Forecast of Global Supply and Demand Trends for Petrochemical Products

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1. Global supply and demand trends for ethylene and ethylene derivatives

(1) Global demand for ethylene derivatives

- Global demand for ethylene derivatives in 2003 (ethylene conversion) came to 97.6 million tons, a 2.7% increase from the previous year. Global demand in 2004 came to 103.2 million tons, which was an increase of 5.4% from the previous year. Overall demand was solid and there was a particularly strong rise in demand from China (7.6% increase from the previous year).
- Overall global demand for ethylene derivatives is expected to grow at an annual rate of 5.3% between 2003 and 2009 with overall demand in 2009 coming to 132.8 million tons, which would be an increase of 35.2 million tons over the level for 2002, provided that the world economy enjoys steady growth from 2004.
- The rate of demand growth will vary from region to region. The demand for ethylene derivatives in the Asian region is expected to grow at an annual rate of 6.7%. Demand from China is expected to continue rising sharply. In fact, demand from China alone is expected to increase by 10.9 million tons during the period from 2003 to 2009. Demand in North America is forecast to rise at an annul rate of 4.1%, while demand in Western Europe is expected to rise at a steady 2.1% annually.
- Demand in Japan came to 5.6 million tons in 2003 and 5.8 million tons in 2004. Japanese demand for 2009 is expected to be around 5.5 million tons based on several assumptions such as a certain level of economic growth, expanded imports of products and the likelihood that some users will be moving operations overseas.

<Table 1-1> Global demand for ethylene derivatives (ethylene conversion) (Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Demand 2003	97.6	35.8	3.8	2.6	15.4	4.6	2.8	5.6	22.0	23.8	2.3
2009	132.8	52.8	4.6	3.6	26.3	6.3	5.0	5.5	25.0	30.3	4.1
Increase 03-09	35.2	17.0	0.8	1.1	10.9	1.6	2.3	-0.1	3.0	6.5	1.8
Growth rate 03-09	5.3%	6.7%	3.1%	5.9%	9.3%	5.2%	10.4%	-0.2%	2.1%	4.1%	10.1%

<Table 1-2> Changes in global demand for ethylene derivatives (ethylene conversion) (Unit: million tons)

	2003	2004	2005	2006	2007	2008	2009	Average growth rate 03-09
Demand volume	97.6	103.2	108.2	114.1	120.5	126.8	132.8	—
On year growth rate	2.7%	5.4%	5.1%	5.4%	5.6%	5.3%	4.7%	5.3%

(2) Global production capacity of ethylene derivatives

- The global production capacity of ethylene derivatives came to 116.6 million tons as of the end of 2003. Global production at the end of 2009 is expected to be 149.1 million tons, based on the current plans for raising production capacity. This would mark an increase of 32.5 million tons over the level for 2003, which is equivalent to an average annual increase of 4.2%.
- Production capacity of ethylene (monomer), the raw material, is expected to rise from 110.2 million tons as of the end of 2003 to 143.7 million tons in 2009 for an average annual increase of 4.5%.
- Huge gains in production capacity are expected for China and the Middle East.

<Table 1-3> Global production capacity of ethylene derivatives (ethylene conversion) (Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Capacity 2003	116.6	36.4	5.9	3.6	8.5	7.3	3.0	8.0	25.5	32.4	8.9
Capacity 2009	149.1	49.4	6.1	4.5	17.9	8.1	5.0	7.8	26.4	32.9	23.3
Increase 03-09	32.5	13.0	0.2	0.9	9.4	0.8	2.0	-0.2	0.9	0.6	14.4
Growth rate 03-09	4.2%	5.2%	0.5%	3.7%	13.2%	1.7%	8.9%	-0.4%	0.6%	0.3%	17.4%

<Table 1-4> Global production capacity of ethylene (monomer) (Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Capacity 2003	110.2	31.1	6.0	3.0	5.8	6.0	2.9	7.4	23.6	32.7	9.2
Capacity 2009	143.7	44.2	6.7	4.3	12.5	6.6	6.7	7.4	24.7	33.5	24.9
Increase 03-09	33.5	13.2	0.8	1.3	6.7	0.6	3.8	0.0	1.0	0.8	15.6
Growth rate 03-09	4.5%	6.1%	2.0%	6.3%	13.7%	1.6%	14.8%	0.0%	0.7%	0.4%	17.9%

