific improvement of industrial technologies, clean utilization of coal through processing and conversion, and resources and environmental protection. Based on this policy, the plan sets targets for nine areas -- coal production, coal mine construction, creation of enterprises, technological advancement, improvement of staff quality, safe production, resources savings, coal-seam gas and environmental protection. The plan also spells out major missions for the coal industry's development and emphasized production adjustment and resources conservation.

As for production adjustments, the plan set production, coal mine construction and small mine shutdown targets for each province (or city or autonomous region). By specifying targets for restrictions on small coal mines for each province (or city or autonomous region), the plan may allow the government to shut down small mines more powerfully. The production target of 2010 is set at 2.6 billion tons, including 700 million tons at small mines (down 300 million tons from 2005). The plan also divides Chinese provinces and autonomous regions into three groups -- supply, demand and self-supply regions, specify roles to be played by each region, and make it easier for local governments to implement local measures (Table 1-2).

Regarding resources conservation, the 11th Five-year Plan for coal industry development state that coal recovery rates should be raised appropriately to promote the comprehensive development of coal-related resources including coal-seam gas, underground water, coal wastes, and coal washing wastes. In order to enhance commercial utilization and management of coal resources, the central government announced a bill for institutional system reform tests regarding commercial utilization of coal resources in September 2006 and has decided to implement tests in nine provinces (including autonomous regions).

Table 1-2 Classification of Regions under 11th Five-year Plan for Coal Industry Development

Group	Provinces or Autonomous Region
Demand Regions	Beitianji (Beijing, Tianjin, Hebei) Northeast (Heilongjiang, Jilin, Liaoning) East (Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong) Mid-south (Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan)
Supply Regions	Jinshaanmengning (Shanxi, Shaanxi, Neimenggu, Ningxia)
Self-supply Regions	Southwest (Chongqing, Sichuan, Guizhou, Yunnan, Tibet) Xinganqing (Xinjiang, Gansu, Qinghai)

Source: *11th Five-year Coal Industry Development*

(3) Coal law amendment

China is now planning to amend the coal law that took effect on August 29, 1996, because the law has failed to meet the present situation. At present, the coal industry is plagued with issues regarding coal resources control, coal mine management and safe production as well as waste and destruction of coal resources. The coal law amendment is designed to solve these problems and lead sound and sustainable development of the coal industry. The sixth draft for the amendment was completed in late 2006 and is under discussion at relevant government agencies. Following is an outline of the fifth draft that has already been published:

Safe production: Since the coal industry faces serious issues with safe production, the new coal law calls for the following measures to promote safe production:

- ▶ Coal mining license requirements are toughened to exclude enterprises with insufficient funds or substandard technology levels in order to reduce accidents and establish the coal mining industry order.
- ▶ The rules are set up for the safety responsibility system for production at coal mines and provisions are added for guaranteed investment in safe production, qualifications for coal mine managers, and relations between safe coal mine production management and business administration. Provisions are toughened for management of safety marks on coal mining machines and materials, coal industry certification systems, and standardization of product quality. At the same time, measures against intrinsic security issues in coal mines and emergency rescue systems for accident are enhanced.
- ▶ The government is urged to grasp mutual relations between central and local government control, corporate responsibility and coal industry management, and to consolidate safe production management systems and develop coal mine security management systems.

Environmental protection: The new coal law calls for the following measures to promote environmental protection:

- ▶ Provisions are added to create a reserve system for forecasting and preventing ecological destruction and to guarantee the coal industry's investment in environmental protection. Financial measures are thus adopted to raise the environmental protection standards for opening new coal mines.
- ▶ When screening applications for coal mine construction projects, the coal industry's control division is required to appropriately restrict development of small coal mines and encourage development of larger coal mines to raise the threshold for entry into the coal industry.

Resources control: Coal resource is nonrenewable and exhaustible. The current coal law fails to specify such principle and establish any effective system for acquisition of coal resources for value. In order to solve these problems, the new coal law calls for the following measures:

- ▶ The principle of paid-for use of resources is specified. The government is urged to develop financial and tax policies for promotion of coal industry development to reform coal resources tax and cost systems.
- ▶ The central government is specifically required to undertake blanket control on coal resources and utilize coal resources tax and fee revenues for developing the base for reforming the coal industry.

Industry control: Coal industry control systems must be consolidated to reform or reconstruct the government's control on the coal industry. In this respect, the new coal law calls for the following measures:

- ▶ The coal industry's control division is required to control all processes in the industry under the principles of efficient control and burden sharing. The division is urged to undertake control functions including management of coal resources, environmental protection, sales, state asset management and appointment of managers for key state-run coal mines. Relevant government agencies are required to develop policies and systems, supervise the coal industry's control division and consolidate the coal industry control system.

2. China's Coal Supply/Demand

China's coal supply/demand relationship tightened as supply growth failed to catch up with a rapid domestic demand expansion from 2003. Over recent years, however, large coal mines (including key state mines) have expanded production beyond their design capacities. Small coal mines have increased output. In addition, investment in the coal industry has risen fast on coal price spikes. Overall coal production has thus swelled, while coal transportation capacity has grown fast on construction of railways and coal-shipping ports. As a result, the coal supply/demand relationship has eased since the second half of 2005. Although the relationship was temporarily tight for high-quality coal in some regions in 2006, the overall coal supply/demand relationship has ended a tightening phase and stabilized. Under China's energy policy, coal will remain as a key primary energy source. China will increase coal consumption while covering most of demand with domestic output.

2-1 Coal consumption trends

(1) Current state of coal consumption

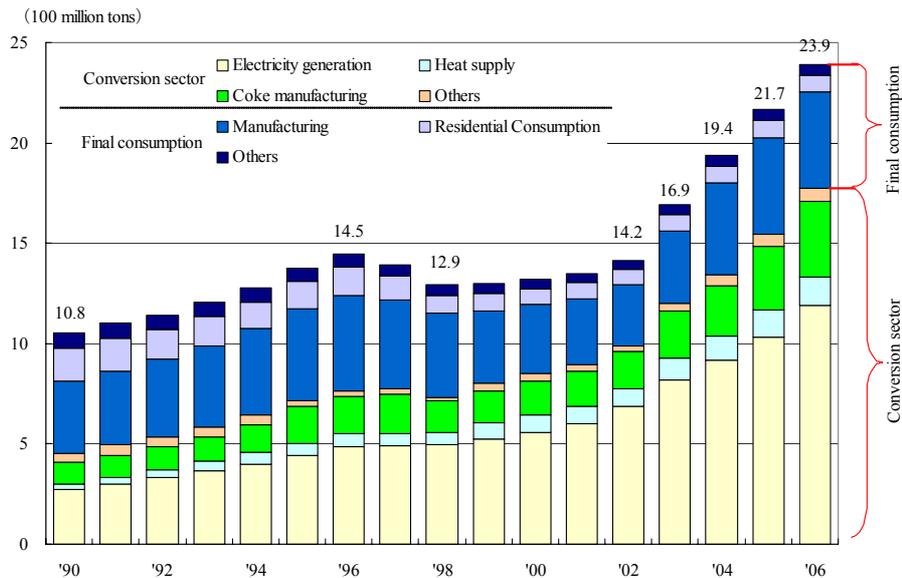
China's coal consumption slackened in the second half of the 1990s before sharp growth began in 2003. As indicated by Table 2-1 and Figure 2-1, annual coal consumption expanded by more than 200 million tons between 2003 and 2006. In 2006, coal consumption totaled 2.39 billion tons. Coal consumption has increased in all sectors. Particularly, consumption has expanded fast for coal for electricity generation in line with rapid growth in electricity demand and for coking coal amid a steel production increase. A coal consumption increase between 2002 and 2006 totaled 980 million tons including 500 million tons in coal for electricity generation and 190 million tons in coking coal. In 2006, coal for electricity generation accounted for 50% (56% including coal for heat supply) of total coal consumption, industrial consumption for 20% and coking coal for 16%.

