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Asia/World Energy Outlook

-- Burgeoning Asian economies and the changing energy supply-demand structure --

The Institute of Energy Economics, Japan (IEEJ)

Summary and implications

[Major results]

● Economic growth

The world economy is projected to grow at an average of 2.7 percent per annum for the period from 2000 to 2020. Asia excluding Japan is expected to grow much faster, at 5.4 percent per annum, and China faster still, at just over 7.0 percent per annum. So Asia and China will play increasingly important roles in global economic and energy matters.

● Primary energy consumption

World primary energy consumption is projected to expand at an average annual growth rate of 2.1 percent by 2020. The increase would amount to some 13.6 billion tons oil equivalent (btoe), about 1.5 times more than the 9.1 btoe in 2000, and about 3.5 times Japan's current gross energy consumption. About 70 percent of the increase would be accounted for by non-OECD member economies, two thirds of which are from the Asian region. Fossil fuels are estimated to account for almost all (90 percent) of the increase in consumption and therefore are expected to be an important energy resource. More specifically, oil is forecast to have the lion's share of the increase at about 36 percent, followed by coal at 35 percent and natural gas, at 17 percent.

● Electrification and power supply

The diffusion of electrical power is expected to expand in Asia along with the rise in the standard of living boosted by its strong economic growth. Over the 20-year period, electric power consumption is expected to increase and achieve a 2.2-fold increase that would result from a growing power demand and more development of energy infrastructure. Regional power supply in Asia is forecast to shift towards more coal-fired power plants, given its abundant reserves and economic advantage, and natural gas-fired plants, with its high generation efficiency and environmentally benign characteristics. Coal-fired power plants will remain the single largest power supply source, and 90 percent of increased coal use will occur in the power sector.

● Motorization in Asia as a whole

Developing Asian economies are currently at the threshold of becoming a motorized society and are fast becoming more motorized as their standards of living improve. This, in turn, would bring an increase in the demand for oil, along with the expanded demand for transportation fuel. Asian oil consumption is forecast to rise from about 19 million barrels per day (Mbpd) in 2000 to 35 Mbpd in 2020, an increase of about 16 Mbpd in 20 years. This is about three times as much as the level of oil consumption in Japan today.

● Motorization in China

In China, the automobile holdings (i.e., the number of vehicles on the road) are expected to increase to about 120 million (about 1.5 times that of Japan today) by 2020, an increase of 100 million from 2000. On a per capita basis, this would amount to a diffusion rate of about 8% in 2020, quite a modest number when compared with other developed economies' average of 53 percent in 2000, which projection suggests that more is expected from China's potential for motorization beyond 2020. It is believed that the spread of automobile ownership in China would have an extremely huge impact on oil markets.

● CO_2 emissions

Over the next 20 years, anthropogenic emissions of carbon dioxide (CO_2) in Asia will increase to as much as 1.9 times as a result of expanded consumption of fossil fuels. The region will account for about 50 percent of the increase in emissions worldwide, with China accounting for about 30 percent. Increase in emissions in Japan will be very minimal.

[Implications]

- The increase in demand for oil in Asia will most likely amplify the dependency on shipments from other regions (particularly the Middle East) due to the lack of prospects for a commensurate supply in the region itself. An assurance of energy security would therefore turn out to be a vital task. Although it is naturally important for economies to ensure the security of its energy supplies, there is also a tendency that excessive pursuit of national interest by any single economy could affect the energy security of other economies in the region. It is therefore becoming increasingly important for the energy security issue to be treated as "one-issue" where all economies in the region have a common stake.

- The pursuit of the best energy mix is another item with which each economy could approach in relation to its own level of energy demand, available resources, level of technology, and economic conditions. It is however extremely important to retain the perspective of optimizing the mix in the regional context. In Asia, the use of coal is expected to expand, especially in the power sector, and this would further heighten the importance of efficient and clean utilization. Utilization of natural gas is also expected to increase in Asia, in response to the increasing demand from the power and residential/commercial sectors. This would lead to a need for an improvement of its economic feasibility. For example, the Asia-Oceania region has a fully sufficient supply potential for natural gas over the long term, and it is imperative for the net consumer economies to collaborate its efforts to assure economic merit by exercise of stronger bargaining power.

- The outlook for a rapid increase in CO_2 emissions in China and other countries in Asia (excluding Japan) only indicates the modest effect of the domestic emission countermeasures in Japan over world CO_2 emissions. To achieve a far larger and greater overall benefit (from the mitigation of environmental burden) therefore would be to pursue the transfer of technology to other economies in Asia and the other regions where the demand for energy is booming.

In Asia (particularly East Asia), the achievement of the "three Es" (economic development, energy security, and environmental preservation) could no longer be viewed as a task to be addressed by each economy separately. Instead, it should be approached through region-wide cooperation - a goal of common interest. Likewise, the perspective of region-wide optimization, as opposed to the pursuit of national interest, should take on increasing importance. In this context, Japan could play a critical role as a leader in the context of technology, infrastructure, economic power, and institutional design. Japan could regard this role not only to fulfill its assistance obligations as a developed economy, but also as a huge opportunity for the improvement of its business, ensuing from energy development and environmental preservation.

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-- Burgeoning Asian economies and the changing energy supply-demand structure --

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Research objective

In the wake of the Cold War economies around the world have become increasingly globalized against the background of trends such as the transition to market economies and the spread of information technology (IT). The countries (and territories) of Asia have achieved an overall high rate of economic growth thanks to the fast-paced expansion of trade and foreign direct investment (FDI), close mutual economic ties, and industrialization. In the process, they have made the region into the growth center for the entire world economy. Due to its economic advances, the region has also become a market with tremendous impact on the global energy supply and demand. The medium-to-long-term outlook for the global energy supply and demand envisions continued strong economic growth in Asia and a rapid rise in its energy demand. If so, the promotion of efforts to assure energy supply and demand stability and address energy and environmental problems, from a perspective embracing all of Asia and in cooperation with the other countries in the region, will become of crucial importance for Japan in its future deployment of international energy policy.

Table 1 Major energy and economic indicators

		Asia			World		
				Average annual growth rate (AAGR)(%)			Average annual growth rate (AAGR)(%)
		2000	**2020**	**2000-2020**	**2000**	**2020**	**2000-2020**
GDP (billions of US dollars at 1995 value)		9,361	17,805	3.3	34,251	58,570	2.7
	GDP (developing Asia*)	3,673	10,432	5.4			
Population (millions)		3,322	4,095	1.1	6,179	7,710	1.1
Primary energy consumption (millions of tons of oil-equivalent; Mtoe)		2,423	4,570	3.2	9,057	13,593	2.1
	Coal (Mtoe)	1,049 (43%)	1,811 (40%)	2.8	2,325 (26%)	3,489 (26%)	2.0
	Oil (Mtoe)	938 (39%)	1,720 (38%)	3.1	3,494 (39%)	5,072 (37%)	1.9
	Natural gas (Mtoe)	237 (10%)	598 (13%)	4.7	2,107 (23%)	3,490 (26%)	2.6
Final energy consumption (Mtoe)		1,511	2,826	3.2	6,103	8,900	1.9
	Transportation sector (Mtoe)	346 (23%)	786 (28%)	4.2	1,781 (29%)	2,730 (31%)	2.2
	Power sector (Mtoe)	276 (18%)	619 (22%)	4.1	1,088 (18%)	1,935 (22%)	2.9
CO_2 emissions (millions of tons of carbon-equivalent; Mt-C)		1,975	3,627	3.1	6,507	9,852	2.1
GDP per capita of population (US dollars at 1995 value/person)		2,818	4,348	2.2	5,544	7,596	1.6
Primary Energy consumption per capita of population (toe/person)		0.73	1.12	2.1	1.47	1.76	0.9
Primary Energy consumption per unit of GDP**		259	257	-0.04	264	232	-0.65
CO_2 emissions per unit of GDP***		211	204	-0.18	190	168	-0.61
CO_2 emissions per unit of primary energy consumption****		0.815	0.794	-0.13	0.718	0.725	0.04
Automobile ownership volume (millions of vehicles)		140	336	4.5	757	1,222	2.4
Automobile ownership volume per thousand of population (vehicles per thousand of population)		42	82	3.4	123	159	1.3

* Asia excluding Japan ** toe/millions of US dollar at 1995 value *** t-C/millions of US dollar at 1995 value
**** t-C/toe Note: Figures in parentheses indicate percentage shares of totals.

The objective of this research lay in producing a quantified profile of the future configuration of energy supply and demand in the world as a whole and Asia in particular to 2020, by applying econometric means. The free trade agreements (FTAs) and other strong ties of interdependence among the economies in the region are expected to develop further and keep rates of economic growth on high levels. Focusing on this region, the research consisted of comprehensive investigation of its energy economics. Thus far, the Institute has executed programs of research on various topics with a focus on the region of Asia. The preparation of this outlook drew upon the findings of these programs. This was supplemented by an in-depth analysis of the situation in each country based on extensive information-sharing with counterpart institutions in other Asian countries through long-standing network links with them, in order to bring the resulting portrait of the supply and demand closer to reality.

[Major conclusions]

1. Socioeconomic outlook

With the continued drive provided by the Asian economy, the world economy is expected to exhibit moderate growth at an overall rate of 2.7% over the forecast period (i.e., the years 2000 - 2020).

By region, North America and the European members of the Organization for Economic Cooperation and Development (OECD) are anticipated to exhibit stable economic growth at respective annual average rates of 2.6% and 2.0%. In the non-OECD countries of Europe such as the former Soviet Union, economies are getting on the path of sustained growth following the dismemberment of the Soviet Union in the 1990s, and are forecast to attain a corresponding rate of 3.3% as a whole. As for Asia (outside Japan), in spite of some uncertainty associated with the prospects for economic growth in developed countries in other regions, the forecast is continued strong growth at a rate of 5.4%, owing to the presence of economies with enormous markets such as China, the Association of Southeast Asian Nations (ASEAN), and India, as well as the reinforcement of mutual interdependence in the region and swift technological progress.

With the support of its surging domestic demand, the Chinese economy in particular sustained high rates of growth throughout the 1990s, and has kept them in the range of 7 - 9% with the start of the 2000s. It managed to record growth of 7.3% in 2001 in spite of deceleration of the U.S. economy and slumping performance among Asian newly industrializing economies (NIEs) and the ASEAN countries. Furthermore, following its admission into the World Trade Organization (WTO) in 2002, China posted high rates of economic growth, at 8.0% in that year and 9.1% in 2003. Although it is saddled with an array of problems such as internal economic disparities, the need for reform of state enterprises, unemployment, and bad debt, China should be able to achieve high-order growth at rates averaging 7.2% over the long term, provided that it continues to practice proper macroeconomic management. The forecast for Japan is comparatively low growth at a corresponding rate of 1.3% owing to factors such as economic maturation and the decline in the labor population accompanying population decrease and aging.

On the population front, although birthrates are tending to move downward in developing countries as they make economic progress, the world population is forecast to continue exhibiting a basic tone of expansion and reach some 7.7 billion in 2020 as compared to about 6.2 billion in 2000. Among the developed countries, a sustained increase is projected in the United States of America, but the tempo should slow to a gradual level. The U.S. share of the world population is therefore not expected to expand. Japan's population is forecast to go into gradual decline after peaking within the next few years. In Europe, too, the population is projected to peak out from 2010 to 2020. In Asia, on the other hand, it is anticipated to continue growing, albeit at lower rates. In 2020, it is estimated that the countries of China and India will have respective populations of 1.4 and 1.3 billion, and that Asia as a whole will account for 53% of the world population increase.

The outlook for crude oil prices was prepared on the basis of the price estimates in documents such as the Annual Energy Outlook (AEO) released by the Department of Energy (EIA/DOE) in the United States. It envisages a moderate rise over the long term as oil production costs increase, with the per-barrel price reaching 24

dollars in 2010 and 27 dollars in 2020 (at 2000 values; the nominal price figures are 29 and 40 dollars, respectively).

As for natural gas prices, the general view is that they are linked with crude oil prices. However, in this outlook, which took account of those of the International Energy Agency (IEA) and other institutions, it was assumed that they would not rise as fast as crude oil prices, in light of the ample supply capacity supported by new projects and more flexible price determination methods. The historical trend shows that coal prices do not have a very strong correlation with crude oil prices, and the forecast levels, which were based on the IEA outlook and other data, incorporate only a gradual increase in production costs.

2. World energy demand outlook

2.1 Primary energy consumption outlook

World primary energy consumption is forecast to increase at an average annual rate of 2.1% over the forecast period, much higher than the corresponding rate of 1.7% over the preceding 20-year period (1980 - 2000). The volume in 2020 is expected to reach 13.6 billion oil-equivalent tons, a 1.5-fold increase from the 9.1 billion tons in 2000.

About 70% of the increase in energy consumption over the forecast period would derive from the non-OECD countries (mainly developing ones). The non-OECD Asian countries should account for about two-thirds of the total, and China, for about 30%.

Along with population increase and economic growth, the share of the world primary energy consumption occupied by non-OECD countries is expected to increase from 41% in 2000 to 51% in 2020. Conversely, that occupied by OECD countries is forecast to shrink from 59% to 49%. The Asian share is forecast to rise from 27% in 2000 to 34% in 2020, and the Chinese share, from a corresponding 10 to 15%. China is now the world's biggest energy consumer after the United States, and it should near the U.S. consumption level by 2020. As such, its presence in the global energy market should become even larger.

Table 2 World primary energy consumption

Primary energy consumption	Millions of toe			Share (%)			AAGR (%)	
	1980	**2000**	**2020**	**1980**	**2000**	**2020**	**1980-2000**	**2000-2020**
Total	**6,481**	**9,057**	**13,593**	**100**	**100**	**100**	**1.7**	**2.1**
Coal	1,782	2,325	3,489	27	26	26	1.3	2.0
Oil	3,008	3,494	5,072	46	39	37	0.8	1.9
Natural gas	1,239	2,107	3,490	19	23	26	2.7	2.6
Nuclear	186	676	781	2.9	7.5	5.7	6.6	0.7
Hydro	148	223	339	2.3	2.5	2.5	2.1	2.1
Geothermal	12	45	123	0.2	0.5	0.9	6.6	5.2
Other renewables	106	187	299	1.6	2.1	2.2	2.9	2.4

2.2 Outlook for fossil fuel consumption

Fossil fuels (coal, oil, and natural gas) are expected to contribute about 90% of the increase in primary energy consumption over the years 2000 - 2020, and therefore should continue to play a major role as energy sources. Consumption of oil is predicted to show the largest increase of all fossil fuels and account for 35% of the increase in primary energy consumption, followed by natural gas at 30% and coal at 26%.

World oil consumption is forecast to rise from the order of 70 million barrels per day in 2000 to that of 102 million barrels per day in 2020, for an increase rate of 1.9%. By region, Asia should account for about 50% of this increase. By sector, it is estimated that about 60% will come from the transportation sector. The share occupied by oil in primary energy consumption is forecast to decline slightly, from 39% in 2000 to 37% in 2020, but oil would nevertheless remain the single-largest energy source.