(3) Global supply and demand balance for ethylene derivatives

- Based on current and very reliable information regarding plans for new and expanded production, the growth in supply in China will not keep pace with growing demand. As such, the negative demand-supply balance (excess of imports over exports) for China is expected to expand to 12.7 million tons in 2009. The import position of ethylene derivatives for all of Asia is expected to be 12.0 million tons in 2009.
- On the other hand, the excess of exports over imports for the Middle East is expected to increase to 16.9 million tons in 2009.
- For products such as LDPE and HDPE it is expected that the increase in the excess of exports over imports for the Middle East will be bigger than the increase in the excess of imports over exports for Asia.

<Table 1-5> Global supply and demand balance for ethylene derivatives (ethylene conversion)

(Unit: million tons)

		Global Total	Asian Total							Western Europe	North America	Middle East
				South Korea	Taiwan	China	ASEAN	India	Japan			
2003	Production	99.1	30.8	5.6	3.1	6.8	5.5	2.6	7.1	21.2	28.0	8.3
	Demand	97.6	35.8	3.8	2.6	15.4	4.6	2.8	5.6	22.0	23.8	2.3
	Balance	1.4	-5.0	1.8	0.5	-8.5	0.9	-0.2	1.6	-0.8	4.2	6.0
2009	Production	131.7	40.8	5.7	3.6	13.6	6.8	4.2	7.0	23.2	31.8	21.0
	Demand	132.8	52.8	4.6	3.6	26.3	6.3	5.0	5.5	25.0	30.3	4.1
	Balance	-1.1	-12.0	1.1	-0.1	-12.7	0.5	-0.8	1.5	-1.8	1.5	16.9

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

<Table 1-6> Japanese ethylene demand forecasts (ethylene conversion) (Unit: 10,000 tons)

	Results		Forecasts		Increase
	2003	2004	2007	2009	03–09
Domestic demand for ethylene derivatives	557	577	554	550	-0.2%
Import-Export balance of ethylene derivatives	156	157	155	146	—
Production of ethylene derivatives (= Domestic demand for ethylene monomer)	713	734	706	696	-0.3%
Import-Export balance of ethylene monomer	23	23	17	3	—
Ethylene production	737	757	722	698	-0.9%

<Table 1-7> Supply and demand balance for ethylene derivatives by product (Unit: million tons)

○ Asia

		Total	LDPE	HDPE	SM	PVC	EG
2003	Capacity	36.4	10.8	9.4	2.9	7.2	3.8
	Production	30.8	9.6	8.1	2.8	5.6	3.3
	Demand	35.8	10.8	8.9	3.3	5.6	5.6
	Balance	-5.0	-1.3	-0.8	-0.4	0.0	-2.3
2009	Capacity	49.4	14.0	12.8	4.2	10.1	5.8
	Production	40.8	12.8	11.5	3.7	8.0	5.1
	Demand	52.8	14.8	13.2	4.1	8.9	10.2
	Balance	-12.0	-2.0	-1.7	-0.4	-1.0	-5.1

○ Middle East

		Total	LDPE	HDPE	SM	PVC	EG
2003	Capacity	8.9	2.9	3.1	0.3	0.3	1.8
	Production	8.3	2.6	2.6	0.3	0.3	1.7
	Demand	2.3	0.7	0.7	0.1	0.3	0.2
	Balance	6.0	1.9	1.9	0.2	0.1	1.5
2009	Capacity	23.3	7.6	7.6	0.9	0.5	5.5
	Production	21.0	6.8	6.3	0.8	0.4	5.1
	Demand	4.1	1.1	1.0	0.1	0.3	0.4
	Balance	16.9	5.7	5.3	0.7	0.1	4.7

○ Asia + Middle East

		Total	LDPE	HDPE	SM	PVC	EG
2003	Balance	1.0	0.6	1.3	-0.2	0.1	-0.8
2009	Balance	4.9	3.7	3.6	0.3	-0.9	-0.4

2. Global supply and demand for propylene derivatives and propylene

(1) Global demand for propylene derivatives

- The global demand for propylene derivatives (propylene conversion) is expected to rise at an average annual rate of 5.0% from the 2003 level of 58.8 million tons to 78.9 million tons in 2009.
- The average annual rate of demand growth for this period is expected to be 6.3% in Asia, 4.0% in North America and 2.8% in Western Europe. Demand from China is expected to remain strong (increase of 6.0 million tons compared to 2003 level).