Table 2-1 Coal Supply/Demand Balance

		1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	(10,000 tons) Average annual growth (2006/1990)
Coal supply	Domestic production	107,988	136,073	139,670	137,282	125,000	128,000	129,921	138,152	145,456	172,200	199,232	220,473	237,300	5.0%
	Imports	200	164	322	201	159	167	218	266	1,126	1,110	1,861	2,617	3,811	20.2%
	Exports	-1,729	-2,862	-3,648	-3,073	-3,230	-3,744	-5,507	-9,013	-8,390	-9,403	-8,666	-7,172	-6,327	8.4%
	Stock Change	-4,239	87	869	-1,251	882	2,653	3,665	1,149	-1,131	-505	-162	-1,455	998	—
	Total	102,221	133,462	137,212	133,159	122,811	127,076	128,297	130,554	137,061	163,402	192,265	214,462	235,781	5.4%
Energy conversion	Electricity generation	27,204	44,440	48,809	48,979	49,489	52,458	55,811	59,798	68,600	81,977	91,962	103,263	118,764	9.6%
	Heat supply	2,996	5,887	6,366	6,245	6,320	7,961	8,794	8,952	8,974	10,896	11,547	13,542	14,561	10.4%
	Coke manufacturing	10,698	18,396	18,456	19,297	15,628	15,932	16,496	17,236	18,625	23,640	25,350	31,667	37,450	8.1%
	Gas manufacturing	360	764	582	582	733	685	848	810	894	973	1,055	1,316	1,277	8.1%
	Losses in coal washing and dressing	4,059	2,033	2,069	2,197	1,023	3,087	3,267	2,509	1,856	2,620	3,878	4,582	5,279	1.7%
		Total	45,317	71,520	76,281	77,451	73,145	80,286	85,179	89,388	99,028	120,187	134,052	154,568	154,568
Final energy consumption	Agriculture, forestry, fisheries, etc.	2,095	1,857	1,917	1,927	1,923	1,736	1,648	1,600	1,623	1,683	2,251	2,315	2,310	0.6%
	Manufacturing	35,774	46,050	47,605	44,214	41,807	36,214	34,122	33,130	30,262	35,981	46,083	48,041	48,007	1.9%
	Construction	438	440	446	383	612	522	537	535	554	577	602	604	582	1.8%
	Transportation, communications	2,161	1,315	1,176	1,431	1,391	1,286	1,132	1,041	1,055	1,067	832	815	725	-6.6%
	Commerce, services	1,058	977	1,074	863	948	896	815	811	809	860	872	874	892	-1.1%
	Other industries	1,980	1,987	1,835	735	783	651	661	665	667	701	731	766	783	-5.6%
	Residential Consumption	16,700	13,530	14,399	12,238	8,884	8,408	7,907	7,830	7,603	8,175	8,173	8,739	8,386	-4.2%
		Total	60,206	66,156	68,454	61,791	56,347	49,714	46,821	45,612	42,572	49,045	59,544	62,154	61,684
	Total coal consumption	105,523	137,677	144,734	139,248	129,492	130,000	132,000	135,000	141,601	169,232	193,596	216,723	239,217	5.2%
	Statistical errors	-3,302	-4,215	-7,522	-6,089	-6,682	-2,924	-3,703	-4,446	-4,540	-5,830	-1,331	-2,260	-3,435	—

Sources: *China Energy Statistics Yearbook* and *China Statistics Yearbook*, China Statistics Press

Figure 2-1 Coal Consumption Trends



Sources: *China Energy Statistics Yearbook* and *China Statistics Yearbook*, China Statistics Press

(2) Coal demand forecast

Coal consumption is expected to increase, centering on coal for electricity generation and projected to rise at an annual rate of 2.7% between 2004 and 2030, reaching 2.71 billion tons in 2010, 3.34 billion tons in 2020 and 3.76 billion tons (up 2.0 times from 2004) in 2030. Coal for electricity generation is expected to account for three quarters of the coal consumption growth through 2030 and for 2.36 billion tons or 63% of total consumption in 2030. Meanwhile, coking coal consumption is estimated to increase to 460 million tons in 2010 before decelerating growth. For 2030, coking coal consumption is forecast at 560 million tons. (Table 2-2)

Table 2-2 Projected Coal Demand Breakdown (subject to revision)

(Million tons)

	Results		Estimates			Average annual growth (%)				
	1980	2004	2010	2020	2030	04/80	10/04	20/10	30/20	30/04
Electricity generation	126.5	919.6	1,485.6	1,980.8	2,356.6	8.6	8.3	2.9	1.8	3.7
Heat supply	0.0	115.5	149.6	177.5	193.1	—	4.4	1.7	0.8	2.0
Coke manufacturing	66.8	253.5	457.0	545.5	560.4	5.7	10.3	1.8	0.3	3.1
Self-consumption	7.3	105.5	102.3	104.3	106.2	11.8	-0.5	0.2	0.2	0.0
Conversion sector total	200.6	1,394.1	2,194.5	2,808.0	3,216.4	8.4	7.9	2.5	1.4	3.3
Manufacturing	237.1	353.3	387.2	425.7	449.0	1.7	1.5	1.0	0.5	0.9
Agriculture, transportation, households	166.1	118.8	118.5	99.8	86.7	-1.4	0.0	-1.7	-1.4	-1.2
Non-energy	0.0	28.8	11.5	9.6	8.3	—	-14.1	-1.8	-1.4	-4.7
Final consumption total	403.1	500.9	517.3	535.2	544.0	0.9	0.5	0.3	0.2	0.3
Total	603.7	1,895.0	2,711.8	3,343.2	3,760.4	4.9	6.2	2.1	1.2	2.7

Sources: Results are from the IEA. Estimates are made by the Coal Research Group, Strategy and Industry Research Unit, IEEJ.