Consumption of natural gas, which came to 2,341 billion cubic meters in 2000, is forecast to hit 3,877 billion cubic meters in 2020, for an average annual increase rate of 2.6%, the highest among the fossil fuels. Installation of combined-cycle power generation systems fueled with natural gas is steadily spreading due to advances in utilization technology and considerations of environmental compatibility. About 60% of the increase in natural gas consumption should come from fuel input into the power sector. Expanded utilization led by this sector is expected to drive an increase in the natural gas share of primary consumption, from 23% in 2000 to 26% in 2020.

In oil-equivalent terms, world coal consumption is forecast to rise from 2.325 billion tons in 2000 to 3.489 billion tons in 2020, for an average annual increase rate of 2.0%. By region, Asia should account for about 70% of this increase, and China, about 40%. By sector, about 90% should come from the power sector as the trend toward input as fuel for generation deepens. The coal share of primary energy consumption should remain more or less unchanged at around 26% over the years 2000-2020.

2.3 Outlook for other fuel consumption

In oil-equivalent terms, consumption of power generated by nuclear power plants is forecast to rise from 676 million tons in 2000 to 781 million tons in 2020, for an average annual increase rate of 0.7%. The nuclear share of primary energy consumption is expected to decline from 8% in 2000 to 6% in 2020 owing to the fast-paced expansion of natural gas utilization in the power sectors of developed countries in North America and Europe and their virtual lack of prospects for construction of additional nuclear power plants. The increase in the generated output of nuclear power plants should be confined almost exclusively to a few countries in Asia. In East Asia, nevertheless, nuclear power will continue to play a vital role in Japan, South Korea, and Taiwan, which have few domestic energy resource reserves, and China, with its rapidly growing demand for electricity.

There are high hopes for the diffusion of renewable energy sources with little environmental burden, such as hydropower, geothermal energy, and new energy. Their share of primary energy consumption is forecast to increase from 5% in 2000 to 6% in 2020. However, they are not going to rank on a par with fossil resources as pillars of the base energy supply, due to their high supply cost and supply instability deriving from natural influences, such as the intermittent nature of photovoltaics and wind power.

2.4 Outlook for final energy consumption

Table 3 World final energy consumption

Final energy consumption	Millions of toe			Share (%)			AAGR (%)	
Sector	**1980**	**2000**	**2020**	**1980**	**2000**	**2020**	**1980-2000**	**2000-2020**
Total	**4,684**	**6,103**	**8,900**	**100**	**100**	**100**	**1.3**	**1.9**
Industry	1,896	2,154	2,944	40	35	33	0.6	1.6
Transportation	1,146	1,781	2,730	24	29	31	2.2	2.2
Residential/ Commercial	1,466	1,987	2,974	31	33	33	1.5	2.0
Non-energy, etc.	176	180	251	3.8	3.0	2.8	0.1	1.7
Energy source								
Total	**4,684**	**6,103**	**8,900**	**100**	**100**	**100**	**1.3**	**1.9**
Coal	699	524	618	15	8.6	6.9	-1.4	0.8
Oil	2,347	2,970	4,379	50	49	49	1.2	2.0
Natural gas	832	1,151	1,578	18	19	18	1.6	1.6
Electricity	585	1,088	1,935	12	18	22	3.1	2.9
Heat	120	237	262	2.6	3.9	2.9	3.4	0.5
Renewables	100	133	128	2.1	2.2	1.4	1.4	-0.2

Consumption of electrical power, a sophisticated form of energy utilization, grew at a swift rate averaging 3.1% annually over the years 1980 - 2000. Over the forecast period, it is expected to grow at a corresponding one of 2.9% and undergo a 1.8-fold increase relative to 2000. By sector, the swiftest increase is anticipated in the residential and commercial sector at 3.2%. By region, consumption is forecast to grow at a 2.0% pace in the OECD countries as opposed to 4.1% in Asia as income levels rise in the latter. The share of final energy consumption occupied by petroleum products was 49% in 2000 and is anticipated to remain in that area. Such products therefore should continue to account for almost half of the total. Energy consumption in the transportation sector, which has a massive demand for petroleum products, is forecast to increase at an average annual rate of 2.2% as a reflection of motorization in developing countries.

2.5 Outlook for the power generation structure

In 2000, coal-fired power accounted for the single-largest share of the world generated output at 39%. The remainder was taken up by natural-gas-fired power, nuclear power, and hydropower. The outlook for the forecast period contains a shift to natural-gas-fired power along with the spread of new technology such as combined-cycle systems fueled with natural gas and efforts to alleviate environmental load. The share of the total generated output occupied by natural-gas-fired power is forecast to jump from 17% in 2000 to 27% in 2020. That occupied by coal-fired power, which was 39% in 2000, is anticipated to stay on that level even as of 2020. Coal-fired power should remain the single-largest power supply source. In China and India in particular, it is anticipated to be the key source for supply of the rapidly expanding demand for power. Meanwhile, the share occupied by oil-fired power is likely to continue in a basic trend of decline, especially in the developed countries. It is estimated that the nuclear power share will shrink from 17% in 2000 to 11% in 2020, because of the almost complete lack of additional plant construction in developed countries, which are also leaning toward the decommissioning of aging facilities without replacement.

Table 4 World power generation

Electricity generation	(TWh)			Share (%)			AAGR(%)	
	1980	**2000**	**2020**	**1980**	**2000**	**2020**	**1980-2000**	**2000-2020**
Total	**8,246**	**15,375**	**27,518**	**100**	**100**	**100**	**3.2**	**3.0**
Coal	3,139	6,014	10,842	38	39	39	3.3	3.0
Oil	1,655	1,225	1,689	20	8.0	6.1	-1.5	1.6
Natural gas	991	2,679	7,318	12	17	27	5.1	5.2
Nuclear	713	2,591	2,998	8.7	17	11	6.7	0.7
Hydro	1,719	2,632	3,941	21	17	14	2.2	2.0
Geothermal	14	50	140	0.2	0.3	0.5	6.7	5.3
Other renewables	14	185	589	0.2	1.2	2.1	13.7	6.0

3. Energy supply-demand outlook in Asia

3.1 Outlook for primary energy consumption

Primary energy consumption in Asia is forecast to grow at an average annual rate of 3.2% and reach 4.6 billion oil-equivalent tons in 2020, for a 1.9-fold increase from the corresponding total of 2.4 billion tons in 2000. Stronger growth is anticipated in countries achieving fast-paced economic growth, such as China, India, Vietnam, Thailand, Malaysia, and Indonesia. About 50% of the consumption increase over the period in question should derive from expanded consumption in China, followed by India at about 20%, Indonesia and South Korea at about 5% each, and Thailand, Malaysia, and the Philippines at about 3% each. Japan's share of the increase is expected to be held to about 2%, or around the same level as that of Vietnam, which is anticipated to achieve rapid economic growth. The share of the primary energy consumption in Asia occupied by China is forecast to expand from 38% in 2000 to 45% in 2020. The outlook also envisions a corresponding expansion from 13 to 15% for

India, 4 to 5% for Indonesia, and 2 to 3% for Thailand. In contrast, the share occupied by Japan is predicted to decline from 22% in 2000 to 12% in 2020 owing to factors such as economic maturation and population decrease, thereby ranking the country third in this connection, behind China and India.

Table 5 Primary energy consumption in Asia

Primary energy consumption	Millions of toe			Share (%)			AAGR (%)	
	1980	2000	2020	1980	2000	2020	1980-2000	2000-2020
Total	**1,054**	**2,423**	**4,570**	**100**	**100**	**100**	**4.2**	**3.2**
Coal	469	1,049	1,811	44	43	40	4.1	2.8
Oil	485	938	1,720	46	39	38	3.3	3.1
Natural gas	52	237	598	4.9	10	13	7.9	4.7
Nuclear	25	132	247	2.4	5.4	5.4	8.6	3.2
Hydro	20	38	91	1.9	1.6	2.0	3.3	4.4
Geothermal	2.6	16	52	0.2	0.6	1.1	9.4	6.2
Other renewables	0.4	13	52	0.03	0.6	1.1	19.8	7.0

3.2 Outlook for fossil fuel consumption

In Asia, fossil fuels (coal, oil, and natural gas) are expected to continue to have a vital place as sources of energy, and to account for about 90% of the increase in primary energy consumption over the forecast period, as in the world as a whole. Among the fossil fuels, oil is anticipated to have the largest share of the increase at 36%, followed by coal at 35% and natural gas at 17%.

Consumption of oil, which was on the order of 19 million barrels per day in 2000, is anticipated to increase by an average annual rate of 3.1% and hit that of 35 million barrels per day in 2020. By region , it is estimated that China will account for about 50% of the increase, and India, about 20%. By sector, about 60% should derive from transportation, with the residential/commercial and industrial sectors accounting for about 20% respectively. The oil share of primary energy consumption should stay on roughly the same level; it is expected to dip from 39% in 2000 to 38% in 2020.

Consumption of natural gas is forecast to undergo a 2.5-fold increase, from 263 billion cubic meters in 2000 to 664 billion cubic meters in 2020, for growth at the highest rate of all fossil fuels (an annual average of 4.7%). It is estimated that about 50% of the consumption increase will derive from input as fuel in the power sector, and about 20%, from the expanded demand in the residential/commercial sector along with the spread of urbanization accompanying economic growth. The natural gas share of Asian primary energy consumption is predicted to rise from 10% in 2000 to 13% in 2020, but the natural gas shift should be slower than in North America and Europe.

Consumption of coal is forecast to rise from the order of 1.049 billion oil-equivalent tons in 2000 to 1.811 billion tons in 2020, for an average annual increase rate of 2.8%. It is estimated that China will account for about 70% of the increase, and India, about 20%. By sector, about 90% of the increase should derive from power generation, and the remaining 10%, from industry. While its share of primary energy consumption is forecast to slip from 43% in 2000 to 40% in 2020, coal should retain the single-largest share of the primary energy supply in Asia.

3.3 Outlook for other fuel consumption

In Asia, consumption of power generated by nuclear power plants is forecast to increase at an annual average rate of 3.2%, from 132 million oil-equivalent tons in 2000 to 247 million tons in 2020. Almost all of the corresponding global increase should come from Asia. There are good prospects for expansion in China and in countries with few domestic reserves of energy resources, such as Japan, Korea, and India. China is predicted to account for about 50% of the nuclear power increase in Asia. The nuclear share of the primary energy consumption should stay on the order of 5% over the period in question. The share occupied by renewable

energies (e.g., hydropower, geothermal energy, and new energy) is expected to increase from 3% in 2000 to 4% in 2020. It should be noted, however, that energy consumption is forecast to expand rapidly in the region, and this will make quick response to assure a stable supply of energy a matter of the highest priority. These circumstances would act to limit utilization of renewable energies, whose supply can be unstabilized by natural conditions (except for hydropower and geothermal energy). Nevertheless, installation of new energy systems with low environmental loads will continue to be a key agenda item.

3.4 Outlook for final energy consumption

In Asia, fast-paced economic growth is being linked to an upgrading of the industrial structure, rise in the standard of living, and rapid increase in consumption of electrical power. Power consumption increased at an average annual rate of 5.9% from 1980 to 2000, and is forecast to increase at one of 4.1% over the forecast period. By sector, the rate of increase is expected to be the highest in the residential/commercial sector at 4.8%. By region, China has the highest corresponding rate at 5.5%, followed by India at 5.2%. Against the backdrop of steady motorization, the share of the final energy demand occupied by petroleum products is forecast to expand from 50% in 2000 to 52% in 2020. Like that of home electrical products, the diffusion of the automobile is one of the most symbolic indicators of a tangible rise in the standard of living, and the general trend of motorization is bound to deepen.

Table 6 Final energy consumption in Asia

Final energy consumption	Millions of toe			Share (%)			AAGR (%)	
Sector	**1980**	**2000**	**2020**	**1980**	**2000**	**2020**	**1980-2000**	**2000-2020**
Total	**755**	**1,511**	**2,826**	**100**	**100**	**100**	**3.5**	**3.2**
Industry	393	708	1,118	52	47	40	3.0	2.3
Transportation	133	346	786	18	23	28	4.9	4.2
Residential/Commercial	208	416	863	27	28	31	3.5	3.7
Non-energy, etc.	21	41	60	2.8	2.7	2.1	3.3	1.9
Energy source								
Total	**755**	**1,511**	**2,826**	**100**	**100**	**100**	**3.5**	**3.2**
Coal	302	346	427	40	23	15	0.7	1.1
Oil	333	763	1,471	44	50	52	4.2	3.3
Natural gas	25	94	240	3.3	6.2	8.5	6.9	4.8
Electricity	88	276	619	12	18	22	5.9	4.1
Heat	7.5	28	64	1.0	1.9	2.3	6.9	4.2
Other renewables	0	3.7	4.4	0	0.2	0.2	-	0.9

3.5 Outlook for the generation structure

In Asia, many countries have abundant reserves of coal, and coal-fired power plants accounted for about 50% of the region's generated output in 2000, the remainder being taken up by natural-gas-fired plants, nuclear power, and hydropower. Oil-fired power plants also generated about 10% of the supply. Over the forecast period, the structure should shift to natural gas along with increased installation of combined-cycle generation systems fueled with it, but coal-fired power generation should also continue to increase in line with policy for effective use of domestic resources. With expanded utilization in China, India, and Indonesia, the coal-fired share is predicted to expand from 51% in 2000 to 54% in 2020 as such plants acquire even more weight as the majority source. Meanwhile, the natural-gas-fired share is anticipated to experience a corresponding expansion from 13 to 17%. The installed capacity of nuclear power is projected to increase in countries including China, South Korea, and India, but its share of the generated output in the region as a whole is forecast to fall from 13% in 2000 to 11% in 2020.

Table 7 Power generation in Asia

Electricity generation	(TWh)			Share (%)			AAGR(%)	
	1980	2000	2020	1980	2000	2020	1980-2000	2000-2020
Total	**1,193**	**3,966**	**8,985**	**100**	**100**	**100**	**6.2**	**4.2**
Coal	301	2,037	4,896	25	51	54	10.0	4.5
Oil	470	384	420	39	10	5	-1.0	0.5
Natural gas	91	519	1,486	7.6	13	17	9.1	5.4
Nuclear	97	505	949	8.2	13	11	8.6	3.2
Hydro	231	480	1,057	19	12	12	3.7	4.0
Geothermal	3.0	18	60	0.2	0.4	0.7	9.4	6.3
Other renewables	0	22	116	0	0.6	1.3	-	8.6

4. Outlook for CO_2 emissions

As fossil fuels should be the source for about 90% of the primary energy consumption in the world as a whole over the forecast period, CO_2 emissions, which came to about 6.5 billion (carbon-equivalent) tons in 2000, are forecast to reach about 9.9 billion tons in 2020. They would consequently expand at an average annual rate of 2.1%, about the same as for primary energy consumption, and multiply by a factor of about 1.5. About 70% of this increase would come from non-OECD countries, and about 30%, from China alone.