<Table 2-1> Global demand for propylene derivatives (propylene conversion) (Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Demand 2003 2009	58.8 78.9	21.6 31.2	1.8 2.2	1.1 1.4	9.3 15.3	3.0 4.1	1.2 2.1	4.8 5.5	14.4 17.0	14.6 18.4	1.5 2.9
Increase 03-09	20.1	9.6	0.4	0.3	6.0	1.1	0.9	0.7	2.6	3.8	1.3
Growth rate 03-09	5.0%	6.3%	3.5	3.8%	8.6%	5.4%	9.7%	2.5%	2.8%	4.0%	11.0%

(2) Global production capacity of propylene derivatives

- Global production capacity of propylene derivatives came to 66.1 million tons as of the end of 2003 (propylene conversion). Based on the current plans for production increases, this level is expected to reach 82.8 million tons by the end of 2009, which would be an increase of 16.7 million tons over the 2003 level and represents an average annual growth rate of 3.8%
- The average annual production growth rate during the 2003-2009 period is expected to be 3.8% in Asia, 1.7% in North America, 0.8% in Western Europe and 27.4% in the Middle East.
- Production capacity of propylene, the raw material, is expected to rise from the end of 2002 level of 72.9 million tons to 88.9 million tons in 2009, which would be an average annual increase of 3.4%.

<Table 2-2> Global production capacity of propylene derivatives (propylene conversion)

(Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Capacity 2003	66.1	23.4	3.5	1.6	6.7	4.6	1.5	5.5	16.0	17.6	1.7
2009	82.8	29.2	3.5	1.9	10.4	4.9	2.8	5.7	16.7	19.4	7.5
Increase 03-09	16.7	5.8	0.0	0.3	3.7	0.3	1.3	0.2	0.8	1.8	5.7
Growth rate 03-09	3.8%	3.8%	0.0%	2.9%	7.5%	1.1%	11.2%	0.6%	0.8%	1.7%	27.4%

<Table 2-3> Global production capacity of propylene (monomer) (Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Capacity 2003	72.9	22.3	3.9	2.0	5.7	3.7	1.5	5.6	16.5	24.5	2.0
2009	88.9	29.5	4.3	3.4	9.7	4.4	1.9	5.9	16.8	25.3	7.2
Increase 03-09	16.0	7.2	0.4	1.4	4.0	0.7	0.4	0.3	0.4	0.8	5.1
Growth rate 03-09	3.4%	4.8%	1.7%	9.1%	9.3%	3.0%	4.4%	0.8%	0.4%	0.5%	23.4%

(3) Supply and demand balance for propylene derivatives and propylene

- The growth in supply of propylene derivative products in China is not keeping pace with the growth in demand. As such, the negative demand-supply balance (excess imports over exports) for propylene derivative products in China is expected to increase to 5.9 million tons in 2009.
- The import position of propylene derivatives for the Asian region is expected to expand to 3.9 million tons.

<Table 2-4> Global supply and demand balance for propylene derivatives and propylene (propylene conversion)

(Unit: million tons)

		Global Total	Asian Total						Western Europe	North America	Middle East
				South Korea	Taiwan	China	ASEAN	India	Japan			
2003	Production	60.2	21.4	3.3	1.4	6.1	3.9	1.4	5.3	14.9	16.2	1.6
	Demand	58.8	21.6	1.8	1.1	9.3	3.0	1.2	4.8	14.4	14.6	1.5
	Balance	1.4	-0.2	1.5	0.3	-3.2	0.9	0.2	0.6	0.4	1.7	0.0
2009	Production	76.2	27.3	3.3	1.7	9.4	4.6	2.4	5.8	16.1	18.3	5.8
	Demand	78.9	31.2	2.2	1.4	15.3	4.1	2.1	5.5	17.0	18.4	2.9
	Balance	-2.7	-3.9	1.1	0.3	-5.9	0.5	0.3	0.3	-1.0	-0.1	2.9

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

<Table 2-5> Global supply and demand balance for propylene (monomer) (Unit: million tons)