2-2 Coal production trends

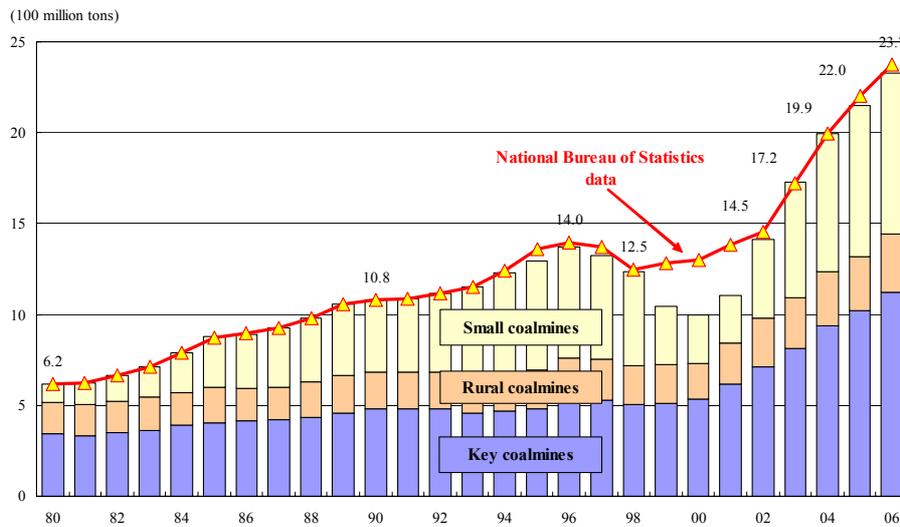
(1) Current state of coal production

Coal production has also increased fast since 2003. Output reached 2.2 billion tons in 2005 and 2.373 billion tons in 2006. The production growth since 2003 has depended on large coal mines' production expansion beyond design capacities and small coal mines' increased output because coal mine investment declined on the coal industry slack in the second half of the 1990s. The excessive production expansion has resulted in such problems as a delay in consolidation of small coal mines, an increase in illegal operations of small coal mines, coal mine safety issues and rough mining, which have become obstacles to development of the coal industry. Since the coal supply-demand relationship began to ease in 2005, consolidation of small coal mines including the shutdown of the illegal ones has been promoted positively. According to preliminary estimates by the National Development and Reform Committee, however, small coal mines still accounted for 38% of China's total coal production in 2006 (Figure 2-2).

(2) Production expansion plan

In pursuit of the coal industry's sustainable development, China plans to further consolidate small coal mines and construct large ones to develop a competitive, stable production system. Large coal mine construction is centering on the 13 major coal production bases. Particularly, many large coal mines are under construction or planning in the three major western coal-producing regions (Shanxi, Shaanxi and western Inner Mongolia) and Ningxia (figure 2-3). According to information from the National Development and Reform Committee, coal production capacity growth through new coal mines under construction or planning at the end of 2005 totals 891 million tons after adjustment for coal mine shutdowns (except the shutdown of small coal mines) in the 11th Five-year Plan period (2006 - 2010), 395 million tons for the 12th (2011 - 2015) and 250 million tons for the 13th (2016 - 2020) (Table 2-3).

Figure 2-2 Coal Production Trends

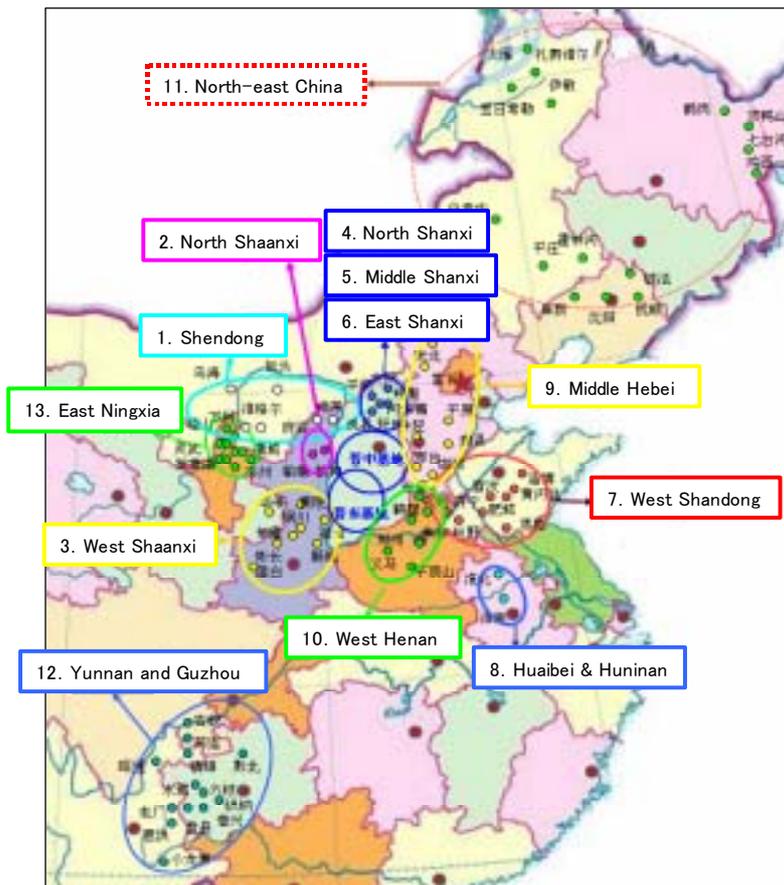


Note: Numbers indicate the line chart.

Sources: Bar charts are based on data from *Coal Industry Yearbook* by Coal Industry Press and preliminary data from the National Development and Reform Committee.

The line chart (data from the National Bureau of Statistics) is based on the *China Energy Statistics Yearbook* and *China Statistic Yearbook* by China Statistics Press.

Figure 2-3 13 Main Coal Production Bases



Sources: China Coal Association

(3) Coal supply forecast

Table 2-3 shows that the production capacity growth is far greater than the projected consumption expansion under the 11th Five-year Plan for Coal Industry Development. This is because coal price spikes in 2004 led to a rapid rise in investment in the coal industry. Coal mines under construction at the end of 2005 were estimated to have a total capacity of 639 million tons, far larger than the projected demand increase. During the period for the 11th Five-year Development Plan, the Chinese government will have to shut down small coal mines, reduce output at coal mines operating at more than 100% of their design capacities, and match coal production growth with a consumption rise. The present conditions indicate that the production structure has been reformed for stable production. Unless small coal mines are consolidated to allow production to meet consumption, however, overproduction could emerge as seen in the second half of the 1990s.

Though China will have to develop a competitive and stable coal production system in the period for the 11th Five-year Plan, China will maintain and enhance the coal production structure built in the period of the 11th Five-year Plan by consolidating small coal mines and constructing new large ones to strengthen the 13 major coal production bases in the period for the 12th Five-year Plan.