5. Outlook for motorization

In Asia and other largely developing regions, consumption of gasoline, gas oil, and other transportation fuel is rapidly expanding. Among the developed countries, motorization has already run its course and the demand is more or less saturated. The developing countries of Asia, in contrast, are now at the threshold of motorization, which is anticipated to gather momentum over the coming years as standards of living rise. The expanded consumption of oil associated with motorization in Asia should be a major factor characterizing the structure of energy supply and demand in the region over the medium and long terms. In 2020, the ownership volume in China is forecast to reach about 120 million vehicles (about 1.5 times as many as in Japan today), but this would amount to a diffusion rate of only about 8%, which would still be low as compared to the average in developed countries (53% in 2000). In other words, China would still have margin for further motorization after 2020, and the diffusion of ownership there may be expected to have a tremendous impact on the international oil market.

6. Crude oil and LNG supply and demand in Asia

In the three countries in Northeast Asia (Japan, China, and South Korea), the rate of oil dependence on the Middle East should steadily deepen. Specifically, in 2020, it is forecast to reach about 90% in Japan and 80% in South Korea. In China, too, it is forecast to jump from 15% in 2000 to about 50% in 2020 due to the sharp increase in the oil demand and the leveling off of domestic production. In the process, the corresponding rate of dependence on the Middle East in Northeast Asia as a whole may be expected to rise from 58% in 2000 to approximately 70% in 2020 along with the quantitative expansion of consumption in China. If the three countries begin to import crude oil produced in Siberia (in quantities totaling about 100 million tons per year), the corresponding rate could possibly be lowered by about 11%.

In North Asia (consisting of Japan, China, South Korea, and Taiwan), import of liquefied natural gas (LNG) should total in the range of 120 - 150 million tons in 2020, considering the commencement of natural gas import from Irkutsk and Sakhalin. At present, plans extending to 2010 would increase the LNG supply capacity to the Asia-Pacific market in that year to about 110 million tons, and this could be increased further to about 180 million tons with the execution of additional projects now under study. Assuming that LNG development moves steadily ahead in the second half of the forecast period from 2010, potential for supply to the region should be sufficiently high in 2020.

7. Implications

While the long term holds the prospect of a deepening dependence on the Middle East for the supply of oil in Asia, the region should have an ample supply capacity for natural gas and coal. The simultaneous attainment of energy security, market rationalization, and environmental preservation in Asia demands the construction of the "best mix" of energy sources in each country, considering its situation as regards its amount of energy reserves, geographical conditions, and stage of economic development. Furthermore, formation of an analogous "best mix" in the region as a whole would require extensive utilization of coal and nuclear power alongside natural gas while assuring the stability of the oil supply.

< Assurance of energy security in Asia >

● Strong economic growth and progressive motorization are going to expand the demand for energy in Asia. As noted above, the dependency on the Middle East for supply of oil should deepen, because the regional oil supply would not be able to keep pace with the swift demand expansion. While it is naturally important for the individual countries to make efforts to secure their own energy supplies, there is also a possibility that excessive pursuit of the national interest by any single country could damage the energy security of the rest of the region. It is consequently becoming increasingly important for the issue to be treated as one in which all countries in the region have a common stake.

● To this end, it is imperative for the Asian countries that are net consumers of energy to collaborate with each other in pursuit of the following four major tasks: 1) fuller exercise of bargaining power given their collective position as a massive regional consumer of oil, and strengthening of ties of dialogue and cooperation as equal partners with net oil producers; 2) construction of a shared reserve scheme for response to emergencies and effective use of the existing infrastructure to deal with short-term crises such as supply suspensions; 3) promotion of cooperative resource development and procurement inside and outside the region; and 4) conditioning of international oil markets to give the supply and demand structure more flexibility.

< Pursuit of energy diversification and "best mix" >

Pursuit of the best energy mix is another agenda item to be tackled by each country in accordance with its circumstances as regards energy demand attributes, amount of resource reserves, level of technology, and economic merit. However, it is also vital to retain the perspective of optimizing the mix in the region as a whole, based on cooperation between the net consumers and net suppliers

● Coal has an excellent economic merit but also entails a high environmental load, and its utilization in developed countries could stop expanding as a result. In Asia, there are abundant reserves of coal in countries including China, India, and Indonesia, and the region's utilization of coal is expected to expand, especially in the power sector. This would further heighten the importance of environment-friendly utilization harnessing high-efficiency technology. As viewed from the perspective of energy security and economic merit, it is crucial for Asia to make better use of its abundant coal deposits, and Japan can play a pivotal role in this connection as a technologically advanced country.

● Utilization of natural gas is also projected to expand in Asia, especially in the power and civil sectors. This points to a need for improvement of its economic feasibility. The Asia-Oceania region has a fully sufficient supply potential for natural gas into the long term, and the net consumer countries must collaborate in efforts to heighten the economic merit by exercise of stronger bargaining power, for example. Gas prices have thus far been set through linkage to crude oil prices because of the competition with oil, but competition with coal is going to carry increasing weight in the future.

● In the developed countries of Europe and North America, construction of additional nuclear power plants has essentially been halted, and the installed capacity is expected to decline. As a result, Asia should be the site of almost all additional nuclear power plants. Many Asian countries have a relatively low level of domestic natural resources, and nuclear power has a major role to play for assurance of supply stability and conquest of environmental problems. There is also a need for intraregional cooperation encompassing the aspects of operation and management in this area.

→ At any rate, it is vital to have various options for energy supply sources. This would be linked not only to higher levels of energy security but also a stronger position in price negotiations for competing fuels.

< Response to global environmental problems >

● The trend of rapid increase in CO_2 emissions in China and other developing Asian countries underscores the limited effectiveness of Japan's emission countermeasures within its borders. As such, a far larger overall benefit would be delivered by mitigation of environmental load through transfer of technology to other countries in Asia and other regions with a burgeoning energy demand.

● Japan should regard this role not merely as a variety of assistance to fulfill its obligations as a developed country but also as a precious opportunity for development of promising business deriving from the environment. China and other developing Asian countries have immense potential for energy conservation, and offer enormous margin for technical assistance through the Clean Development Mechanism (CDM) and other schemes. Japan ranks at the vanguard worldwide in respect of energy-conservation and environmental technology. With its dearth of natural resources, it is crucial for Japan to support the advancement of its economy through extensive use of its undepletable resource - its technology.

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Attached Table 1 World primary energy consumption (by region)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
North America	2,137 (27.4)	2,555 (28.2)	2,863 (25.9)	3,196 (23.5)	1.8	1.1	1.1	1.1
Central and South America	382 (4.9)	526 (5.8)	710 (6.4)	980 (7.2)	3.2	3.0	3.3	3.2
OECD Europe	1,624 (20.8)	1,764 (19.5)	1,953 (17.7)	2,116 (15.6)	0.8	1.0	0.8	0.9
Non-OECD Europe	1,468 (18.8)	1,001 (11.1)	1,197 (10.8)	1,385 (10.2)	-3.8	1.8	1.5	1.6
Africa	201 (2.6)	259 (2.9)	336 (3.0)	455 (3.4)	2.5	2.7	3.1	2.9
Middle East	224 (2.9)	385 (4.3)	492 (4.5)	703 (5.2)	5.6	2.5	3.6	3.0
Asia	60 (21.2)	2,423 (26.8)	3,335 (30.2)	4,570 (33.6)	3.9	3.2	3.2	3.2
China	673 (8.6)	932 (10.3)	1,406 (12.7)	2,063 (15.2)	3.3	4.2	3.9	4.1
Japan	439 (5.6)	525 (5.8)	543 (4.9)	561 (4.1)	1.8	0.3	0.3	0.3
India	187 (2.4)	322 (3.6)	452 (4.1)	684 (5.0)	5.6	3.4	4.2	3.8
Other Asian countries	361 (4.6)	644 (7.1)	934 (8.4)	1,263 (9.3)	6.0	3.8	3.1	3.4
Oceania	102 (1.3)	129 (1.4)	149 (1.3)	166 (1.2)	2.4	1.4	1.1	1.3
Other regions	14 (0.2)	15 (0.2)	18 (0.2)	22 (0.2)	0.9	1.7	1.9	1.8
OECD country total	4,517 (57.8)	5,317 (58.7)	5,981 (54.1)	6,633 (48.8)	1.6	1.2	1.0	1.1
Non-OECD country total	3,293 (42.2)	3,740 (41.3)	5,073 (45.9)	6,961 (51.2)	1.3	3.1	3.2	3.2
World total	7,811 (100.0)	9,057 (100.0)	11,053 (100.0)	13,593 (100.0)	1.5	2.0	2.1	2.1

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 2 Primary energy consumption in Asia (by region)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
China	673 (40.5)	932 (38.5)	1,406 (42.2)	2,063 (45.1)	3.3	4.2	3.9	4.1
Japan	439 (26.4)	525 (21.7)	543 (16.3)	561 (12.3)	1.8	0.3	0.3	0.3
South Korea	93 (5.6)	191 (7.9)	262 (7.9)	303 (6.6)	7.5	3.2	1.5	2.3
India	187 (11.3)	322 (13.3)	452 (13.6)	684 (15.0)	5.6	3.4	4.2	3.8
Indonesia	52 (3.1)	98 (4.1)	144 (4.3)	209 (4.6)	6.5	3.9	3.8	3.9
Taiwan	48 (2.9)	83 (3.4)	110 (3.3)	132 (2.9)	5.6	2.9	1.9	2.4
Singapore	13 (0.8)	25 (1.0)	36 (1.1)	48 (1.1)	6.3	4.0	2.9	3.4
Malaysia	20 (1.2)	47 (1.9)	74 (2.2)	110 (2.4)	8.7	4.6	4.0	4.3
Philippines	18 (1.1)	33 (1.4)	57 (1.7)	96 (2.1)	5.9	5.6	5.5	5.5
Thailand	29 (1.7)	58 (2.4)	89 (2.7)	145 (3.2)	7.3	4.4	5.0	4.7
Vietnam	5.8 (0.3)	14 (0.6)	33 (1.0)	54 (1.2)	9.5	8.7	5.2	6.9
Hong Kong	11 (0.6)	15 (0.6)	18 (0.5)	20 (0.4)	3.8	1.7	1.1	1.4
Other Asian countries	71 (4.3)	80 (3.3)	111 (3.3)	144 (3.2)	1.2	3.4	2.6	3.0
Asian total	60 (100.0)	2,423 (100.0)	3,335 (100.0)	4,570 (100.0)	3.9	3.2	3.2	3.2
Developing Asia	21 (73.6)	1 8 (78.3)	2,792 (83.7)	4,010 (87.7)	4.5	3.9	3.7	3.8

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 3 Primary energy consumption in the world and Asia (by energy source)

World

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
Coal	2,184 (28.0)	2,325 (25.7)	2,888 (26.1)	3,489 (25.7)	0.6	2.2	1.9	2.0
Oil	3,070 (39.3)	3,494 (38.6)	4,140 (37.5)	5,072 (37.3)	1.3	1.7	2.1	1.9
Natural gas	1,672 (21.4)	2,107 (23.3)	2,678 (24.2)	3,490 (25.7)	2.3	2.4	2.7	2.6
Hydro	185 (2.4)	223 (2.5)	282 (2.6)	339 (2.5)	1.9	2.4	1.8	2.1
Geothermal	34 (0.4)	45 (0.5)	73 (0.7)	123 (0.9)	2.9	5.1	5.4	5.2
Nuclear	525 (6.7)	676 (7.5)	747 (6.8)	781 (5.7)	2.6	1.0	0.5	0.7
Other renewables	140 (1.8)	187 (2.1)	246 (2.2)	299 (2.2)	2.9	2.8	2.0	2.4
World total	7,811 (100.0)	9,057 (100.0)	11,053 (100.0)	13,593 (100.0)	1.5	2.0	2.1	2.1
GDP (billions of US dollars at 1995 value)	26,505	34,251	44,901	58,570	2.6	2.7	2.7	2.7
GDP prime units (1990 = 100)	100.0	89.7	83.5	78.8	-1.1	-0.7	-0.6	-0.7
CO_2 emissions (millions of tons of carbon-equivalent)	5,771	6,507	7,963	9,852	1.2	2.0	2.2	2.1

Asia

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
Coal	801 (48.2)	1,049 (43.3)	1,384 (41.5)	1,811 (39.6)	2.7	2.8	2.7	2.8
Oil	621 (37.4)	938 (38.7)	1,246 (37.4)	1,720 (37.6)	4.2	2.9	3.3	3.1
Natural gas	115 (6.9)	237 (9.8)	392 (11.8)	598 (13.1)	7.5	5.1	4.3	4.7
Hydro	32 (1.9)	38 (1.6)	67 (2.0)	91 (2.0)	1.8	5.7	3.1	4.4
Geothermal	7.2 (0.4)	16 (0.6)	28 (0.8)	52 (1.1)	8.0	6.2	6.3	6.2
Nuclear	77 (4.6)	132 (5.4)	189 (5.7)	247 (5.4)	5.5	3.7	2.7	3.2
Other renewables	7.1 (0.4)	13 (0.6)	29 (0.9)	52 (1.1)	6.5	8.0	6.1	7.0
Asian total	1,660 (100.0)	2,423 (100.0)	3,335 (100.0)	4,570 (100.0)	3.9	3.2	3.2	3.2
GDP (billions of US dollars at 1995 value)	6,869	9,361	12,905	17,805	3.1	3.3	3.3	3.3
GDP prime units (1990 = 100)	100.0	107.1	107.0	106.2	0.7	-02	-0.07	-0.04
CO_2 emissions (millions of tons of carbon-equivalent)	1,414	1,975	2,669	3,627	3.4	3.1	3.1	3.1

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 4 Final energy consumption in Asia

(Unit: millions of toe)

		Actual		Forecast		AAGR (%)			
		1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
Breakdown by sector	Industrial sector	574 (50.3)	708 (46.9)	902 (43.6)	118 (39.6)	2.1	2.4	2.2	2.3
	Residential/Commercial sector	3 (29.1)	416 (27.5)	599 (28.9)	863 (30.5)	2.3	3.7	3.7	3.7
	Transportation sector	1 (18.5)	346 (22.9)	522 (25.2)	786 (27.8)	5.1	4.2	4.2	4.2
	Non-energy and other sectors	24 (2.1)	41 (2.7)	46 (2.2)	60 (2.1)	5.4	1.3	2.6	1.9
Breakdown by energy source	Coal	439 (38.5)	346 (22.9)	394 (19.1)	427 (15.1)	-2.3	1.3	0.8	1.1
	Oil	478 (41.8)	763 (50.5)	1,048 (50.7)	1,471 (52.0)	4.8	3.2	3.4	3.3
	Natural Gas	50 (4.4)	94 (6.2)	156 (7.5)	240 (8.5)	6.5	5.2	4.4	4.8
	Electricity	158 (13.8)	276 (18.3)	423 (20.5)	619 (21.9)	5.7	4.4	3.9	4.1
	Renewables	17 (1.5)	32 (2.1)	47 (2.3)	69 (2.4)	6.4	4.0	3.8	3.9
Asian Total		1,142 (100.0)	1,511 (100.0)	2,069 (100.0)	2,826 (100.0)	2.8	3.2	3.2	3.2

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 5 Power generation in Asia

(Unit: TWh)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
Coal	871 (39.1)	2,037 (51.4)	3,177 (52.2)	4,896 (54.5)	8.9	4.5	4.4	4.5
Oil	433 (19.4)	384 (9.7)	382 (6.3)	420 (4.7)	-1.2	-0.0	0.9	0.5
Natural gas	233 (10.4)	519 (13.1)	940 (15.4)	1,486 (16.5)	8.4	6.1	4.7	5.4
Hydro	371 (16.7)	480 (12.1)	777 (12.8)	1,057 (11.8)	2.6	4.9	3.1	4.0
Geothermal	8.3 (0.4)	18 (0.4)	33 (0.5)	60 (0.7)	7.9	6.2	6.3	6.3
Nuclear	294 (13.2)	505 (12.7)	726 (11.9)	949 (10.6)	5.5	3.7	2.7	3.2
Other renewables	17 (0.8)	22 (0.6)	54 (0.9)	116 (1.3)	2.9	9.4	7.9	8.6
Asian total	2,227 (100.0)	3,966 (100.0)	6,089 (100.0)	8,985 (100.0)	5.9	4.4	4.0	4.2

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ
Note: 1. Figures in parentheses indicate percentage shares of totals.
2. Figures for other renewables, include photovoltaic generation, wind power, and other such sources.