		Global Total	Asian Total						Western Europe	North America	Middle East
				South Korea	Taiwan	China	ASEAN	India	Japan			
2003	Production	61.5	22.0	3.9	1.8	5.9	3.5	1.4	5.6	14.7	16.8	1.7
	Demand	61.7	22.3	3.9	1.9	6.1	3.8	1.4	5.3	14.9	16.7	1.6
	Balance	-0.2	-0.3	0.0	-0.1	-0.2	-0.3	0.0	0.3	-0.2	0.2	0.2
2009	Production	79.9	29.2	4.2	3.1	9.7	4.3	1.9	6.1	15.8	20.2	5.9
	Demand	77.7	28.5	3.9	2.0	9.9	4.5	2.4	5.8	16.2	18.3	5.8
	Balance	2.2	0.7	0.3	1.1	-0.2	-0.2	-0.5	0.3	-0.3	1.9	0.1

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

3. Global supply and demand for aromatics and aromatic derivatives

(1) Global supply and demand for aromatics

- Global demand for benzene, toluene and xylene in 2003 came to 35.9 million tons (8.1% increase on-year), 16.4 million tons (8.7% increase on-year) and 33.7 million tons (8.7% increase on-year), respectively.
- In terms of average annual growth rates for demand during the 2003–2009 period, demand for benzene is expected to increase 4.2%, toluene 4.5% and xylene 5.9%.
- Global production capacity of the 2003–2009 period is expected to increase at an annual average rate of 2.5% for benzene, 2.5% for toluene and 2.2% for xylene.
- Excess demand for benzene, toluene and xylene in the Asian region is expected to keep growing.

<Table 3-1> Global demand, production capacity and demand-supply balance for benzene

Global benzene demand (Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Demand 2003	35.9	13.2	2.5	1.4	2.1	2.1	0.7	4.5	8.3	9.8	1.2
2009	45.9	18.0	3.6	1.7	4.2	2.5	1.1	4.9	9.1	10.6	3.8
Increase 03-09	10.1	4.7	1.1	0.3	2.1	0.4	0.5	0.4	0.8	0.8	2.7
Growth rate 03-09	4.2%	5.2%	6.0%	3.0%	12.3%	2.9%	9.0%	1.6%	1.5%	1.3%	21.9%

Global benzene production capacity (Unit: million tons, %)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Capacity 2003	42.4	15.1	3.2	1.1	2.7	1.8	0.8	5.5	9.4	10.8	2.1
2009	49.0	18.3	3.3	1.5	4.7	2.6	0.8	5.5	10.1	10.9	3.8
Increase 03-09	6.7	3.3	0.1	0.4	2.0	0.8	0.0	0.0	0.7	0.2	1.6
Growth rate 03-09	2.5%	3.3%	0.6%	4.8%	9.8%	6.1%	0.0%	0.0%	1.3%	0.3%	9.9%

Global benzene demand-supply balance (Unit: million tons)

	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
2003 2009	0.0 -0.8	0.6 0.0	-0.4 -0.6	0.1 0.0	-0.5 -0.1	0.0 -0.4	0.1 0.2	-0.0 0.0	-0.8 -0.7	0.3 -0.4

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

<Table 3-2> Global demand, production capacity and demand-supply balance for toluene

Global toluene demand (Unit: million tons)

	Global Total	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
Demand 2003 2009	 16.4 21.3	 5.4 7.8	 1.2 2.0	 0.3 0.4	 1.7 2.7	 0.4 0.6	 0.3 0.4	 1.6 1.6	 1.9 1.8	 6.2 7.0	 0.6 0.7
Increase 03-09	4.9	2.4	0.9	0.1	0.9	0.2	0.1	0.1	-0.0	0.8	0.0
Growth rate 03-09	4.5%	6.2%	9.8%	6.0%	7.7%	5.1%	7.0%	1.3%	-0.3%	2.0%	0.8%

Global toluene production capacity (Unit: million tons)

	Global Total	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
Capacity 2003 2009	 23.7 27.5	 5.7 6.9	 2.0 2.0	 0.1 0.1	 1.0 2.0	 0.7 0.9	 0.3 0.3	 1.6 1.6	 2.6 2.6	 10.5 12.2	 0.7 0.7
Increase 03-09	3.8	1.2	0.0	0.0	1.0	0.2	0.0	0.0	0.0	1.7	0.0
Growth rate 03-09	2.5%	3.2%	0.0%	0.0%	12.0%	4.2%	0.0%	0.0%	0.0%	2.5%	0.0%