Table 2-3 Coal Production Capacity and Consumption Outlook against Production Capacity Growth

		(10,000 tons/year)				
		11th Plan (2006-2010)	12th Plan (2011-2015)	13th Plan (2016-2020)	14th Plan (2021-2030)	Total
Growth of (design) coal production capacity						
Growth	Expansion of existing mines	40,800	17,000	13,000	10,000	80,800
	Under construction	20,800	—	—	—	20,800
	Under planning	20,000	17,000	13,000	10,000	60,000
	Construction of new mines	56,100	30,000	20,000	25,000	131,100
	Under construction	43,100	—	—	—	43,100
	Under planning	13,000	30,000	20,000	25,000	88,000
	Total	96,900	47,000	33,000	35,000	211,900
Drop on shutdowns		7,800	7,500	8,000	9,000	15,300
Net production capacity growth		89,100	39,500	25,000	26,000	128,600
Coal output growth						
National Institute for Occupational Safety		44,500	20,000	15,000	—	—
11th five-year Development Guidelines targets		39,500	—	—	—	—
Coal consumption growth						
Projection of This Study		54,500	35,300	27,900	41,700	159,400
Coal Industry Development Research Center (lower case)		35,200	52,000		—	—
Coal Industry Development Research Center (upper case)		56,200	64,000		—	—
China Coal Transportation Association (upper case)		42,300	—	—	—	—

Note: Growth of coal production capacity (design capacity) indicates a total of capacity additions coming on completion of projects in each five-year plan period. These projects are limited to those controlled by the central government. The projects (expansion of existing coal mines and construction of new ones) were under construction or planning at the end of 2005.

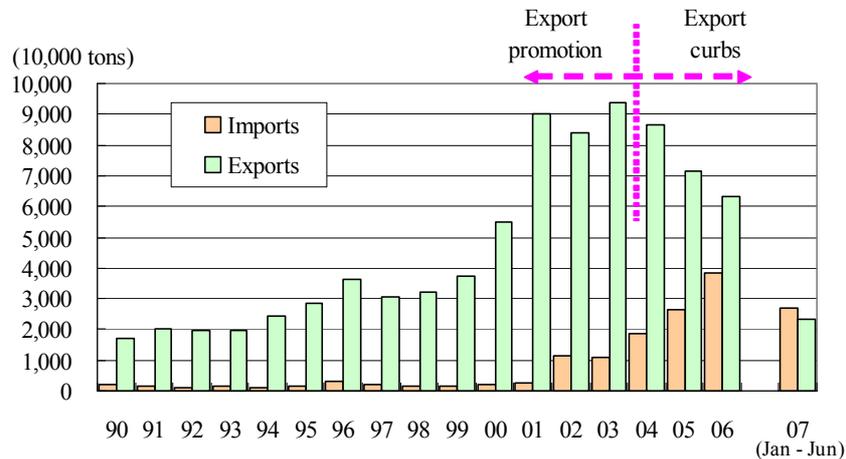
Source: State Administration of Work Safety and Table 2-2

2-3 Coal exports and imports

China has seen coal export declines and import gains since 2004 as the supply/demand relationship has tightened on a fast domestic coal demand expansion since 2003. Exports decreased from 93.9 million tons in 2003 to

63.3 million tons in 2006, while imports expanded from 10.8 million tons to 38.2 million tons. An export fall and an import expansion have been continuing into 2007 and imports is exceeding exports in the first six months of 2007 (Figure 2-4).

Figure 2-4 Coal Imports and Exports



Sources: *China Energy Statistics Yearbook* and *China Statistics Yearbook*, China Statistics Press; *TEX Report*

(1) Coking coal

As indicated by a category-by-category breakdown of coal imports and exports (see Figures 2-5 and 2-6), coking coal exports in 2004 declined to less than half the level for the previous year due to domestic supply shortages in the second half of 2003 and export curbs (elimination of incentives for coal exports and quantitative restrictions on coal exports) in 2004. Coking coal exports have continued a downward trend since then. Meanwhile, imports jumped 2.5-fold in 2004. But they turned down in 2006 as domestic supply caught up with a demand increase.

Coking coal imports and exports may change depending on domestic supply conditions. As the domestic supply/demand relationship is expected to remain tight over a short to medium term, coking coal exports are likely to continue falling with imports leveling off.

(2) Steaming coal

As for steaming coal, effects of the tightening supply/demand relationship have been seen on imports and exports since 2005. Exports decreased from 74.5 million tons in 2004 to 53.7 million tons in 2006, while imports expanded from 3.8 million tons in 2004 to 10.5 million tons in 2006. The decline in steaming coal exports is attributable to gradual elimination of incentives for coal exports, the yuan's appreciation cutting profit of exporters, and lower export prices than domestic sales prices. In 2006, gaps expanded between export and domestic sales prices. The increase in imports is attributable to reduction of import duty to 1%, rising domestic coal prices and stable quality of imported coal. Particularly, Indonesian coal imports featuring lower F.O.B. prices and a shorter maritime transportation distance increased rapidly in 2006.

Future steaming coal exports and imports may change depending on coal prices. Over a short term, China's

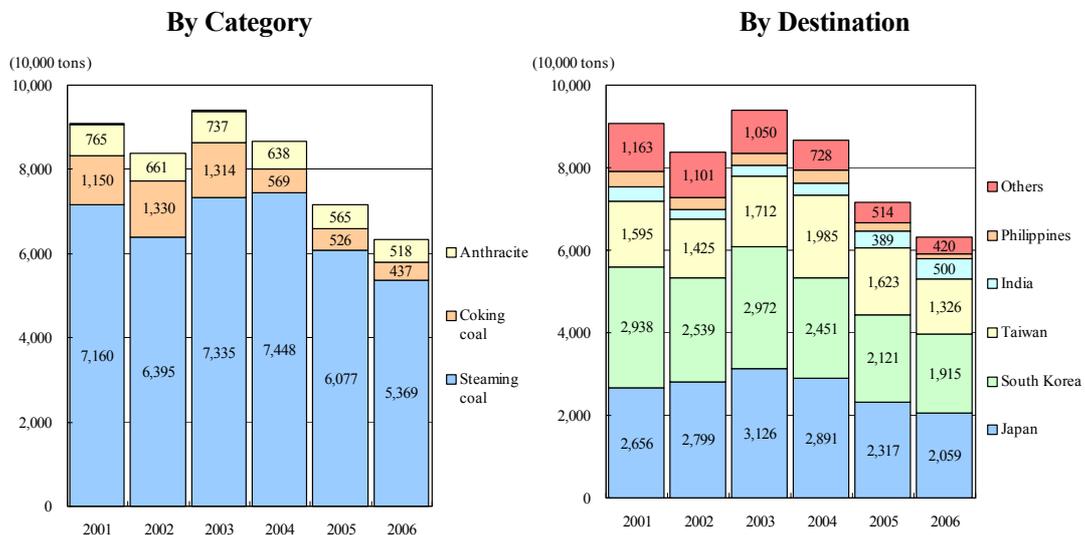
domestic coal prices are expected to remain high and electric power companies are about to seriously consider imports. Therefore, exports are expected to continue falling, with imports increasing. If domestic coal prices become almost equal to international prices on stabilization of coal supply amid the coal industry's restructuring over a medium to long term, however, exports may recover. Meanwhile, China's southeastern coastal regions are expected to expand coal imports. In this way, China may establish a system for coal imports in its southern region and exports from its northern region. Exports and imports in volume may fluctuate according to the gap between domestic and overseas coal prices.