Attached Table 6 World primary energy consumption (Coal)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
North America	483 (22.1)	572 (24.6)	726 (25.1)	832 (23.8)	1.7	2.4	1.4	1.9
Central and South America	20 (0.9)	29 (1.2)	33 (1.1)	37 (1.1)	3.5	1.5	1.3	1.4
OECD Europe	436 (20.0)	321 (13.8)	317 (11.0)	360 (10.3)	-3.0	-0.1	1.3	0.6
Non-OECD Europe	331 (15.1)	208 (9.0)	277 (9.6)	276 (7.9)	-4.5	2.9	-0.0	1.4
Africa	74 (3.4)	90 (3.9)	90 (3.1)	89 (2.5)	2.0	0.0	-0.2	-0.1
Middle East	3 (0.1)	8 (0.3)	6 (0.2)	23 (0.7)	10.0	-2.2	14.1	5.6
Asia	801 (36.7)	1,049 (45.1)	1,384 (47.9)	1,811 (51.9)	2.7	2.8	2.7	2.8
China	535 (24.5)	6 (28.2)	878 (30.4)	1,158 (33.2)	2.1	3.0	2.8	2.9
Japan	74 (3.4)	94 (4.0)	97 (3.4)	101 (2.9)	2.4	0.4	0.3	0.4
India	107 (4.9)	176 (7.6)	217 (7.5)	305 (8.8)	5.1	2.1	3.5	2.8
Other Asian countries	85 (3.9)	124 (5.3)	191 (6.6)	246 (7.1)	3.8	4.4	2.6	3.5
Oceania	36 (1.7)	48 (2.1)	54 (1.9)	58 (1.7)	3.0	1.1	0.8	0.9
Other regions	1.0 (0.0)	.1 (0.0)	1.6 (0.1)	2.3 (0.1)	1.2	3.6	3.9	3.7
OECD country total	1,058 (48.4)	1 (46.5)	1,265 (43.8)	1,426 (40.9)	0.2	1.6	1.2	1.4
Non-OECD country total	1,127 (51.6)	4 (53.5)	1,623 (56.2)	2,063 (59.1)	1.0	2.7	2.4	2.6
World total	2,184 (100.0)	2,325 (0.0)	2,888 (100.0)	3,489 (100.0)	0.6	2.2	1.9	2.0

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 7 Primary energy consumption in Asia (Coal)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
China	535 (66.8)	656 (62.5)	878 (63.5)	1,158 (64.0)	2.1	3.0	2.8	2.9
Japan	74 (9.2)	94 (8.9)	97 (7.0)	101 (5.6)	2.4	0.4	0.3	0.4
South Korea	25 (3.2)	39 (3.8)	63 (4.6)	66 (3.6)	4.5	4.9	0.4	2.6
India	107 (13.3)	176 (16.7)	217 (15.7)	305 (16.9)	5.1	2.1	3.5	2.8
Indonesia	4.0 (0.5)	14 (1.3)	25 (1.8)	39 (2.2)	13.2	6.4	4.4	5.4
Taiwan	11 (1.4)	29 (2.8)	37 (2.7)	51 (2.8)	10.1	2.3	3.2	2.8
Singapore	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-100.0	-	-	-
Malaysia	0.9 (0.1)	1.7 (0.2)	9 (0.6)	14 (0.8)	6.9	18.2	4.7	11.2
Philippines	1.3 (0.2)	5.0 (0.5)	5.1 (0.4)	6.9 (0.4)	14.5	0.2	3.1	1.6
Thailand	3.8 (0.5)	7.5 (0.7)	13 (0.9)	20 (1.1)	7.0	5.3	4.5	4.9
Vietnam	2.5 (0.3)	3.7 (0.4)	6.3 (0.5)	8.2 (0.5)	4.1	5.5	2.6	4.1
Hong Kong	5.5 (0.7)	3.7 (0.4)	6.5 (0.5)	8.7 (0.5)	-3.8	5.7	2.9	4.3
Other Asian countries	31 (3.8)	20 (1.9)	26 (1.9)	33 (1.8)	-4.3	2.9	2.3	2.6
Asian total	801 (100.0)	1,049 (100.0)	1,384 (100.0)	1,811 (100.0)	2.7	2.8	2.7	2.8
Developing Asia	727 (90.8)	955 (91.1)	1,286 (93.0)	1,710 (94.4)	2.8	3.0	2.9	3.0

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 8 World primary energy consumption (Oil)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
North America	847 (27.6)	981 (28.1)	1,067 (25.8)	1,161 (22.9)	1.5	0.8	0.8	0.8
Central and South America	237 (7.7)	307 (8.8)	398 (9.6)	517 (10.2)	2.6	2.6	2.6	2.6
OECD Europe	631 (20.5)	685 (19.6)	711 (17.2)	743 (14.6)	0.8	0.4	0.4	0.4
Non-OECD Europe	456 (14.9)	212 (6.1)	262 (6.3)	307 (6.0)	-7.4	2.2	1.6	1.9
Africa	89 (2.9)	106 (3.0)	134 (3.2)	182 (3.6)	1.8	2.3	3.2	2.7
Middle East	142 (4.6)	210 (6.0)	258 (6.2)	372 (7.3)	4.0	2.1	3.7	2.9
Asia	621 (20.2)	938 (26.8)	1,246 (30.1)	1,720 (33.9)	4.2	2.9	3.3	3.1
China	110 (3.6)	222 (6.3)	366 (8.8)	592 (11.7)	7.2	5.1	4.9	5.0
Japan	253 (8.2)	265 (7.6)	260 (6.3)	253 (5.0)	0.5	-0.2	-0.3	-0.2
India	62 (2.0)	112 (3.2)	172 (4.2)	278 (5.5)	6.1	4.4	4.9	4.6
Other Asian countries	195 (6.3)	339 (9.7)	448 (10.8)	596 (11.8)	5.7	2.8	2.9	2.9
Oceania	37 (1.2)	43 (1.2)	48 (1.2)	52 (1.0)	1.6	1.2	0.9	1.0
Other regions	12 (0.4)	13 (0.4)	15 (0.4)	18 (0.4)	0.9	1.4	1.5	1.4
OECD country total	1,901 (61.9)	2,172 (62.2)	2,339 (56.5)	2,520 (49.7)	1.3	0.7	0.7	0.7
Non-OECD country total	1,170 (38.1)	1,322 (37.8)	1,801 (43.5)	2,552 (50.3)	1.2	3.1	3.5	3. 3
World total	3,070 (100.0)	3,494 (100.0)	4,140 (100.0)	5,072 (100.0)	1.3	1.7	2.1	1.9

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 9 Primary energy consumption in Asia (Oil)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
China	110 (17.8)	222 (23.6)	366 (29.4)	592 (34.4)	7.2	5.1	4.9	5.0
Japan	253 (40.8)	265 (28.3)	260 (20.9)	253 (14.7)	0.5	-0.2	-0.3	-0.2
South Korea	50 (8.1)	104 (11.1)	124 (9.9)	137 (7.9)	7.6	1.8	1.0	1.4
India	62 (10.0)	112 (12.0)	172 (13.8)	278 (16.2)	6.1	4.4	4.9	4.6
Indonesia	33 (5.3)	53 (5.7)	76 (6.1)	109 (6.3)	4.9	3.7	3.7	3.7
Taiwan	26 (4.2)	37 (4.0)	43 (3.5)	51 (3.0)	3.7	1.5	1.7	1.6
Singapore	13 (2.1)	23 (2.5)	34 (2.7)	44 (2.6)	5.8	3.8	2.6	3.2
Malaysia	13 (2.1)	23 (2.5)	37 (3.0)	60 (3.5)	5.9	4.9	4.9	4.9
Philippines	12 (1.9)	17 (1.8)	25 (2.0)	40 (2.3)	3.7	4.0	4.7	4.3
Thailand	19 (3.1)	32 (3.4)	42 (3.4)	65 (3.8)	5.3	2.8	4.4	3.6
Vietnam	2.9 0.5	8.3 0.9	16 (1.3)	30 (1.7)	11.2	7.1	6.2	6.6
Hong Kong	5.3 (0.8)	8.9 (0.9)	8.9 (0.7)	8.9 (0.5)	5.4	-0.0	0.0	-0.0
Other Asian countries	21 (3.3)	32 (3.4)	41 (3.3)	51 (3.0)	4.5	2.4	2.3	2.4
Asian total	621 (100.0)	938 (100.0)	1,246 (100.0)	1,720 (100.0)	4.2	2.9	3.3	3.1
Developing Asia	368 (59.2)	673 (71.7)	986 (79.1)	6.2 (85.3)	3.9	4.1	4.0	4.0

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 10 World primary energy consumption (Gas)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
North America	494 (29.6)	623 (29.6)	651 (24.3)	751 (21.5)	2.4	0.4	1.4	0.9
Central and South America	76 (4.5)	120 (5.7)	189 (7.1)	310 (8.9)	4.7	4.7	5.1	4.9
OECD Europe	258 (15.4)	390 (18.5)	519 (19.4)	605 (17.3)	4.2	2.9	1.5	2.2
Non-OECD Europe	600 (35.9)	493 (23.4)	572 (21.4)	721 (20.7)	-2.0	1.5	2.3	1.9
Africa	32 (1.9)	53 (2.5)	100 (3.7)	167 (4.8)	5.1	6.6	5.2	5.9
Middle East	77 (4.6)	166 (7.9)	223 (8.3)	299 (8.6)	7.9	3.0	3.0	3.0
Asia	115 (6.9)	237 (11.3)	392 (14.6)	598 (17.1)	7.5	5.1	4.3	4.7
China	16 (0.9)	28 (1.3)	79 (3.0)	162 (4.6)	5.9	10.9	7.4	9.1
Japan	43 (2.6)	65 (3.1)	77 (2.9)	84 (2.4)	4.1	1.7	0.9	1.3
India	11 (0.6)	23 (1.1)	43 (1.6)	71 (2.0)	8.1	6.5	5.0	5.8
Other Asian countries	46 (2.7)	121 (5.8)	193 (7.2)	282 (8.1)	10.3	4.7	3.9	4.3
Oceania	19 (1.1)	24 (1.2)	31 (1.2)	38 (1.1)	2.7	2.4	2.0	2.2
Other regions	0.3 0)	0.2 (0.0)	0.3 (0.0)	0.5 (0.0)	-1.4	3.1	4.5	3.8
OECD country total	840 (50.2)	1,153 (54.7)	1,357 (50.7)	1,601 (45.9)	3.2	1.6	1.7	1.7
Non-OECD country total	832 (49.8)	954 (45.3)	1,321 (49.3)	1,889 (54.1)	1.4	3.3	3.6	3.5
World total	1,672 (100.0)	2,107 (100.0)	2,678 (100.0)	3,490 (100.0)	2.3	2.4	2.7	2.6

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 11 Primary energy consumption in Asia (Gas)

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
China	16 (13.7)	28 (11.8)	79 (20.2)	162 (27.1)	5.9	10.9	7.4	9.1
Japan	43 (37.5)	65 (27.3)	77 (19.6)	84 (14.0)	4.1	1.7	0.9	1.3
South Korea	2.7 (2.4)	17 (7.2)	28 (7.2)	44 (7.4)	20.1	5.2	4.6	4.9
India	11 (9.2)	23 (9.7)	43 (11.1)	71 (11.8)	8.1	6.5	5.0	5.8
Indonesia	14 (12.0)	28 (12.0)	40 (10.1)	57 (9.4)	7.5	3.4	3.6	3.5
Taiwan	1.7 (1.5)	5.5 (2.3)	13 (3.4)	16 (2.7)	12.1	9.4	2.0	5.6
Singapore	0 (0.0)	1.2 (0.5)	2.3 (0.6)	4.2 (0.7)	-	7.1	6.1	6.6
Malaysia	6.1 (5.3)	2 (9.1)	27 (6.8)	34 (5.7)	13.5	2.1	2.5	2.3
Philippines	0 (0.0)	0 (0.0)	2.2 (0.6)	2.0 (0.3)	-	73.4	-0.9	31.1
Thailand	5 (4.4)	18 (7.4)	31 (8.0)	58 (9.7)	13.1	6.0	6.3	6.2
Vietnam	0 (0.0)	1.1 (0.5)	6.7 (1.7)	11 (1.8)	81.1	19.3	5.0	11.9
Hong Kong	0 (0.0)	2.0 (0.8)	2.0 (0.5)	2.0 (0.3)	-	0.0	0.0	0.0
Other Asian countries	16 (14.0)	27 (11.4)	40 (10.3)	54 (9.0)	5.3	4.1	2.9	3.5
Asian total	115 (100.0)	237 (100.0)	392 (100.0)	598 (100.0)	7.5	5.1	4.3	4.7
Developing Asia	72 (62.5)	173 (72.7)	315 (80.4)	515 (86.0)	9.1	6.2	5.0	5.6

Source: Based on data from "Energy Balances of OECD Countries" and "Energy Balances of Non-OECD Countries," IEA; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 12 CO_2 emissions in Asia

(Unit: millions of toe)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
China	680 (48.1)	900 (45.6)	1,285 (48.1)	1,819 (50.1)	2.8	3.6	3.5	3.6
Japan	294 (20.8)	331 (16.7)	342 (12.8)	344 (9.5)	1.2	0.3	0.1	0.2
South Korea	65 (4.6)	118 (6.0)	161 (6.0)	182 (5.9)	6.1	3.2	1.2	2.2
India	168 (11.9)	281 (14.2)	386 (14.4)	577 (15.9)	5.3	3.2	4.1	3.7
Indonesia	40 (2.8)	76 (3.9)	116 (4.3)	169 (4.7)	6.8	4.2	3.9	4.0
Taiwan	32 (2.3)	62 (3.1)	75 (2.8)	96 (2.7)	6.9	1.9	2.5	2.2
Singapore	10 (0.7)	18 (0.9)	25 (0.9)	32 (0.9)	6.3	3.5	2.6	3.1
Malaysia	16 (1.1)	34 (1.7)	57 (2.1)	86 (2.4)	8.3	5.1	4.2	4.7
Philippines	11 (0.8)	20 (1.0)	28 (1.0)	41 (1.1)	5.8	3.5	4.1	3.8
Thailand	23 (1.7)	46 (2.3)	68 (2.6)	111 (3.1)	7.0	4.0	5.0	4.5
Vietnam	5.0 (0.4)	12 (0.6)	25 (0.9)	41 (1.1)	8.7	7.9	5.1	6.5
Hong Kong	10 (0.7)	13 (0.6)	16 (0.6)	18 (0.5)	2.1	2.1	1.4	1.8
Other Asian countries	60 (4.3)	65 (3.3)	87 (3.3)	112 (3.3)	0.7	3.0	2.5	2.8
Asian total	1,414 (100.0)	1,975 (100.0)	2,669 (100.0)	3,627 (100.0)	3.4	3.1	3.1	3.1
Developing Asia	1,120 (79.2)	1,644 (83.3)	2,327 (87.2)	3,283 (90.5)	3.9	3.5	3.5	3.5