Global toluene demand-supply balance (Unit: million tons)

	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
2003	-0.3	0.7	-0.2	-1.0	0.2	0.0	0.0	0.3	-0.3	0.0
2009	-1.4	-0.2	-0.3	-1.1	0.3	-0.2	0.0	0.5	-0.6	0.0

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

<Table 3-3> Global demand, production capacity and demand-supply balance for xylene

Global xylene demand (Unit: million tons)

	Global Total	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
Demand 2003	24.6	12.9	2.7	1.4	2.8	0.9	0.3	4.8	3.6	5.6	1.2
2009	34.7	17.7	3.4	1.7	5.6	1.2	0.4	5.3	3.6	6.5	3.5
Increase 03-09	10.1	4.8	0.7	0.3	2.8	0.3	0.1	0.5	0.0	1.0	2.3
Growth rate 03-09	5.9%	5.4%	4.0%	3.4%	12.4%	4.8%	7.0%	1.6%	0.0%	2.7%	19.6%

Global xylene production capacity (Unit: million tons)

	Global Total	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
Capacity 2003	33.7	14.1	2.5	1.4	3.0	1.0	0.3	5.9	4.6	10.3	1.1
2009	38.4	15.4	2.5	1.5	4.0	1.1	0.3	5.9	4.7	9.9	3.4
Increase 03-09	4.7	1.4	0.0	0.1	1.1	0.2	0.0	0.0	0.1	-0.4	2.3
Growth rate 03-09	2.2%	1.5%	0.0%	1.1%	5.3%	2.8%	0.0%	0.0%	0.4%	-0.6%	20.1%

Global xylene demand-supply balance (Unit: million tons)

	Asian Total							Western Europe	North America	Middle East
		South Korea	Taiwan	China	ASEAN	India	Japan			
2003	-0.7	-0.6	-0.2	-0.3	-0.0	0.0	0.4	0.6	0.9	-0.2
2009	-3.3	-1.2	-0.4	-2.0	-0.2	-0.1	0.6	0.7	0.8	-0.2

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

(2) Global supply and demand for paraxylene and PTA

- The global demand for paraxylene in 2003 came to 19.3 million tons (3.3% increase on year) and the global demand for PTA came to 26.2 million tons (3.1% increase on year). Demand from the Asian region accounted for roughly 70% of the total.
- This high rate of growth in global demand is expected to continue. For the 2003–2009 period global demand for paraxylene is expected to grow at an average annual rate of 7.8% and demand for PTA is expected to increase at an average annual rate of 8.5%.
- Excess demand for paraxylene and PTA in the Asian region is expected to keep expanding.

<Table 3-4>Global paraxylene demand and demand-supply balance

Global paraxylene demand (Unit: million tons)

	Global Total	Asian Total							Western Europe	North America	Middle East
			South Korea	Taiwan	China	ASEAN	India	Japan			
Demand 2003	19.3	12.9	2.7	2.9	2.5	2.0	1.6	1.1	2.4	2.5	0.3
2009	30.3	21.8	4.3	3.0	7.9	2.8	2.4	1.1	3.1	3.2	0.8
Increase 03-09	11.0	8.9	1.6	0.2	5.4	0.8	0.8	0.0	0.7	0.7	0.5
Growth rate 03-09	7.8%	9.1%	8.3%	0.9%	21.3%	5.6%	7.0%	0.1%	4.1%	3.9%	17.6%

Global paraxylene demand-supply balance (Unit: million tons)

	Asian Total							Western Europe	North America	Middle East
		South Korea	Taiwan	China	ASEAN	India	Japan			
2003	-1.4	-0.6	-1.7	-0.9	0.0	0.0	2.0	-0.2	1.8	0.2
2009	-3.0	-0.4	-1.4	-3.4	0.3	-0.3	2.3	-0.3	1.6	1.0

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

<Table 3-5> Global PTA demand and demand-supply balance

Global PTA demand (Unit: million tons)