(3) Anthracite

As for anthracite, exports have been falling gradually since 2004 affected by supply/demand constraints, while imports have been rising fast due to price spikes and supply shortages for domestic anthracite. The imports of Vietnam's anthracite that is cheaper and of a lower grade have increased rapidly and Vietnam's anthracite has been consumed in southern coastal regions including Guangdong Province and Guangxi-Zhuang Autonomous Region.

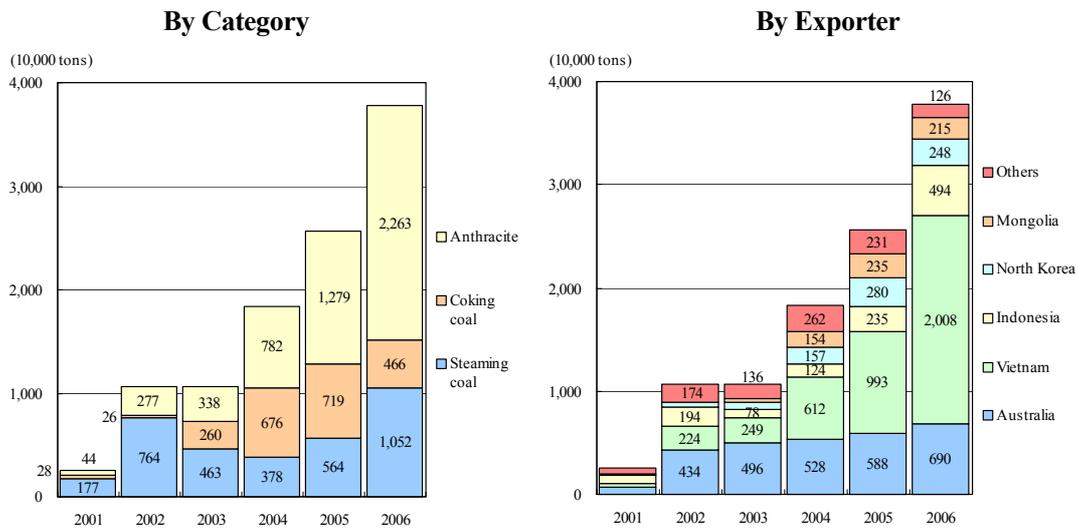
In the future, anthracite exports are expected to continue falling due to the tight supply/demand relationship and gaps between overseas and domestic prices. Over a short term, imports are likely to increase due to the tight supply/demand relationship and their lower prices. Over the medium to long term, anthracite imports may depend on Vietnam's export policy.

Figure 2-5 Coal Exports by Category and Destination



Sources: *TEX Report*

Figure 2-6 Coal Imports by Category and Exporter



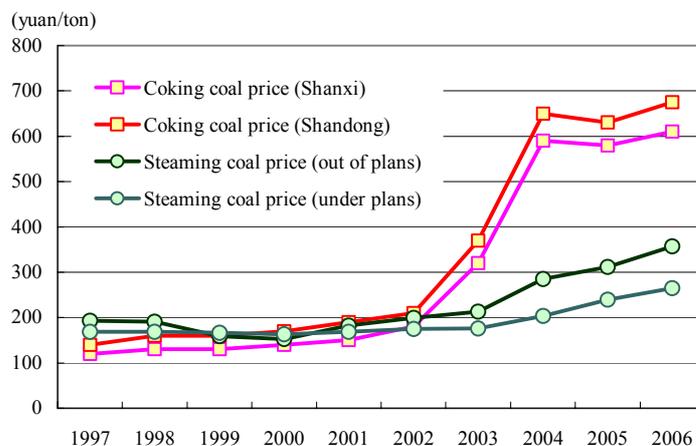
Sources: *TEX Report*

2-3 Coal prices

(1) Domestic prices

China's domestic coal prices have shot up and remained high on the tight supply/demand relationship. The annual average price for coking coal at coal mine has risen sharply on supply shortages that emerged in the second half of 2003. It rose from around 200 yuan per ton in 2002 to more than 300 yuan in 2003, and to 590 yuan in Shanxi and 650 yuan in Shandong in 2004. The price thus tripled in two years. Since 2004, the price has leveled off as production has caught up with a demand rise. For steaming coal, the annual average price at coal mine has risen more moderately than coking coal prices. It increased from 175-200 yuan per ton in 2002 to 265-357 yuan in 2006 (Figure 2-7).

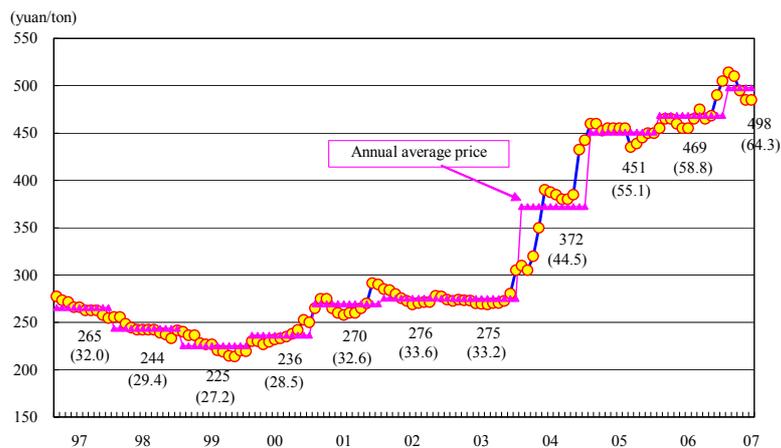
Figure 2-7 Annual Average Domestic Coal Prices at Coal mine



Source: Beijing Xinhua InfoLink Development Co., Ltd.

The average F.O.B. price at Qinhuangdao Port for China's representative steaming coal brand, Datong, has risen fast since December 2003 and now stands at around 500 yuan per ton. The brand's annual average price stood at 270 yuan per ton before rising to 372 yuan in 2004, 451 yuan in 2005 and 468 yuan in 2006. The average price for the first five months of 2007 came to 498 yuan. This indicates that the supply/demand relationship is tight in China's steaming coal market, particularly for key brands, though coal supply/demand is almost balancing (Figure 2-8). In 2006 the average Datong coal price was 562 yuan or \$70.50 per ton in Shanghai, and 595 yuan or \$74.60 per ton in Guangzhou.