Source: Based on data from "Energy Balances of OECD Countries" (IEA) and other sources; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 13 GDPs in Asia

(Unit: billions of US dollars at 1995 value)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
China	398 (5.8)	1,042 (11.1)	2,200 (17.0)	4,184 (23.5)	10.1	7.8	6.6	7.2
Japan	4,936 (71.9)	5,688 (60.8)	6,595 (51.1)	7,373 (41.4)	1.4	1.5	1.1	1.3
South Korea	342 (5.0)	620 (6.6)	996 (7.7)	1,439 (8.1)	6.2	4.8	3.7	4.4
India	284 (4.1)	482 (5.1)	841 (6.5)	1,436 (8.1)	5.4	5.7	5.5	5.6
Indonesia	138 (2.0)	209 (2.2)	318 (2.5)	494 (2.8)	4.2	4.3	4.5	4.4
Taiwan	186 (2.7)	347 (3.7)	476 (3.7)	668 (3.8)	6.4	3.2	3.4	3.3
Singapore	54 (0.8)	113 (1.2)	167 (1.3)	241 (1.4)	7.7	3.9	3.7	3.8
Malaysia	56 (0.8)	112 (1.2)	178 (1.4)	290 (1.6)	7.0	4.8	5.0	4.9
Philippines	67 (1.0)	88 (0.9)	136 (1.1)	206 (1.2)	2.9	4.4	4.2	4.3
Thailand	111 (1.6)	172 (1.8)	293 (2.3)	477 (2.7)	4.4	5.5	5.0	5.2
Vietnam	14 (0.2)	28 (0.3)	53 (0.4)	95 (0.5)	7.5	6.7	6.0	6.3
Hong Kong	107 (1.6)	165 (1.8)	236 (1.8)	326 (1.8)	4.4	3.6	3.3	3.5
Other Asian countries	176 (2.6)	296 (3.2)	417 (3.2)	576 (3.2)	5.3	3.5	3.3	3.4
Asian total	6,869 (100.0)	9,361 (100.0)	12,905 (100.0)	17,805 (100.0)	3.1	3.3	3.3	3.3
Developing Asia	1,933 (28.1)	3,673 (39.2)	6,310 (48.9)	10,432 (58.6)	6.6	5.6	5.2	5.4

Based on data from "World Development Indicators" (World Bank) and other sources; forecast figures prepared by the IEEJ.
Note: Figures in parentheses indicate percentage shares of totals.

Attached Table 14 Automobile ownership volume in Asia

(Unit: millions of vehicles)

	Actual		Forecast		AAGR (%)			
	1990	2000	2010	2020	2000/ 1990	2010/ 2000	2020/ 2010	2020/ 2000
China	5.5 (6.4)	16 (11.5)	52 (24.1)	119 (35.4)	11.3	12.5	8.6	10.5
Japan	58 (67.2)	73 (52.0)	79 (36.4)	81 (24.2)	2.3	0.8	0.3	0.6
South Korea	3.4 (4.0)	12 (8.6)	20 (9.1)	26 (7.7)	13.5	5.0	2.8	3.9
India	4.3 (5.0)	9.4 (6.7)	20 (9.4)	38 (11.4)	8.1	7.9	6.6	7.3
Indonesia	2.8 (3.2)	5.5 (3.9)	7.9 (3.6)	12 (3.5)	7.1	3.6	4.1	3.9
Taiwan	2.8 (3.2)	5.5 (4.0)	8.0 (3.7)	11 (3.3)	7.2	3.7	3.3	3.5
Singapore	0.4 (0.5)	0.6 (0.4)	0.7 (0.3)	0.7 (0.2)	2.7	1.7	0.7	1.2
Malaysia	2.4 (2.8)	5.2 (3.8)	8.1 (3.8)	13 (4.0)	8.0	4.5	5.2	4.8
Philippines	1.2 (1.4)	2.5 (1.8)	4.6 (2.1)	8.0 (2.4)	7.4	6.3	5.7	6.0
Thailand	2.8 (3.3)	6.1 (4.4)	10.4 (4.8)	18 (5.5)	8.1	5.4	5.8	5.6
Vietnam	0.2 (0.2)	0.2 (0.2)	0.4 (0.2)	0.8 (0.2)	2.2	6.7	6.0	6.3
Hong Kong	0.4 (0.4)	0.5 (0.4)	0.7 (0.3)	0.8 (0.3)	2.7	3.3	2.3	2.8
Other Asian countries	2.0 (2.3)	3.4 (2.4)	4.6 (2.1)	6.4 (1.9)	5.5	3.2	3.4	3.3
Asian total	86 (100.0)	140 (100.0)	216 (100.0)	336 (100.0)	5.0	4.4	4.5	4.5
Developing Asia	28 (32.8)	67 (48.0)	137 (63.6)	254 (75.8)	9.1	7.4	6.4	6.9

Based on data from "World Motor Vehicle Statistics" published by the Japan Automobile Manufacturers Association, Inc. and other sources; forecast figures prepared by the IEEJ.

Results of the energy supply and demand forecast for the world, Asia, and Asian countries

- World
- Asia
- China
- Japan
- South Korea
- India
- Indonesia
- Taiwan
- Malaysia
- Philippines
- Thailand
- Vietnam

World

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**6,481**	**9,057**	**11,053**	**13,593**	**100**	**100**	**100**	**100**	**1.7**	**2.0**	**2.1**	**2.1**
Coal	1,782	2,325	2,888	3,489	27	26	26	26	1.3	2.2	1.9	2.0
Oil	3,008	3,494	4,140	5,072	46	39	37	37	0.8	1.7	2.1	1.9
Natural gas	1,239	2,107	2,678	3,490	19	23	24	26	2.7	2.4	2.7	2.6
Nuclear	186	676	747	781	2.9	7.5	6.8	5.7	6.6	1.0	0.5	0.7
Hydro	148	223	282	339	2.3	2.5	2.6	2.5	2.1	2.4	1.8	2.1
Geothermal	12	45	73	123	0.2	0.5	0.7	0.9	6.6	5.1	5.4	5.2
Other renewables	106	187	246	299	1.6	2.1	2.2	2.2	2.9	2.8	2.0	2.4

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**4,684**	**6,103**	**7,308**	**8,900**	**100**	**100**	**100**	**100**	**1.3**	**1.8**	**2.0**	**1.9**
Industry	1,896	2,154	2,482	2,944	40	35	34	33	0.6	1.4	1.7	1.6
Transportation	1,146	1,781	2,198	2,730	24	29	30	31	2.2	2.1	2.2	2.2
Residential/Commercial	1,466	1,987	2,412	2,974	31	33	33	33	1.5	2.0	2.1	2.0
Non-energy, etc.	176	180	216	251	3.8	3.0	3.0	2.8	0.1	1.8	1.5	1.7
Energy source												
Total	**4,684**	**6,103**	**7,308**	**8,900**	**100**	**100**	**100**	**100**	**1.3**	**1.8**	**2.0**	**1.9**
Coal	699	524	575	618	15	8.6	7.9	6.9	-1.4	0.9	0.7	0.8
Oil	2,347	2,970	3,565	4,379	50	49	49	49	1.2	1.8	2.1	2.0
Natural gas	832	1,151	1,326	1,578	18	19	18	18	1.6	1.4	1.8	1.6
Electricity	585	1,088	1,461	1,935	12	18	20	22	3.1	3.0	2.8	2.9
Heat	120	237	247	262	2.6	3.9	3.4	2.9	3.4	0.4	0.6	0.5
Renewables	100	133	135	128	2.1	2.2	1.8	1.4	1.4	0.1	-0.5	-0.2

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**8,246**	**15,375**	**20,691**	**27,518**	**100**	**100**	**100**	**100**	**3.2**	**3.0**	**2.9**	**3.0**
Coal	3,139	6,014	8,099	10,842	38	39	39	39	3.3	3.0	3.0	3.0
Oil	1,655	1,225	1,367	1,689	20	8.0	6.6	6.1	-1.5	1.1	2.1	1.6
Natural gas	991	2,679	4,604	7,318	12	17	22	27	5.1	5.6	4.7	5.2
Nuclear	713	2,591	2,867	2,998	8.7	17	14	11	6.7	1.0	0.5	0.7
Hydro	1,719	2,632	3,281	3,941	21	17	16	14	2.2	2.2	1.8	2.0
Geothermal	14	50	82	140	0.2	0.3	0.4	0.5	6.7	5.1	5.5	5.3
Other renewables	14	185	393	589	0.2	1.2	1.9	2.1	13.7	7.8	4.1	6.0

CO_2 emissions	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**5,038**	**6,507**	**7,963**	**9,852**	**100**	**100**	**100**	**100**	**1.3**	**2.0**	**2.2**	**2.1**
Coal-derived	1,925	2,512	3,119	3,768	38	39	39	38	1.3	2.2	1.9	2.0
Oil-derived	2,319	2,645	3,128	3,847	46	41	39	39	0.7	1.7	2.1	1.9
Natural-gas-derived	794	1,351	1,716	2,237	16	21	22	23	2.7	2.4	2.7	2.6

Energy and economic indicators					AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
GDP (billions of US dollars at 1995 value)	19,923	34,251	44,901	58,570	2.7	2.7	2.7	2.7
Population (millions of people)	4,505	6,179	6,949	7,710	1.6	1.2	1.0	1.1
GDP per capita of population (US dollars at 1995 value/person)	4,423	5,544	6,461	7,596	1.1	1.5	1.6	1.6
Primary energy consumption per capita of population (toe/person)	1.44	1.47	1.59	1.76	0.1	0.8	1.0	0.9
Primary energy consumption per unit of GDP*	325	264	246	232	-1.03	-0.71	-0.59	-0.65
CO_2 emissions per unit of GDP**	253	190	177	168	-1.42	-0.69	-0.53	-0.61
CO_2 emissions per unit of primary energy consumption***	0.777	0.718	0.720	0.725	-0.39	0.03	0.06	0.04
Automobile ownership volume (millions of vehicles)	418	757	964	1,222	3.0	2.4	2.4	2.4
Automobile ownership volume per thousand of population (vehicles per thousand of population)	93	123	139	159	1.4	1.3	1.3	1.3

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Asia

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**1,054**	**2,423**	**3,335**	**4,570**	**100**	**100**	**100**	**100**	**4.2**	**3.2**	**3.2**	**3.2**
Coal	469	1,049	1,384	1,811	44	43	41	40	4.1	2.8	2.7	2.8
Oil	485	938	1,246	1,720	46	39	37	38	3.3	2.9	3.3	3.1
Natural gas	52	237	392	598	4.9	9.8	12	13	7.9	5.1	4.3	4.7
Nuclear	25	132	189	247	2.4	5.4	5.7	5.4	8.6	3.7	2.7	3.2
Hydro	20	38	67	91	1.9	1.6	2.0	2.0	3.3	5.7	3.1	4.4
Geothermal	2.6	16	28	52	0.2	0.6	0.8	1.1	9.4	6.2	6.3	6.2
Other renewables	0.4	13	29	52	0	0.6	0.9	1.1	19.8	8.0	6.1	7.0

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**755**	**1,511**	**2,069**	**2,826**	**100**	**100**	**100**	**100**	**3.5**	**3.2**	**3.2**	**3.2**
Industry	393	708	902	1,118	52	47	44	40	3.0	2.4	2.2	2.3
Transportation	133	346	522	786	18	23	25	28	4.9	4.2	4.2	4.2
Residential/Commercial	208	416	599	863	27	28	29	31	3.5	3.7	3.7	3.7
Non-energy, etc.	21	41	46	60	2.8	2.7	2.2	2.1	3.3	1.3	2.6	1.9
Energy source												
Total	**755**	**1,511**	**2,069**	**2,826**	**100**	**100**	**100**	**100**	**3.5**	**3.2**	**3.2**	**3.2**
Coal	302	346	394	427	40	23	19	15	0.7	1.3	0.8	1.1
Oil	333	763	1,048	1,471	44	50	51	52	4.2	3.2	3.4	3.3
Natural gas	25	94	156	240	3.3	6.2	7.5	8.5	6.9	5.2	4.4	4.8
Electricity	88	276	423	619	12	18	20	22	5.9	4.4	3.9	4.1
Heat	7.5	28	43	64	1.0	1.9	2.1	2.3	6.9	4.3	4.1	4.2
Renewables	0	3.7	4.0	4.4	0	0.2	0.2	0.2	-	0.7	1.1	0.9

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**1,193**	**3,966**	**6,089**	**8,985**	**100**	**100**	**100**	**100**	**6.2**	**4.4**	**4.0**	**4.2**
Coal	301	2,037	3,177	4,896	25	51	52	54	10.0	4.5	4.4	4.5
Oil	470	384	382	420	39	9.7	6.3	4.7	-1.0	0.0	0.9	0.5
Natural gas	91	519	940	1,486	7.6	13	15	17	9.1	6.1	4.7	5.4
Nuclear	97	505	726	949	8.2	13	12	11	8.6	3.7	2.7	3.2
Hydro	231	480	777	1,057	19	12	13	12	3.7	4.9	3.1	4.0
Geothermal	3.0	18	33	60	0.2	0.4	0.5	0.7	9.4	6.2	6.3	6.3
Other renewables	0	22	54	116	0	0.6	0.9	1.3	-	9.4	7.9	8.6

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**916**	**1,975**	**2,669**	**3,627**	**100**	**100**	**100**	**100**	**3.9**	**3.1**	**3.1**	**3.1**
Coal-derived	507	1,133	1,494	1,955	55	57	56	54	4.1	2.8	2.7	2.8
Oil-derived	376	690	923	1,288	41	35	35	36	3.1	3.0	3.4	3.2
Natural-gas-derived	33	152	251	383	3.6	7.7	9.4	11	7.9	5.1	4.3	4.7