	Global Total	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
Demand 2003	26.2	18.5	3.2	2.8	7.3	2.3	1.6	0.9	2.4	3.7	0.2
2009	42.7	29.5	3.2	3.0	15.6	4.0	2.3	0.9	3.5	5.1	0.9
Increase 03-09	16.6	11.0	-0.0	0.2	8.3	1.7	0.8	0.0	1.2	1.5	0.7
Growth rate 03-09	8.5%	8.1%	-0.2%	1.0%	13.5%	9.8%	7.0%	0.5%	7.0%	5.7%	32.4%

Global PTA demand-supply balance (Unit: million tons)

	Asian Total	South Korea	Taiwan	China	ASEAN	India	Japan	Western Europe	North America	Middle East
2003	0.2	1.7	1.2	-4.6	1.1	0.1	0.5	0.1	0.1	0.2
2009	0.7	2.2	1.5	-4.5	0.2	0.7	0.6	-0.6	-0.6	0.1

Note: The forecasts for production were made for each country based on very reliable plans for increases in new production facilities up until 2009. Separately, demand forecasts up until 2009 have been made for each country since 2004 based on the assumption that steady growth in the global economy will be achieved and while taking into consideration the economic conditions and industrial structures of each country. As such, there may not be perfect agreement between the global totals for production capacity and demand.

4. Movements of the petrochemical industries in major countries and regions around the world

(1) Asia

- High economic growth is expected for the mid-term and so Asia is recognized as a region where demand for petrochemical products is expected to grow.
- In particular, demand for petrochemical products is projected to grow in China, where solid domestic demand is expected to help the country maintain a high GDP growth rate of around 8%.
- China is considering plans for large-scale increases in production capacity, but the nation's imports are still expected to increase due to the surging demand.
- In India demand for petrochemical products, mainly ethylene and propylene, is expected to increase. Meanwhile, some plans are being studied to increase production capacity with participation by not only the usual petrochemical companies, but also by petroleum and gas companies.

1) Japan

- Domestic demand for petrochemical products is expected to continue to decrease slightly as many major users of these products move their operations overseas and as imports of such products from Asian countries increase.

2) South Korea

- The Korean economy is starting to recover after the government aggressively introduced new fiscal and macroeconomic policies in the first half. However, exports have been dull with China, the main recipient of Korean exports, instituting new measures to restrict investment. Personal consumption has also stalled and private sector capital expenditures have remained at a low level. As a result the economy has been sluggish in the second half and the economic growth rate is expected to be 4.6%. In 2005 the economic growth rate is expected to remain around 4.0% as poor construction investment dampens the employment situation, increases the unemployment rate and prevents a recovery in personal consumption.
- Korean production of ethylene came to 5.91 million tons in 2003, an increase of 3.6% from the previous year. In 2004 this amount is expected to increase another 1.9% on-year to a record high of 5.96 million tons. Exports were down slightly as compared to 2003, but robust demand from China is expected to continue. The situation for other petrochemical products is starting to improve thanks to solid exports, mainly to China. In 2004 there was an aggressive push to start and expand production at Chinese bases for South Korea's LG Chemical, Hanwha Chemical and other corporations. Honam Petrochemical is also in the process of acquiring KP Chemical. Domestically efforts are being made to bolster naphtha cracker facilities, and in 2007 the three companies of LG, Yochon NCC and Hyundai Petrochemical will be producing more than one million tons.

3) Taiwan

- In 2004 Taiwan likely achieved a 5.9% economic growth rate thanks to the improving global economy, high economic growth in China, better private sector demand and public investment that had the stated goal of 5% growth. In 2005 there should be moderate economic growth thanks to solid private sector demand, expanded public investment and the effects of public expenditures. Economic growth for the full year is forecast to be around 4.7%.

- In August Taiwan's Formosa Plastics Group (FPG) held discussions with Sinopec regarding a strategic alliance in such areas as consigned petroleum production, supplying raw materials and trade. Then the company submitted an application with China's State Council to construct an ethylene plant with a production capacity of 1.2 million tons in Ningbo of China's Zhejiang Province. There are also plans to build Taiwan's largest petroleum refinery in Yunlin County. This refinery will require an investment of 120 billion yuan and when finished will produce 600,000 barrels/day. Meanwhile, Chinese Petroleum Corp. (CPC) has started exports of ethylene and it has decided to invest 42.5 billion yuan to rebuild its third naphtha cracker plant capable of producing one million tons of ethylene in the Yuanlin Industry Park.