Figure 2-8 Average F.O.B. Price of Datong Coal for Domestic Shipments at Qinhuangdao Port



Note: Numbers indicate annual average prices in Chinese yuan. In parentheses are U.S. dollar prices.
Sources: *Japan-China Energy Exchange Monthly Report*; *China Coal Report*, Barlow Jonker

(2) Import and export prices

Chinese coal export prices rose for all categories in 2004 and 2005 in response to price hikes in global markets as well as in the Chinese market. In 2006, these prices fell slightly as the global supply/demand relationship eased somewhat. A comparison between export prices for recent years and the average price of Datong coal for domestic shipments, as shown in Figure 2-8, indicates that export prices have been lower than domestic prices and price gap have widened. Meanwhile, imported coal prices have risen on global coal price spikes since 2004. But China's imported coal prices are relatively lower than global market prices as China imports cheap low-grade anthracite from Vietnam and North Korea, and cheap coking coal from Mongolia (Table 2-4).

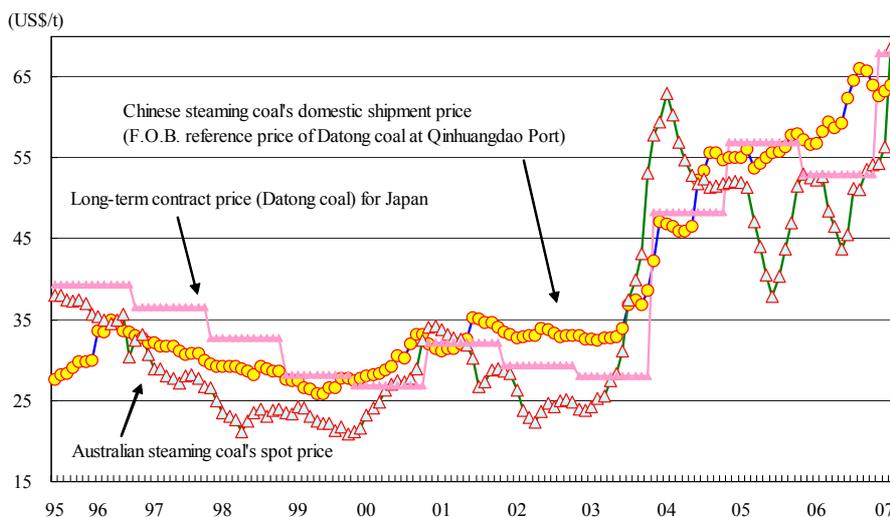
Table 2-4 Average Import and Export Prices

	2000	2001	2002	2003	2004	2005	2006
C.I.F. import price (smokeless coal)	8.60	16.10	21.70	21.20	30.10	51.60	32.72
C.I.F. import price (coking coal)	43.00	47.30	53.90	53.00	66.60	85.50	78.21
C.I.F. import price (steaming coal)	33.30	38.00	32.70	32.40	50.70	50.00	47.60
F.O.B. export price (smokeless coal)	32.50	32.60	22.80	34.50	45.60	80.30	77.05
F.O.B. export price (coking coal)	34.30	37.30	38.40	38.50	90.90	113.30	107.00
F.O.B. export price (steaming coal)	24.90	28.00	28.10	27.10	41.40	53.10	52.26

Source: Beijing Xinhua InfoLink Development Co. Ltd.

The Australian steaming coal price has roughly remained below the Datong domestic shipment price. While the Australian steaming coal price has fluctuated wildly between US\$38 and US\$54 per ton since 2005, the Chinese steaming coal price for domestic has retained an upward trend. At the end of 2006, the Chinese domestic steaming coal price reached US\$64.60 per ton. The gap has thus widened between Chinese domestic and international prices. China has eliminated export incentives including a value added tax refund for coal exports since 2004. Coal exporters (coal mines for exports) have thus begun to lose their enthusiasm for coal export.

Figure 2-9 Chinese Steaming Coal's Domestic Shipment Price and Australian Steaming Coal's Spot Price



Sources: *Japan-China Energy Exchange Monthly*; *China Coal Report* and *Australian Coal Report*, Barlow Jonker

3. China's Coal Transportation Infrastructure

Though coal resources is scattered throughout China, a little over 60% of proved reserve concentrate in Shanxi, Shaanxi and Inner Mongolia and coal reserves are limited in coastal regions. Roughly, coal has thus been transported eastward and southward from the major coal supply regions (Shanxi, Shaanxi and western of Inner Mongolia) to coastal coal consumption regions. The east-west and north-south transportation networks have been established.

China's coal transportation, especially railway network had been called a bottleneck for the coal industry's development or the nation's economic development. Transportation capacity shortages had been cited as a factor behind the tight supply from 2004. In a bid to solve the problem, China has fast expanded capacities for the coal transporting railways from Shanxi, Shaanxi and western of Inner Mongolia and coal-shipping ports linked to the railways. In 2006, coal transportation reportedly ended its tightness, though some sections of coal transport route have still tightened.