Energy and economic indicators					AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
GDP (billions of US dollars at 1995 value)	4,302	9,361	12,905	17,805	4.0	3.3	3.3	3.3
Population (millions of people)	2,413	3,322	3,719	4,095	1.6	1.1	1.0	1.1
GDP per capita of population (US dollars at 1995 value/person)	1,782	2,818	3,470	4,348	2.3	2.1	2.3	2.2
Primary energy consumption per capita of population (toe/person)	0.44	0.73	0.90	1.12	2.6	2.1	2.2	2.1
Primary energy consumption per unit of GDP*	245	259	258	257	0.27	-0.02	-0.07	-0.04
CO_2 emissions per unit of GDP**	213	211	207	204	-0.05	-0.20	-0.15	-0.18
CO_2 emissions per unit of primary energy consumption***	0.869	0.815	0.800	0.794	-0.32	-0.18	-0.09	-0.13
Automobile ownership volume (millions of vehicles)	48	140	216	336	5.5	4.4	4.5	4.5
Automobile ownership volume per thousand of population (vehicles per thousand of population)	20	42	58	82	3.8	3.3	3.5	3.4

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

China

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**413**	**932**	**1,406**	**2,063**	**100**	**100**	**100**	**100**	**4.2**	**4.2**	**3.9**	**4.1**
Coal	307	656	878	1,158	74	70	62	56	3.9	3.0	2.8	2.9
Oil	89	222	366	592	22	24	26	29	4.7	5.1	4.9	5.0
Natural gas	12	28	79	162	2.9	3.0	5.6	7.8	4.4	10.9	7.4	9.1
Nuclear	0	4.4	31	61	0	0.5	2.2	3.0	-	21.5	7.2	14.1
Hydro	5.0	19	37	54	1.2	2.1	2.6	2.6	6.9	6.8	3.8	5.3
Geothermal	0	0.1	0.3	0.5	0	0	0	0	-	6.1	7.2	6.6
Other renewables	0.3	3.5	15	35	0	0.4	1.0	1.7	12.8	15.6	9.1	12.3

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**313**	**559**	**826**	**1,195**	**100**	**100**	**100**	**100**	**2.9**	**4.0**	**3.8**	**3.9**
Industry	188	319	407	489	60	57	49	41	2.7	2.5	1.9	2.2
Transportation	25	74	153	278	7.8	13	18	23	5.7	7.5	6.2	6.8
Residential/Commercial	92	153	250	407	29	27	30	34	2.6	5.0	5.0	5.0
Non-energy, etc.	8.3	13	17	22	2.7	2.4	2.0	1.8	2.4	2.3	2.6	2.4
Energy source												
Total	**313**	**559**	**826**	**1,195**	**100**	**100**	**100**	**100**	**2.9**	**4.0**	**3.8**	**3.9**
Coal	218	247	279	290	70	44	34	24	0.6	1.2	0.4	0.8
Oil	59	179	310	508	19	32	38	43	5.7	5.7	5.1	5.4
Natural gas	6.8	18	37	75	2.2	3.2	4.5	6.3	4.9	7.7	7.2	7.5
Electricity	21	90	161	263	6.8	16	20	22	7.4	6.0	5.0	5.5
Heat	7.4	25	39	58	2.4	4.6	4.7	4.9	6.4	4.3	4.1	4.2
Renewables	0	0	0	0	0	0	0	0	-	-	-	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**301**	**1,357**	**2,477**	**4,061**	**100**	**100**	**100**	**100**	**7.8**	**6.2**	**5.1**	**5.6**
Coal	164	1,062	1,770	2,853	55	78	71	70	9.8	5.2	4.9	5.1
Oil	78	46	46	46	26	3.4	1.9	1.1	-2.6	0.0	0.0	0.0
Natural gas	0.7	6.4	94	234	0.2	0.5	3.8	5.8	11.8	30.9	9.5	19.7
Nuclear	0	17	117	235	0	1.2	4.7	5.8	-	21.5	7.2	14.1
Hydro	58	222	429	624	19	16	17	15	6.9	6.8	3.8	5.3
Geothermal	0	0.2	0.3	0.6	0	0	0	0	-	6.1	7.2	6.6
Other renewables	0	2.8	20	69	0	0.2	0.8	1.7	-	21.3	13.4	17.3

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**413**	**900**	**1,285**	**1,819**	**100**	**100**	**100**	**100**	**4.0**	**3.6**	**3.5**	**3.6**
Coal-derived	331	708	949	1,251	80	79	74	69	3.9	3.0	2.8	2.9
Oil-derived	75	174	285	464	18	19	22	26	4.3	5.1	5.0	5.0
Natural-gas-derived	7.7	18	51	104	1.9	2.0	3.9	5.7	4.4	10.9	7.4	9.1

Energy and economic indicators					AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
GDP (billions of US dollars at 1995 value)	164	1,042	2,200	4,184	9.7	7.8	6.6	7.2
Population (millions of people)	987	1,270	1,355	1,442	1.3	0.7	0.6	0.6
GDP per capita of population (US dollars at 1995 value/person)	166	821	1,623	2,902	8.3	7.1	6.0	6.5
Primary energy consumption per capita of population (toe/person)	0.42	0.59	0.73	0.91	1.7	2.2	2.2	2.2
Primary energy consumption per unit of GDP*	2,524	892	639	493	-5.07	-3.28	-2.56	-2.92
CO_2 emissions per unit of GDP**	2,526	864	584	435	-5.22	-3.84	-2.91	-3.38
CO_2 emissions per unit of primary energy consumption***	1.001	1.011	0.969	0.936	0.05	-0.43	-0.34	-0.39
Automobile ownership volume (millions of vehicles)	1.8	16	52	119	11.6	12.5	8.6	10.5
Automobile ownership volume per thousand of population (vehicles per thousand of population)	1.8	13	38	82	10.2	11.7	7.9	9.8

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Japan

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**347**	**525**	**543**	**561**	**100**	**100**	**100**	**100**	**2.1**	**0.3**	**0.3**	**0.3**
Coal	60	94	97	101	17	18	18	18	2.3	0.4	0.3	0.4
Oil	236	265	260	253	68	51	48	45	0.6	-0.2	-0.3	-0.2
Natural gas	21	65	77	84	6.2	12	14	15	5.7	1.7	0.9	1.3
Nuclear	22	84	91	104	6.2	16	17	19	7.0	0.8	1.4	1.1
Hydro	7.6	7.5	7.6	7.6	2.2	1.4	1.4	1.4	-0.1	0.1	0.0	0.0
Geothermal	0.8	3.1	3.3	3.5	0.2	0.6	0.6	0.6	7.2	0.7	0.4	0.6
Other renewables	0	6.5	6.8	7.8	0	1.2	1.3	1.4	37.0	0.5	1.4	0.9

Final energy consumption Breakdown by sector	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Sector	**233**	**347**	**356**	**361**	**100**	**100**	**100**	**100**	**2.0**	**0.3**	**0.1**	**0.2**
Total	111	137	134	138	47	40	38	38	1.1	-0.2	0.3	0.0
Industry	55	94	93	88	24	27	26	24	2.7	-0.1	-0.5	-0.3
Transportation	59	106	119	125	25	30	33	35	3.0	1.2	0.5	0.8
Residential/Commercial	8.3	9.8	9.8	9.8	3.5	2.8	2.8	2.7	0.8	0.1	-0.1	0.0
Non-energy, etc.												
Energy source	**233**	**347**	**356**	**361**	**100**	**100**	**100**	**100**	**2.0**	**0.3**	**0.1**	**0.2**
Total	21	22	19	18	9.2	6.2	5.3	5.0	0.1	-1.3	-0.6	-0.9
Coal	158	215	210	203	68	62	59	56	1.6	-0.2	-0.3	-0.3
Oil	9.7	23	27	31	4.2	6.7	7.7	8.5	4.5	1.6	1.1	1.4
Natural gas	44	83	95	104	19	24	27	29	3.2	1.4	0.9	1.1
Electricity	0.1	0.5	0.5	0.5	0	0.2	0.1	0.1	8.7	-0.6	0.0	-0.3
Heat	0	3.6	3.5	3.8	0	1.0	1.0	1.0	-	0.0	0.6	0.3

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**573**	**1,082**	**1,218**	**1,314**	**100**	**100**	**100**	**100**	**3.2**	**1.2**	**0.8**	**1.0**
Coal	55	254	294	328	9.6	24	24	25	8.0	1.5	1.1	1.3
Oil	265	159	165	148	46	15	14	11	-2.5	0.4	-1.1	-0.4
Natural gas	81	239	299	323	14	22	25	25	5.6	2.3	0.8	1.5
Nuclear	83	322	350	401	14	30	29	30	7.0	0.8	1.4	1.1
Hydro	88	87	88	88	15	8.1	7.2	6.7	-0.1	0.1	0.0	0.0
Geothermal	0.9	3.3	3.6	3.8	0.2	0.3	0.3	0.3	6.8	0.7	0.4	0.6
Other renewables	0	17	19	23	0	1.5	1.6	1.8	-	1.3	2.0	1.7

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**255**	**331**	**342**	**344**	**100**	**100**	**100**	**100**	**1.3**	**0.3**	**0.1**	**0.2**
Coal-derived	64	101	105	109	25	31	31	32	2.3	0.4	0.3	0.4
Oil-derived	177	188	187	182	69	57	55	53	0.3	0.0	-0.3	-0.2
Natural-gas-derived	14	42	49	54	5.4	13	14	16	5.7	1.7	0.9	1.3

Energy and economic indicators					AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
GDP (billions of US dollars at 1995 value)	3,304	5,688	6,595	7,373	2.8	1.5	1.1	1.3
Population (millions of people)	117	127	127	124	0.4	0.0	-0.3	-0.1
GDP per capita of population (US dollars at 1995 value/person)	28,296	44,830	51,745	59,448	2.3	1.4	1.4	1.4
Primary energy consumption per capita of population (toe/person)	2.97	3.55	4.14	4.21	0.9	1.5	0.2	0.8
Primary energy consumption per unit of GDP*	105	92	82	76	-0.64	-1.13	-0.80	-0.96
CO_2 emissions per unit of GDP**	77	58	52	47	-1.41	-1.15	-1.04	-1.09
CO_2 emissions per unit of primary energy consumption***	0.736	0.669	0.630	0.631	-0.48	-0.60	0.01	-0.29
Automobile ownership volume (millions of vehicles)	38	73	79	81	3.3	0.8	0.3	0.6
Automobile ownership volume per thousand of population (vehicles per thousand of population)	324	573	617	657	2.9	0.8	0.6	0.7

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

South Korea

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**41**	**191**	**262**	**303**	**100**	**100**	**100**	**100**	**8.0**	**3.2**	**1.5**	**2.3**
Coal	13	39	63	66	33	21	24	22	5.5	4.9	0.4	2.6
Oil	27	104	124	137	65	54	47	45	7.0	1.8	1.0	1.4
Natural gas	0	17	28	44	0	8.9	11	15	-	5.2	4.6	4.9
Nuclear	0.9	28	43	52	2.2	15	16	17	18.8	4.2	1.9	3.0
Hydro	0.2	0.3	0.4	0.4	0.4	0.2	0.1	0.1	3.6	0.6	0.5	0.5
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	2.2	3.6	4.6	0	1.1	1.4	1.5	-	5.1	2.6	3.9

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**31**	**126**	**172**	**202**	**100**	**100**	**100**	**100**	**7.2**	**3.1**	**1.6**	**2.4**
Industry	13	56	72	79	41	44	42	39	7.6	2.6	0.9	1.8
Transportation	5.1	30	44	53	16	24	25	26	9.3	3.8	2.0	2.9
Residential/Commercial	13	38	52	64	42	30	30	32	5.4	3.3	2.1	2.7
Non-energy, etc.	0.3	2.2	3.7	4.9	1.0	1.8	2.2	2.4	10.1	5.3	2.9	4.1
Energy source												
Total	**31**	**126**	**172**	**202**	**100**	**100**	**100**	**100**	**7.2**	**3.1**	**1.6**	**2.4**
Coal	9.7	6.7	8.1	8.3	31	5.3	4.7	4.1	-1.9	2.0	0.2	1.1
Oil	19	86	107	119	60	68	62	59	7.9	2.2	1.1	1.6
Natural gas	0	11	21	30	0	8.7	12	15	-	6.9	3.6	5.2
Electricity	2.8	20	32	39	9.0	16	19	19	10.3	4.8	2.0	3.4
Heat	0	2.2	3.6	5.1	0	1.8	2.1	2.5	-	5.0	3.6	4.3
Renewables	0	0.1	0.2	0.2	0	0.1	0	0	-	0.6	0.7	0.6

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**37**	**264**	**407**	**496**	**100**	**100**	**100**	**100**	**10.3**	**4.4**	**2.0**	**3.2**
Coal	2.5	98	180	198	6.7	37	44	40	20.2	6.3	0.9	3.6
Oil	29	25	22	18	79	9.3	5.3	3.7	-0.9	-1.2	-1.6	-1.4
Natural gas	0	28	32	70	0	11	7.8	14	-	1.2	8.2	4.7
Nuclear	3.5	109	165	199	9.3	41	40	40	18.8	4.2	1.9	3.0
Hydro	2.0	4.0	4.2	4.4	5.3	1.5	1.0	0.9	3.6	0.6	0.5	0.5
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0.5	3.9	5.6	0	0.2	1.0	1.1	-	23.5	3.7	13.2

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**34**	**118**	**161**	**182**	**100**	**100**	**100**	**100**	**6.4**	**3.2**	**1.2**	**2.2**
Coal-derived	15	43	68	71	42	36	42	39	5.5	4.9	0.4	2.6
Oil-derived	20	65	75	82	58	55	46	45	6.1	1.5	1.0	1.2
Natural-gas-derived	0	11	18	28	0	9.2	11	16	-	5.2	4.6	4.9

Energy and economic indicators					AAGR (%)			
	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
GDP (billions of US dollars at 1995 value)	149	620	996	1,439	7.4	4.8	3.7	4.3
Population (millions of people)	38	47	50	51	1.1	0.5	0.2	0.4
GDP per capita of population (US dollars at 1995 value/person)	3,910	13,199	20,081	28,443	6.3	4.3	3.5	3.9
Primary energy consumption per capita of population (toe/person)	1.09	2.16	4.07	4.80	3.5	6.5	1.7	4.1
Primary energy consumption per unit of GDP*	278	308	263	211	0.52	-1.57	-2.19	-1.88
CO_2 emissions per unit of GDP**	231	191	162	126	-0.96	-1.62	-2.46	-2.04
CO_2 emissions per unit of primary energy consumption***	0.833	0.707	0.619	0.614	-0.82	-1.32	-0.07	-0.70
Automobile ownership volume (millions of vehicles)	0.5	12	20	26	17.0	5.0	2.8	3.9
Automobile ownership volume per thousand of population (vehicles per thousand of population)	14	255	397	513	15.8	4.5	2.6	3.6

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

India

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**95**	**322**	**452**	**684**	**100**	**100**	**100**	**100**	**6.3**	**3.4**	**4.2**	**3.8**
Coal	55	176	217	305	58	55	48	45	5.9	2.1	3.5	2.8
Oil	34	112	172	278	36	35	38	41	6.2	4.4	4.9	4.6
Natural gas	1.3	23	43	71	1.3	7.2	10	10	15.6	6.5	5.0	5.8
Nuclear	0.8	4.4	8.6	15	0.8	1.4	1.9	2.2	9.0	6.9	5.5	6.2
Hydro	4.0	6.4	10	14	4.2	2.0	2.3	2.0	2.4	5.0	2.8	3.9
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0.3	0.7	1.0	0	0	0.1	0.1	-	10.1	4.0	7.0