4) China

- China enjoyed a very brisk economic growth rate of 9.5% in 2004. Inflationary pressures increased with the consumer price index rising 3.9% on-year, and fiscal restraints and measures to curb investment are expected to continue. The unemployment rate in urban areas dropped on-year for the first time in 13 years, but these conditions are still very unpredictable. Various institutions are projecting an economic growth rate between 8~9% for China in 2005. The State Council's Development Research Center has expressed the view that China will maintain a growth rate of around 8% up until 2010. In other words, this trend is expected to continue up until around the time of the 2008 Beijing Olympics and the 2010 Shanghai Expo.
- Plans for new large-scale ethylene production facilities include Shanghai SECCO (annual ethylene production of 900,000 tons), which has been proceeding with foreign capital mainly from the U.S. and Europe, and will start operations from March, Yangzi BASF (600,000 tons), which will start operations from May, and SHELL Shanghai (800,000 tons), which plans to start operations sometime between the end of the year and 2006. In addition to these projects, EXXON MOBILE is making progress with two projects planned for Fujian and Guangzhou, which it hopes to have up and running in 2008. Other petrochemical plans are also taking shape. New partners are being selected for the Tianjin Project (one million tons) following DOW's withdrawal. There are also plans for expanding existing ethylene complexes such as those for Xinjiangs Uyghur's Dushanzi (by 1.2 million tons), Ningbo's Zhenhai Oil (by 1 million tons) and Fushun (by 800,000 tons).

5) India

- In 2004 a late monsoon season resulted in a drop in agricultural production, but results for the mining, manufacturing, service and IT sectors were all very strong. As a result, GDP likely grew at a brisk 8.2%. India has been making progress in improving relations with nearby countries. Even the long strained relationship with its neighbor Pakistan has improved.
- In terms of new production plans, Reliance, which accounts for around 60% of India's petrochemical production capacity, is planning ethylene production of 800,000 tons in 2007. In addition, state-operated petroleum company IOC is planning ethylene production of 800,000 ton in 2007 and state-run gas company GAIL is planning production of 300,000 tons in 2006 and 2008.

(2) Western Europe

- Real GDP for the EU countries continues to see a gradual overall recovery and came to 1.8% in 2004. During the first half of 2005 there has been a slowdown in the global economy and external demand has fallen off. At the same time there is expected to be only a mild recovery in domestic demand due to higher crude prices and efforts by corporations to correct high costs. However, there is the strong possibility of the economic recovery gaining strength in the second half when the global economy is expected to improve and more progress is likely to be made in the organization of corporate divisions. Therefore, real GDP in 2005 is expected to come to the same 1.8% growth seen in 2004.
- The petrochemical industry has been undergoing a process of restructuring that started in the 1990's, but there have been no major developments in this regard since SABIC bought the petrochemical division of Holland's DSM in 2002. However, in 2004 BP announced that among its seven main products it would retain only PX, PTA and acetic acid operations, while spinning off the other operations including olefin and polyolefin. Plans to sell Basell, which is a joint venture between Shell and BASF and world's leading producer of PP, were also announced.
- Currently there are no plans to build new large-scale ethylene production faculties in Europe. However, there are plans to increase overall "de-bottlenecking" capacity to one million tons between 2003 and 2009 as the various companies try to keep pace with rising demand.

(3) America (USA)

- In 2004 there were concerns that the Iraq War would have negative impacts on the economy. However, the economy continued to improve and grew at a rate of 4.5%, beating the initial forecast of 4.0% growth. GDP is forecast to grow 3.5% in 2005 and enjoy average annual growth of 2.7% until 2009.
- Overall profitability for the U.S. petrochemical industry improved in 2004. There were concerns about higher prices for natural gas, an important raw material, as well as the unstable situation in the Middle East. However, demand remained strong throughout 2004 and dropping capacity kept the market a little tight and allowed the industry to charge higher prices.
- The market is now in a period of recovery, but in 2004 there were no announcements regarding plans to build any major new facilities. There have been no new large-scale mergers and acquisitions in the petroleum and petroleum products industries.