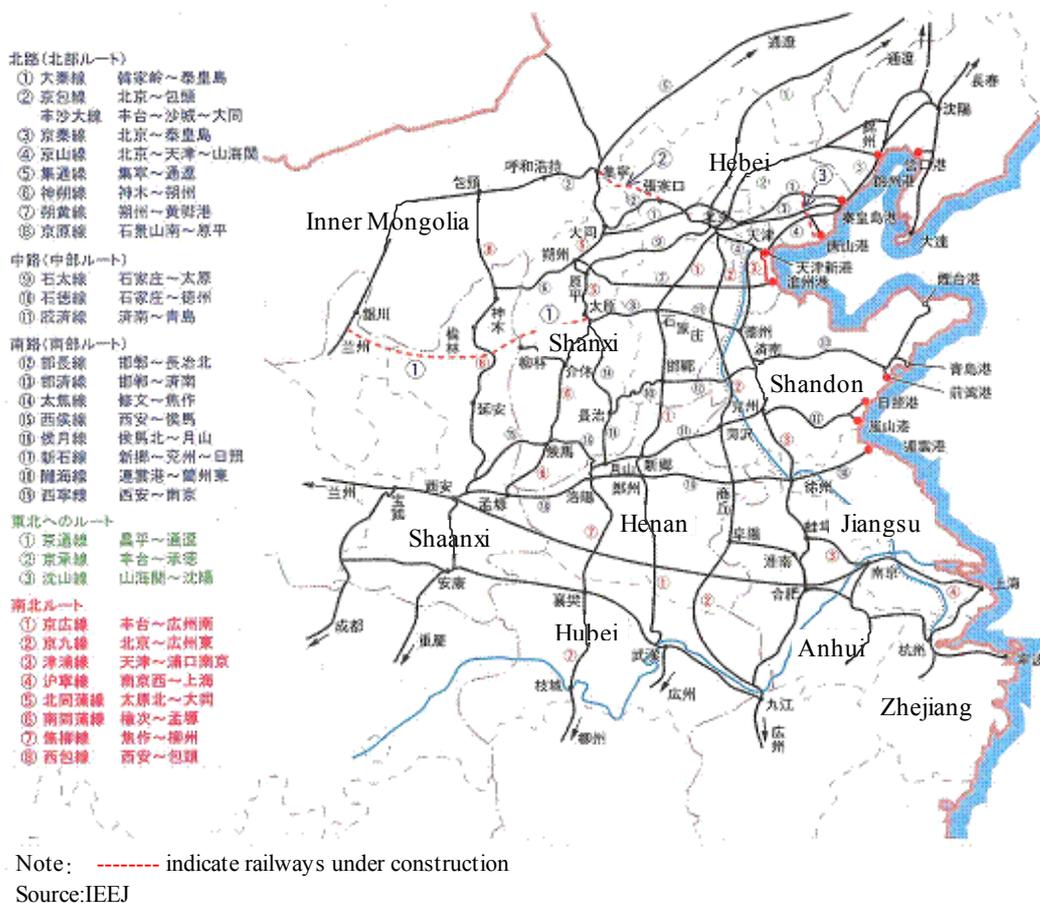
3-1 Railways

(1) Present state and plans

China's coal transportation through railways includes transportation from main coal supply region (Shanxi,

Shaanxi and western of Inner Mongolia) to consumption regions or coal-shipping ports (see Figure 3-1). The railways from coal supply regions are divided into three -- the northern route for transportation of coal from northern Shanxi, northern Shaanxi and Inner Mongolia, the middle route for coal from central Shanxi, and the southern route for coal from central and southern Shaanxi. The northern route is the most important among them. The Daqin and Shenshuohuang railways of the northern route have mainly expanded their transportation capacities. Particularly, the Daqin railway's capacity was annually expanded by 50 million tons per year from 2004 to 250 million tons per year in 2006, contributing much to improvements in coal transportation.

Figure 3-1 Railways from Three Major Western Coal Bases



Under the 11th Five-year Plan, electrification, track-doubling, passenger train line construction, station development and other projects have been implemented to expand transportation capacities of railways from Shanxi, Shaanxi and western of Inner Mongolia. The existing plans call for annual transportation capacity to expand to 400 million tons by 2009 for the Daqin railway and to 150 million to 200 million tons by 2010 for the Shenshuohuang railway. Other railway transportation capacity expansion plans (Table 3-1).

Table 3-1 Expansion of Transportation Capacities for Existing Railways

Line	Route	Distance (km)	Project	Planned completion	Transportation capacity target (10,000 tons/year)
Jitong	Jining-Tongliao	942	Electrification	2008	2,500
Shitai	Shijiazhuang-Taiyuan	231	Passenger railway construction	2008	10,000
Hanzhan	Handan-Zhazhi	220	Electrification in Hebei	2010	8,000
Taijiao	Taiyuan-Jiaozuo	434	Electrification of Xiuwen-Zhazhi par	2010	9,000
Longhai	Lanzhou-Lianyungang	1,735	Faster speed	2008	10,000
Yanshi	Yanzhou-Shijiusuo	316	Two-line addition for northern part	2010	10,000
Xikang	Xian-Ankang	260	Partial double tracking	2010	7,600
Houxi	Xian-Houma	288	Electrification	2008	2,000
Ningxi	Nanjing-Xian	1,086	Electrification and double tracking	2006	5,000

Note: The table does not necessarily cover all plans for coal transportation routes from the three western coal supply bases to coal-shipping ports.

Source: Data from Beijing Xinhua InfoLink Development Co., Ltd.

(2) Forecast

A coal transportation demand outlook indicates that 920 million tons of coal may be transported from the three major western coal supply bases in 2010. If capacity expansion projects are implemented, total coal transportation capacity may come to 1,040 million tons per year (Table 3-2, 3-3). But some experts believe that environmental problems and other constraints may limit the Daqin railway capacity to 300 million tons per year. Coal transportation may be affected by other cargo traffic on railways other than those specialized for coal transportation. Given these conditions, China may have to plan railway development projects while considering that coal transportation capacity for railways from Shanxi, Shaanxi and western of Inner Mongolia would not necessarily exceed demand.

Table 3-2 Coal Transportation Outlook

		(100 million tons)			
		2005	2006	2010	2020
Output	Entire China	22.05	23.25	27	33
	3 major western coal supply bases	9.69	11.02	14.5	18
Railway transportation		12.88	-	18.36	25
Transportation through state-run railways		10.71	10.90	15.27	21
Road transportation		4.00	-	3.38	-
Shipments from northern coal-shipping ports		3.83	3.90	5.21	6.9
Shipments from 7 major ports		3.50	3.74	4.85	6.4
Shipments from river ports		1.72	-	1.35	-
Railway transportation from 3 major western coal supply bases		5.36	-	9.22	12.8
Northern route		3.53	-	6.40	8.7
Middle route		0.74	-	0.94	1.5
Southern route		1.09	-	1.88	2.6

Notes: Actual results for 2005. Projections for 2006. The three major western coal supply bases include Ningxia as well as Shanxi, Shaanxi and Inner Mongolia. Data for 2020 have been estimated by the IEEJ based on hearings by the National Development and Reform Committee's Institute for Comprehensive Transportation.

Source: Hearings by the National Development and Reform Committee's Institute for Comprehensive Transportation, JAPAC Seminar (November 2006)

Table 3-3 Transportation Capacity Outlook for Railways from Three Major Western Coal Supply Bases

	Cargo transportation capacity (10,000 tons/year)			Coal transportation capacity (10,000 tons/year)			Results (10,000 tons)
	2005	2006	2010	2005	2006	2010	2005
Total	78,700	83,700	135,100	60,900	65,900	103,800	53,598
Northern route	43,900	48,900	75,500	40,100	45,100	70,000	35,315
Daxin	20,000	25,000	40,000	20,000	25,000	40,000	20,200
Fengshada	6,800	6,800	10,000	4,300	4,300	6,300	3,849
Shenshuohuang	13,000	13,000	20,000	13,000	13,000	20,000	9,354
Jingyuan	2,200	2,200	3,000	1,600	1,600	2,100	1,445
Jitong	1,900	1,900	2,500	1,200	1,200	1,600	467
Middle route	10,500	10,500	18,000	6,800	6,800	11,600	7,356
Shitai	7,500	7,500	10,000	5,000	5,000	6,700	6,817
Hanzhan	3,000	3,000	8,000	1,800	1,800	4,900	539
Southern route	24,300	24,300	41,600	14,000	14,000	22,200	10,927
Taijiao	5,000	5,000	9,000	3,900	3,900	7,100	4,005
Houyue	10,000	10,000	10,000	6,500	6,500	6,500	5,212
Longhai	5,000	5,000	10,000	1,900	1,900	3,800	876
Ningxi	2,300	2,300	5,000	900	900	1,900	377
Xikang	2,000	2,000	7,600	800	800	2,900	457

Notes: Coal transportation capacity was computed based on 2005 data (including the ratio of coal transportation to total cargo transportation). The Daqin and Shenshuohuang railways are specialized for coal transportation. Results for 2005 indicate shipments from the three major western coal supply bases.