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**63**	**177**	**271**	**430**	**100**	**100**	**100**	**100**	**5.3**	**4.3**	**4.7**	**4.5**
Industry	27	78	111	166	43	44	41	39	5.5	3.5	4.1	3.8
Transportation	18	45	83	143	29	25	31	33	4.5	6.4	5.6	6.0
Residential/Commercial	16	46	69	109	25	26	25	25	5.5	4.2	4.6	4.4
Non-energy, etc.	2.2	8.7	8.0	12	3.5	4.9	3.0	2.9	7.1	-0.8	4.3	1.7
Energy source												
Total	**63**	**177**	**271**	**430**	**100**	**100**	**100**	**100**	**5.3**	**4.3**	**4.7**	**4.5**
Coal	27	35	41	49	43	20	15	11	1.3	1.6	1.8	1.7
Oil	28	100	160	265	44	56	59	62	6.6	4.8	5.2	5.0
Natural gas	0.7	12	20	31	1.1	6.6	7.2	7.1	15.0	5.4	4.5	5.0
Electricity	7.7	31	51	85	12	18	19	20	7.2	5.0	5.3	5.2
Heat	0	0	0	0	0	0	0	0	-	-	-	-
Renewables	0	0	0	0	0	0	0	0	-	-	-	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**119**	**554**	**860**	**1,405**	**100**	**100**	**100**	**100**	**8.0**	**4.5**	**5.0**	**4.8**
Coal	60	434	600	987	51	78	70	70	10.4	3.3	5.1	4.2
Oil	8.2	7.5	9.7	17	6.9	1.4	1.1	1.2	-0.4	2.5	5.8	4.2
Natural gas	1.2	20	89	173	1.0	3.6	10	12	15.2	16.1	6.9	11.4
Nuclear	3.0	17	33	56	2.5	3.1	3.8	4.0	9.0	6.9	5.5	6.2
Hydro	47	75	122	161	39	13	14	11	2.4	5.0	2.9	3.9
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	1.6	6.3	10	0	0.3	0.7	0.7	-	14.9	4.7	9.7

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**85**	**281**	**386**	**577**	**100**	**100**	**100**	**100**	**6.2**	**3.2**	**4.1**	**3.7**
Coal-derived	60	190	234	330	70	68	61	57	5.9	2.1	3.5	2.8
Oil-derived	24	76	124	201	29	27	32	35	5.9	5.0	5.0	5.0
Natural-gas-derived	0.8	15	28	45	1.0	5.3	7.2	7.9	15.6	6.5	5.0	5.8

Energy and economic indicators					AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
GDP (billions of US dollars at 1995 value)	162	482	841	1,436	5.6	5.7	5.5	5.6
Population (millions of people)	687	1,016	1,173	1,302	2.0	1.4	1.0	1.2
GDP per capita of population (US dollars at 1995 value/person)	235	474	717	1,103	3.6	4.2	4.4	4.3
Primary energy consumption per capita of population (toe/person)	0.14	0.22	0.32	0.36	2.4	3.7	1.3	2.5
Primary energy consumption per unit of GDP*	589	668	538	476	0.63	-2.15	-1.20	-1.67
CO_2 emissions per unit of GDP**	526	582	459	402	0.51	-2.36	-1.32	-1.84
CO_2 emissions per unit of primary energy consumption***	0.892	0.896	0.871	0.866	0.02	-0.28	-0.06	-0.17
Automobile ownership volume (millions of vehicles)	1.7	9.4	20	38	9.0	7.9	6.6	7.3
Automobile ownership volume per thousand of population (vehicles per thousand of population)	2.4	9.3	17	30	6.9	6.4	5.5	6.0

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Indonesia

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**26**	**98**	**144**	**209**	**100**	**100**	**100**	**100**	**6.8**	**3.9**	**3.8**	**3.9**
Coal	0.2	14	25	39	0.6	14	18	19	24.6	6.4	4.4	5.4
Oil	21	53	76	109	80	54	53	52	4.7	3.7	3.7	3.7
Natural gas	4.9	28	40	57	19	29	28	27	9.1	3.4	3.6	3.5
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	0.1	0.8	0.9	1.2	0.4	0.8	0.6	0.6	10.0	0.9	3.0	2.0
Geothermal	0	2.3	2.1	2.8	0	2.3	1.4	1.3	-	-1.0	3.0	1.0
Other renewables	0	0	0.1	0.2	0	0	0	0	-	-	4.0	-

Final energy consumption Breakdown by sector	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Sector	**21**	**67**	**99**	**144**	**100**	**100**	**100**	**100**	**6.1**	**4.0**	**3.8**	**3.9**
Total	7.7	23	36	52	37	35	36	36	5.7	4.4	3.9	4.2
Industry	6.2	21	30	43	30	32	30	30	6.4	3.4	3.7	3.6
Transportation	6.4	21	33	47	31	32	33	33	6.2	4.3	3.7	4.0
Residential/Commercial	0.3	0.7	1.0	1.4	1.2	1.1	1.0	1.0	5.4	3.0	3.6	3.3
Non-energy, etc.												
Energy source	**21**	**67**	**99**	**144**	**100**	**100**	**100**	**100**	**6.1**	**4.0**	**3.8**	**3.9**
Total	0.1	5.7	7.0	9.2	0.6	8.6	7.1	6.4	21.4	2.1	2.8	2.4
Coal	17	45	63	87	85	68	64	61	4.8	3.4	3.3	3.4
Oil	2.4	9.1	17	26	12	14	17	18	7.0	6.3	4.5	5.4
Natural gas	0.6	6.8	12	21	2.7	10	12	15	13.3	6.0	5.6	5.8
Electricity	0	0	0	0	0	0	0	0	-	-	-	-
Heat	0	0	0	0	0	0	0	0	-	-	-	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**8.4**	**93**	**167**	**288**	**100**	**100**	**100**	**100**	**12.7**	**6.0**	**5.6**	**5.8**
Coal	0	29	72	129	0	31	43	45	-	9.7	6.0	7.8
Oil	7.1	20	28	46	84	22	17	16	5.4	3.3	5.2	4.2
Natural gas	0	32	52	93	0	34	31	32	-	5.1	5.9	5.5
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	1.3	9.1	10.0	13	16	9.8	6.0	4.7	10.0	0.9	3.0	2.0
Geothermal	0	2.6	2.4	3.2	0	2.9	1.4	1.1	-	-1.0	3.0	1.0
Other renewables	0	0	1.5	2.3	0	0	0.9	0.8	-	-	4.0	-

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**21**	**76**	**116**	**169**	**100**	**100**	**100**	**100**	**6.7**	**4.2**	**3.9**	**4.0**
Coal-derived	0.2	15	28	42	0.9	19	24	25	24.6	6.4	4.4	5.4
Oil-derived	17	44	63	90	84	57	54	53	4.7	3.7	3.7	3.7
Natural-gas-derived	3.2	18	25	36	15	24	22	21	9.1	3.4	3.6	3.5

Energy and economic indicators					AAGR (%)			
	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
GDP (billions of US dollars at 1995 value)	75	209	318	494	5.3	4.3	4.5	4.4
Population (millions of people)	148	210	240	274	1.8	1.3	1.3	1.3
GDP per capita of population (US dollars at 1995 value/person)	503	994	1,324	1,804	3.5	2.9	3.1	3.0
Primary energy consumption per capita of population (toe/person)	0.18	0.29	0.47	0.55	2.5	4.8	1.7	3.2
Primary energy consumption per unit of GDP*	352	470	454	423	1.45	-0.34	-0.69	-0.52
CO_2 emissions per unit of GDP**	278	366	363	342	1.38	-0.07	-0.61	-0.34
CO_2 emissions per unit of primary energy consumption***	0.790	0.759	0.779	0.791	-0.20	0.25	0.15	0.20
Automobile ownership volume (millions of vehicles)	1.3	5.5	7.9	12	7.5	3.6	4.1	3.9
Automobile ownership volume per thousand of population (vehicles per thousand of population)	8,723	26,145	32,732	42,781	5.6	2.3	2.7	2.5

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Taiwan

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**28**	**83**	**110**	**132**	**100**	**100**	**100**	**100**	**5.5**	**2.9**	**1.9**	**2.4**
Coal	3.9	29	37	51	14	35	34	38	10.6	2.3	3.2	2.8
Oil	21	37	43	51	72	45	39	39	3.0	1.5	1.7	1.6
Natural gas	1.6	5.5	13	16	5.6	6.6	12	12	6.4	9.4	2.0	5.6
Nuclear	2.1	10	15	13	7.5	12	14	9.6	8.0	4.3	-1.8	1.2
Hydro	0.3	0.8	0.7	0.7	0.9	0.9	0.6	0.5	5.7	-1.1	0.6	-0.3
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0	0.4	0.8	0	0	0.4	0.6	-	-	6.6	-

Final energy consumption Breakdown by sector	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Sector	**19**	**50**	**68**	**84**	**100**	**100**	**100**	**100**	**4.9**	**3.0**	**2.2**	**2.6**
Total	12	25	34	40	62	49	51	48	3.8	3.3	1.6	2.5
Industry	3.4	13	18	24	18	27	27	29	7.1	3.0	2.9	3.0
Transportation	3.6	10	13	17	18	20	20	20	5.3	2.9	2.5	2.7
Residential/Commercial	0.4	2.1	1.9	2.3	2.2	4.1	2.8	2.8	8.3	-1.1	2.2	0.5
Non-energy, etc.												
Energy source	**19**	**50**	**68**	**84**	**100**	**100**	**100**	**100**	**4.9**	**3.0**	**2.2**	**2.6**
Total	2.4	6.1	7.7	8.5	12	12	11	10	4.8	2.4	0.9	1.7
Coal	12	29	38	47	64	58	56	56	4.4	2.7	2.1	2.4
Oil	1.4	1.5	3.3	4.4	7.0	3.0	4.8	5.3	0.5	8.2	3.1	5.6
Natural gas	3.2	14	18	24	16	27	27	28	7.6	2.9	2.6	2.7
Electricity	0	0	0	0	0	0	0	0	-	-	-	-
Heat	0	0	0.3	0.5	0	0	0.4	0.6	-	-	5.7	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**43**	**193**	**257**	**332**	**100**	**100**	**100**	**100**	**7.8**	**2.9**	**2.6**	**2.8**
Coal	6.0	94	129	203	14	49	50	61	14.8	3.2	4.6	3.9
Oil	26	35	11	6.4	60	18	4.2	1.9	1.5	-10.9	-5.1	-8.1
Natural gas	0	17	49	61	0	8.9	19	18	-	11.1	2.2	6.6
Nuclear	8.2	39	58	49	19	20	23	15	8.0	4.3	-1.8	1.2
Hydro	2.9	8.9	7.9	8.4	6.9	4.6	3.1	2.5	5.7	-1.1	0.6	-0.3
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0	1.8	3.9	0	0	0.7	1.2	-	-	8.1	-

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**21**	**62**	**75**	**96**	**100**	**100**	**100**	**100**	**5.6**	**1.9**	**2.5**	**2.2**
Coal-derived	4.2	32	40	55	20	51	53	57	10.6	2.3	3.2	2.8
Oil-derived	16	27	26	31	75	43	35	32	2.7	-0.1	1.7	0.8
Natural-gas-derived	1.0	3.5	8.6	10	4.9	5.7	11	11	6.4	9.4	2.0	5.6

Energy and economic indicators					AAGR (%)			
	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
GDP (billions of US dollars at 1995 value)	87	347	476	668	7.2	3.2	3.4	3.3
Population (millions of people)	18	22	24	26	1.1	0.8	0.8	0.8
GDP per capita of population (US dollars at 1995 value/person)	4,921	15,661	19,885	25,776	6.0	2.4	2.6	2.5
Primary energy consumption per capita of population (toe/person)	1.62	2.38	3.75	4.28	2.0	4.7	1.3	3.0
Primary energy consumption per unit of GDP*	328	240	231	198	-1.56	-0.36	-1.52	-0.94
CO_2 emissions per unit of GDP**	240	178	157	144	-1.47	-1.26	-0.87	-1.07
CO_2 emissions per unit of primary energy consumption***	0.732	0.662	0.745	0.710	-0.50	1.18	-0.48	0.35
Automobile ownership volume (millions of vehicles)	0.5	5.5	8.0	11	13.0	3.7	3.3	3.5
Automobile ownership volume per thousand of population (vehicles per thousand of population)	27	253	333	424	11.8	2.8	2.5	2.6

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Malaysia

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**11**	**47**	**74**	**110**	**100**	**100**	**100**	**100**	**7.7**	**4.6**	**4.0**	**4.3**
Coal	0	1.7	8.9	14	0.5	3.5	12	13	18.8	18.2	4.7	11.2
Oil	8.4	23	37	60	79	49	50	55	5.2	4.9	4.9	4.9
Natural gas	2.0	22	27	34	19	46	36	31	12.6	2.1	2.5	2.3
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	0.1	0.6	1.0	1.6	1.1	1.3	1.3	1.5	8.4	5.0	5.0	5.0
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0	0	0	0	0	0	0	-100.0	-	-	-

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**6.5**	**29**	**47**	**73**	**100**	**100**	**100**	**100**	**7.9**	**4.9**	**4.4**	**4.6**
Industry	2.9	13	22	33	45	43	47	46	7.6	5.9	4.0	4.9
Transportation	2.5	12	18	30	38	41	39	41	8.3	4.4	4.8	4.6
Residential/Commercial	0.8	4.0	5.1	8.2	13	14	11	11	8.1	2.6	4.8	3.7
Non-energy, etc.	0.3	0.6	1.1	1.6	4.2	2.1	2.4	2.3	4.3	6.0	3.9	5.0
Energy source												
Total	**6.5**	**29**	**47**	**73**	**100**	**100**	**100**	**100**	**7.9**	**4.9**	**4.4**	**4.6**
Coal	0	1.0	1.6	2.2	0.8	3.4	3.4	3.0	15.8	5.0	3.2	4.1
Oil	5.6	20	31	47	87	67	65	65	6.4	4.6	4.4	4.5
Natural gas	0	3.5	5.2	8.5	0.5	12	11	12	26.6	4.2	5.0	4.6
Electricity	0.7	5.3	9.6	15	12	18	20	21	10.3	6.2	4.6	5.4
Heat	0	0	0	0	0	0	0	0	-	-	-	-
Renewables	0	0	0	0	0	0	0	0	-	-	-	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**10**	**69**	**126**	**197**	**100**	**100**	**100**	**100**	**10.1**	**6.2**	**4.5**	**5.4**
Coal	0	1.8	34	59	0	2.6	27	30	-	34.1	5.5	19.0
Oil	8.5	6.1	0.3	0.5	85	8.8	0.3	0.3	-1.7	-24.9	4.5	-11.4
Natural gas	0.1	54	80	119	1.2	79	63	60	35.6	4.0	4.0	4.0
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	1.4	7.0	11	18	14	10	9.0	9.4	8.4	5.0	5.0	5.0
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0	0	0	0	0	0	0	-	-	-	-

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980**	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
Total	**8.1**	**34**	**57**	**86**	**100**	**100**	**100**	**100**	**7.5**	**5.1**	**4.2**	**4.7**
Coal-derived	0	1.8	9.6	15	0.7	5.2	17	18	18.8	18.2	4.7	11.2
Oil-derived	6.8	19	30	49	83	54	53	57	5.2	4.9	4.9	4.9
Natural-gas-derived	1.3	14	17	22	16	40	30	26	12.6	2.1	2.5	2.3

Energy and economic indicators					AAGR (%)			
	1980	**2000**	**2010**	**2020**	**1980-2000**	**2000-2010**	**2010-2020**	**2000-2020**
GDP (billions of US dollars at 1995 value)	32	112	178	290	6.5	4.8	5.0	4.9
Population (millions of people)	14	23	29	35	2.7	2.2	2.0	2.1
GDP per capita of population (US dollars at 1995 value/person)	2,297	4,797	6,165	8,254	3.7	2.5	3.0	2.8
Primary energy consumption per capita of population (toe/person)	0.77	1.12	2.02	2.30	1.9	6.1	1.3	3.7
Primary energy consumption per unit of GDP*	334	421	413	377	1.16	-0.18	-0.91	-0.55
CO_2 emissions per unit of GDP**	257	309	319	295	0.92	0.33	-0.77	-0.22
CO_2 emissions per unit of primary energy consumption***	0.769	0.765	0.733	0.763	-0.03	-0.42	0.40	-0.01
Automobile ownership volume (millions of vehicles)	0.9	5.2	8.1	13	9.2	4.5	5.2	4.8
Automobile ownership volume per thousand of population (vehicles per thousand of population)	65	225	261	366	6.4	1.5	3.5	2.5

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Philippines

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**13**	**33**	**57**	**96**	**100**	**100**	**100**	**100**	**4.6**	**5.6**	**5.5**	**5.5**
Coal	0.4	5.0	5.1	6.9	2.7	15	9.0	7.2	14.1	0.2	3.1	1.6
Oil	11	17	25	40	82	52	45	42	2.3	4.0	4.7	4.3
Natural gas	0	0	2.2	2.0	0	0	3.9	2.1	-	73.4	-0.9	31.1
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	0.3	0.7	1.3	2.2	2.3	2.0	2.3	2.3	4.1	7.0	5.2	6.1
Geothermal	1.8	10.0	23	45	13	30	40	47	9.0	8.5	7.1	7.8
Other renewables	0	0	0	0	0	0	0	0	-	-	-	-

Final energy consumption Breakdown by sector	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Sector	**7.9**	**18**	**29**	**47**	**100**	**100**	**100**	**100**	**4.1**	**5.2**	**4.9**	**5.0**
Total	3.1	3.6	4.7	6.0	39	20	16	13	0.8	2.7	2.6	2.6
Industry	1.9	8.3	15	25	24	47	52	54	7.5	6.1	5.3	5.7
Transportation	2.7	5.3	8.7	15	33	30	30	31	3.5	5.0	5.3	5.1
Residential/Commercial	0.3	0.4	0.7	1.2	3.4	2.1	2.4	2.5	1.7	6.4	5.2	5.8
Non-energy, etc.												
Energy source	**7.9**	**18**	**29**	**47**	**100**	**100**	**100**	**100**	**4.1**	**5.2**	**4.9**	**5.0**
Total	0.2	0.8	0.7	0.9	2.6	4.6	2.4	2.0	7.1	-1.6	3.0	0.7
Coal	6.3	14	23	38	79	77	79	80	4.0	5.4	5.0	5.2
Oil	0	0	0	0	0	0	0	0	-	-	-	-
Natural gas	1.5	3.1	5.2	8.4	18	18	18	18	3.9	5.2	4.8	5.0
Electricity	0	0	0	0	0	0	0	0	-	-	-	-
Heat	0	0	0	0	0	0	0	0	-	-	-	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**18**	**45**	**73**	**116**	**100**	**100**	**100**	**100**	**4.7**	**4.9**	**4.7**	**4.8**
Coal	0.2	17	18	26	1.0	37	25	23	25.4	1.0	3.6	2.3
Oil	12	9.2	2.8	1.7	68	20	3.8	1.5	-1.4	-11.2	-4.9	-8.1
Natural gas	0	0	10	10.0	0	0	14	8.6	-	89.8	-0.3	37.5
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	3.5	7.8	15	25	20	17	21	22	4.1	7.0	5.2	6.1
Geothermal	2.1	12	26	52	12	26	36	45	9.0	8.5	7.1	7.8
Other renewables	0	0	0	0	0	0	0	0	-	-	-	-

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**9.2**	**20**	**28**	**41**	**100**	**100**	**100**	**100**	**3.9**	**3.5**	**4.1**	**3.8**
Coal-derived	0.4	5.4	5.5	7.5	4.3	28	20	18	14.1	0.2	3.1	1.6
Oil-derived	8.8	14	21	33	96	72	75	79	2.4	3.9	4.6	4.3
Natural-gas-derived	0	0	1.4	1.3	0	0	5.1	3.1	-	73.4	-0.9	31.1

Energy and economic indicators					AAGR (%)			
	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
GDP (billions of US dollars at 1995 value)	56	88	136	206	2.3	4.4	4.2	4.3
Population (millions of people)	48	76	90	107	2.3	1.8	1.7	1.8
GDP per capita of population (US dollars at 1995 value/person)	1,173	1,167	1,503	1,921	0.0	2.6	2.5	2.5
Primary energy consumption per capita of population (toe/person)	0.28	0.30	0.44	0.53	0.4	3.7	2.0	2.9
Primary energy consumption per unit of GDP*	236	373	416	467	2.31	1.11	1.16	1.13
CO_2 emissions per unit of GDP**	163	222	204	201	1.58	-0.88	-0.13	-0.50
CO_2 emissions per unit of primary energy consumption***	0.689	0.606	0.597	0.521	-0.64	-0.15	-1.35	-0.75
Automobile ownership volume (millions of vehicles)	0.9	2.5	4.6	8.0	5.5	6.3	5.7	6.0
Automobile ownership volume per thousand of population (vehicles per thousand of population)	18	33	51	75	3.1	4.4	3.9	4.2

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Thailand

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**12**	**58**	**89**	**145**	**100**	**100**	**100**	**100**	**8.1**	**4.4**	**5.0**	**4.7**
Coal	0.5	7.5	13	20	3.9	13	14	14	14.8	5.3	4.5	4.9
Oil	12	32	42	65	95	55	48	45	5.3	2.8	4.4	3.6
Natural gas	0	18	31	58	0	30	36	40	-	6.0	6.3	6.2
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	0.1	0.5	0.6	0.8	0.9	0.9	0.7	0.5	8.1	2.3	2.0	2.1
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0.2	1.6	1.6	0.5	0.4	1.8	1.1	6.7	21.1	-0.1	10.0

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**9.2**	**42**	**64**	**102**	**100**	**100**	**100**	**100**	**7.9**	**4.2**	**4.8**	**4.5**
Industry	2.7	15	23	35	29	36	36	35	9.1	4.3	4.3	4.3
Transportation	4.0	17	28	46	43	41	43	45	7.6	4.7	5.2	4.9
Residential/Commercial	2.4	8.5	12	19	26	20	18	18	6.6	3.1	4.9	4.0
Non-energy, etc.	0.2	1.0	1.3	2.4	1.7	2.3	2.1	2.4	9.5	3.3	6.0	4.7
Energy source												
Total	**9.2**	**42**	**64**	**102**	**100**	**100**	**100**	**100**	**7.9**	**4.2**	**4.8**	**4.5**
Coal	0	3.4	7.0	12	1.0	8.2	11	12	19.7	7.3	5.5	6.4
Oil	8.0	30	42	65	87	71	66	64	6.8	3.5	4.4	4.0
Natural gas	0	1.3	1.5	2.6	0	3.0	2.3	2.6	-	1.7	5.9	3.7
Electricity	1.1	7.6	13	22	12	18	20	22	10.0	5.4	5.6	5.5
Heat	0	0	0	0	0	0	0	0	-	-	-	-
Renewables	0	0	0	0	0	0	0	0	-	-	-	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**14**	**94**	**150**	**270**	**100**	**100**	**100**	**100**	**9.9**	**4.7**	**6.1**	**5.4**
Coal	1.4	18	25	37	9.8	19	17	14	13.5	3.7	3.8	3.7
Oil	12	10.0	1.4	2.6	81	10.6	0.9	1.0	-0.8	-17.8	6.3	-6.5
Natural gas	0	61	114	219	0	64	76	81	-	6.5	6.8	6.6
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	1.3	6.0	7.5	9.2	8.8	6.4	5.0	3.4	8.1	2.3	2.0	2.1
Geothermal	0	0	0	0	0	0	0	0	-	-	-	-
Other renewables	0	0.0	1.5	1.8	0	0.0	1.0	0.7	-	94.0	1.8	40.5

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**10**	**46**	**68**	**111**	**100**	**100**	**100**	**100**	**7.9**	**4.0**	**5.0**	**4.5**
Coal-derived	0.5	8.1	14	21	5.0	18	20	19	14.8	5.3	4.5	4.9
Oil-derived	9.6	27	34	53	95	58	50	48	5.3	2.5	4.4	3.4
Natural-gas-derived	0	11	20	37	0	24	30	33	-	6.0	6.3	6.2

Energy and economic indicators					AAGR (%)			
	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
GDP (billions of US dollars at 1995 value)	52	172	293	477	6.1	5.5	5.0	5.2
Population (millions of people)	47	61	66	70	1.3	0.8	0.6	0.7
GDP per capita of population (US dollars at 1995 value/person)	1,117	2,826	4,458	6,812	4.7	4.7	4.3	4.5
Primary energy consumption per capita of population (toe/person)	0.26	0.51	0.95	1.16	3.5	6.4	2.0	4.2
Primary energy consumption per unit of GDP*	233	337	302	304	1.86	-1.08	0.05	-0.52
CO_2 emissions per unit of GDP**	194	269	232	233	1.64	-1.46	0.01	-0.73
CO_2 emissions per unit of primary energy consumption***	0.834	0.820	0.798	0.777	-0.08	-0.27	-0.28	-0.27
Automobile ownership volume (millions of vehicles)	0.9	6.1	10	18	10.2	5.4	5.8	5.6
Automobile ownership volume per thousand of population (vehicles per thousand of population)	19	101	158	261	8.7	4.6	5.2	4.9

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

Vietnam

Primary energy consumption	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**4.2**	**14**	**33**	**54**	**100**	**100**	**100**	**100**	**6.3**	**8.7**	**5.2**	**6.9**
Coal	2.3	3.7	6.3	8.2	54	26	19	15	2.4	5.5	2.6	4.1
Oil	1.8	8.3	16	30	43	58	50	55	7.8	7.1	6.2	6.6
Natural gas	0	1.1	6.7	11	0	7.9	20	20	-	19.3	5.0	11.9
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	0.1	1.3	3.5	5.5	3.0	8.7	11	10	12.1	10.9	4.5	7.7
Geothermal	0	0	0	0	0	0	0	0	-	-	0.0	-
Other renewables	0	0	0	0	0	0	0	0	-	-	0.0	-

Final energy consumption Sector	Millions of toe				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**3.4**	**12**	**26**	**45**	**100**	**100**	**100**	**100**	**6.5**	**8.1**	**5.5**	**6.8**
Industry	1.5	3.8	8.5	14	45	31	32	31	4.7	8.4	5.1	6.7
Transportation	0.6	4.8	10	19	19	40	39	43	10.5	7.9	6.5	7.2
Residential/Commercial	1.2	3.4	7.5	12	35	28	29	26	5.4	8.2	4.6	6.4
Non-energy, etc.	0	0	0	0	1.3	0	0	0	-100.0	-	-100.0	-
Energy source												
Total	**3.4**	**12**	**26**	**45**	**100**	**100**	**100**	**100**	**6.5**	**8.1**	**5.5**	**6.8**
Coal	1.5	2.5	3.1	3.5	44	21	12	7.8	2.5	2.3	1.2	1.8
Oil	1.7	7.6	16	30	49	63	62	68	7.9	7.8	6.5	7.2
Natural gas	0	0	1.7	2.8	0	0	6.4	6.2	-	-	5.2	-
Electricity	0.2	1.9	5.3	8.3	6.8	16	20	18	11.2	10.6	4.6	7.5
Heat	0	0	0	0	0	0	0	0	-	-	-	-
Renewables	0	0	0	0	0	0	0	0	-	-	-	-

Electricity generation	(TWh)				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**3.6**	**27**	**76**	**121**	**100**	**100**	**100**	**100**	**10.6**	**11.1**	**4.7**	**7.9**
Coal	1.4	3.1	9.1	15	40	12	12	12	4.0	11.3	4.9	8.1
Oil	0.7	4.6	4.0	2.6	18	17	5.2	2.1	10.2	-1.4	-4.3	-2.9
Natural gas	0	4.4	22	39	0	16	29	33	-	17.6	6.0	11.6
Nuclear	0	0	0	0	0	0	0	0	-	-	-	-
Hydro	1.5	15	41	64	42	55	54	53	12.1	10.9	4.5	7.7
Geothermal	0	0	0	0	0	0	0	0	-	-	0.0	-
Other renewables	0	0	0.1	0.1	0	0	0.2	0	-	-	0.0	-

CO_2 emission levels	Millions of tons of carbon-equivalent				Share (%)				AAGR (%)			
	1980	2000	2010	2020	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
Total	**4.0**	**12**	**25**	**41**	**100**	**100**	**100**	**100**	**5.5**	**7.9**	**5.1**	**6.5**
Coal-derived	2.5	4.0	6.8	8.8	62	34	27	22	2.4	5.5	2.6	4.1
Oil-derived	1.5	6.9	14	25	38	60	55	61	7.9	7.1	6.2	6.6
Natural-gas-derived	0	0.7	4.3	7.0	0	6.3	17	17	-	19.3	5.0	11.9

Energy and economic indicators					AAGR (%)			
	1980	2000	2010	2020	1980-2000	2000-2010	2010-2020	2000-2020
GDP (billions of US dollars at 1995 value)	8.0	28	53	95	6.5	6.7	6.0	6.3
Population (millions of people)	54	79	89	101	1.9	1.3	1.2	1.3
GDP per capita of population (US dollars at 1995 value/person)	148	356	598	947	4.5	5.3	4.7	5.0
Primary energy consumption per capita of population (toe/person)	0.08	0.09	0.18	0.29	0.5	7.6	4.7	6.2
Primary energy consumption per unit of GDP*	533	513	618	571	-0.19	1.88	-0.80	0.53
CO_2 emissions per unit of GDP**	498	416	466	428	-0.89	1.14	-0.85	0.14
CO_2 emissions per unit of primary energy consumption***	0.933	0.869	0.811	0.770	-0.35	-0.70	-0.52	-0.61
Automobile ownership volume (millions of vehicles)	0	0.2	0.4	0.8	-	6.7	6.0	6.3
Automobile ownership volume per thousand of population (vehicles per thousand of population)	0	2.9	4.8	7.7	-	5.3	4.7	5.0

* Toe/millions of US dollar at 1995 value
** Tons of carbon-equivalent/millions of US dollar at 1995 value
*** Tons of carbon-equivalent/toe

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