Sources: Transportation capacity: Data from Beijing Xinhua InfoLink Development Co., Ltd.; Table 3-1; Interview survey Results: Reports at JAPAC Seminar (November 2006)

Coal transportation from Shanxi, Shaanxi and western of Inner Mongolia in 2020 is projected at 1,280 million tons. While no plan for railway development in and after 2011 is made available, expansion of the existing railways alone is expected to fail to meet demand. New railways may have to be developed. For the northern route, a feasibility study has been completed for a railway from Inner Mongolia to Tangshan Port. For the middle route, a plan exists for a railway from Taiyuan of Shanxi Province to a shipment port.

3-2 Shipment ports

(1) Present state and plans

In line with the railway transportation capacity expansion, China has increased coal-shipping capacities at seven major northern ports. Coal-shipping capacity expansion projects implemented over the recent years include Phases 4 and 5 at Qinhuangdao Port, Phase 2 at Cangzhou Port and at the Shenhua coal terminal (Phase 2) of Tianjin Port. In 2006, the seven ports' capacity totaled 440 million tons, a level viewed as sufficient.

At Tangshan Port, the second largest Chinese coal-shipping port after Qinhuangdao, the first half of Phase 1 construction at Caofeidian port area and construction of a new berth at Jiantang port area are ongoing. Other projects under the 11th five-year Plan include Phase 3 at Tianjin Port, Phase 3 at Cangzhou Port and the second half of Phase 1 construction at Caofeidian port area of Tangshan Port. An additional capacity expansion is under consideration at Qinhuangdao Port (Table 3-4).

Table 3-4 Coal Shipment Port Expansion Projects under Construction or Planning

	Project name	Construction period	Coal shipping capacity (10,000 tons/year)
Tangshan	Jingtang port coal-shipping pier (Berths 32-34)	2006- within 11th 5-year period	3,000
Tangshan	Caofeidian coal-shipping pier (1st half of Phase 1)	2006—2008	5,000
Tianjin	4th loading line	2006—2007	1,500~2,000
Rizhao	Coal pier (Phase 3)	2006—2009	1000
Lianyungang	Channel expansion to accept 150,000DWT-class ships	October 2005—2008	n.a.
Tangshan	Caofeidian coal-shipping pier (2nd half of Phase 1)	After 1st-half completion	5,000
Tangshan	Caofeidian coal-shipping pier (Phase 2)	Starting within 11th 5-year period	10,000
Tianjin	Nanjiang Coal Berths 16-18	2008—2010	3,000~5,000
Gangzhou	Phase 3	2007—2008	3,000

Note: Coal shipping capacity is on a design basis.

The Rizhao port coal pier project (3rd phase) covers construction of a coking coal berth.

Cangzhou Port's coal shipping capacity will reach 100 million tons per year if the third phase project is completed.

Sources: Beijing Xinhua InfoLink Development Co., Ltd.; Interview survey

(2) Forecast

Coal shipments from northern ports are projected at 520 million tons for 2010, including 490 million tons from the seven major ports. The seven ports' coal shipment capacity is expected to reach 600 million tons if their planned expansion is implemented smoothly (Table 3-2, 3-5). The planned expansion projects may be implemented depending on real coal shipments toward 2010.

Table 3-5 Projected Coal Shipment Capacities at 7 Major Northern Ports

	Shipping capacity (10,000 tons/year)			Results (10,000 tons)
	2005	2006	2010	2005
Total	38,500	44,400	59,500	35,001
Qinhuangdao	13,700	18,700	18,700	14,514
Tianjin	7,300	7,300	10,000	7,990
Cangzhou	7,500	8,000	11,000	6,725
Tangshan	3,000	3,000	11,000	1,377
Qingdao	2,300	2,300	2,300	936
Rizhao	2,500	2,500	2,500	2,014
Lianyungang	2,200	2,600	4,000	1,444

Notes: Transportation capacity for Tianjin Port in 2005 and 2006 includes capacity for Beijiang Port.

Capacity for Tianjin Port in 2010 covers only Nanjiang Port. Coal shipments from Beijiang are expected to shift to those from Nanjiang.

Shipping capacity in 2010 covers considerations given to completion of capacity expansion projects shown in Table 3-4.

Sources: Transportation capacity: Data from Beijing Xinhua InfoLink Development Co., Ltd.; Interview survey

Results (2005): National Development and Reform Committee's Institute for Comprehensive Transportation, Reports at JAPAC Seminar (November 2006)

Coal shipments from northern ports in 2020 are projected at 690 million tons, including 640 million tons from the seven major ports. In and after 2011, Phase 2 construction for Caofeidian at Tangshan Port will be

implemented. At ports other than the seven major ones, coal-shipping piers may be developed. Northern ports may thus expand their total coal-shipping capacity to exceed demand for shipments.

Conclusion

In China, demand is expected to increase in the future for coal as fuel for electricity generation, as coke material for steelmaking and as an energy source for other industrial activities. Coal may thus remain a key primary energy for supporting sustainable economic development in China. Its domestic coal production will meet most of its increasing demand. Under the 11th Five-year Plan, therefore, China is seeking to build the coal industry's base through structural production reforms and to implement production adjustments and coal resources conservation for sustainable development of the coal industry. At the same time, China is developing infrastructure for coal transportation as existing coal transportation networks have remained bottlenecked for coal supply. These projects' smooth progress is expected to stabilize China's coal supply. Under the 12th and later Five-year Plans, China may expand coal production capacity and develop coal transportation infrastructure in a bid to sustain stable supply over a medium to long term.

China now consumes some 40% of world coal supply at present. It will expand its share on growing consumption. China's coal demand situation may thus have increasing influences on Asian and global coal markets. Coal demand is expected to grow in the world, including Asia. As well as China, India is likely to rapidly expand coal consumption. South Korea, Taiwan and Southeast Asian nations are also predicted to increase coal consumption. Under such situation, stability of China's coal supply/demand relationship and its coal imports and exports would be indispensable for stable coal supply in Asia or the world. In this sense, whether China's ongoing coal industry development policy would make smooth progress or not would be significant not only for China but also for Asia and the world, particularly for East Asia. Such progress will have to be watched closely along with the Chinese coal supply/demand relationship including imports and exports.

Inquiry: report@tky.ieej.or.jp