(4) Middle East

- The petrochemical industry in the Middle East is striving to become much less dependent on oil production, make more effective use of resources and diversify revenue sources. To this end, governments in the Middle East have been working to introduce capital, technological skills and business management expertise from foreign firms.
- Early in 2001 three large-scale ethylene plants that have a total capacity of 2.30 million tons began operating in Saudi Arabia. Since then large-scale plants in Abu Dhabi, Qatar and Iran have also come on line. Exports of Middle Eastern petrochemical products, mainly those based on gas for which there are cost competitive advantages, are expanding and ethylene plants are maintaining high operating rates. Furthermore, there are plans to continue building large petrochemical plants between 2005 and 2010. Ethylene production capacity in the Middle East will come to 25 million tons by the end of 2009, 2.7 times the level seen at the end of 2003.

Notes: In this document,

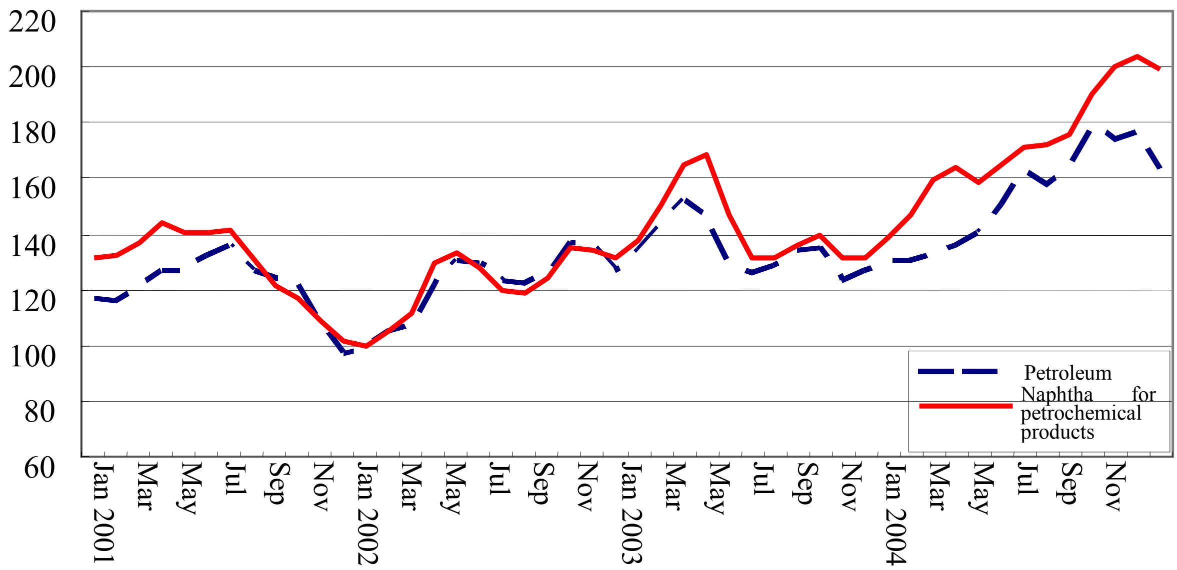
(1) The Middle East is not included in Asia. Turkey is not included in the Middle East but is included in Western Europe.
(2) The term "capacity" refers to annual capacity.
(3) The terms "growth" and "growth rate" refer to annual growth and growth rates, unless otherwise specified.

(Reference)

- The conditions for the global market for petrochemical products in 2004 is characterized by a dynamic increase in demand from Asia, particularly China, and a sharp jump in naphtha prices along with higher petroleum prices. [Refer to Figures (1)-(3).]
- Against this background there has been the emergence of several new production expansion plans for this one-year period, especially in China and the Middle East. Many of these plans were not known as of March 2003.
- In recent years demand from China has accounted for an ever increasing percentage of the overall global demand. The conditions are now such that trends in the Chinese market can have major impacts on the outlook for overall global demand.
- Taking these conditions into consideration and referring to the Fiscal 2004 version of "Future Demand Trends for Global Petrochemical Products", the following two points were noted mainly for ethylene and propylene.
  (1) Production: Compared to the Fiscal 2003 version (prepared in March 2004), the new production capacity expansion plans that emerged over this past year have had an impact on the outlook for production amounts.
  (2) Demand: Forecasts are made regarding what impact economic trends in China will have on Chinese demand.

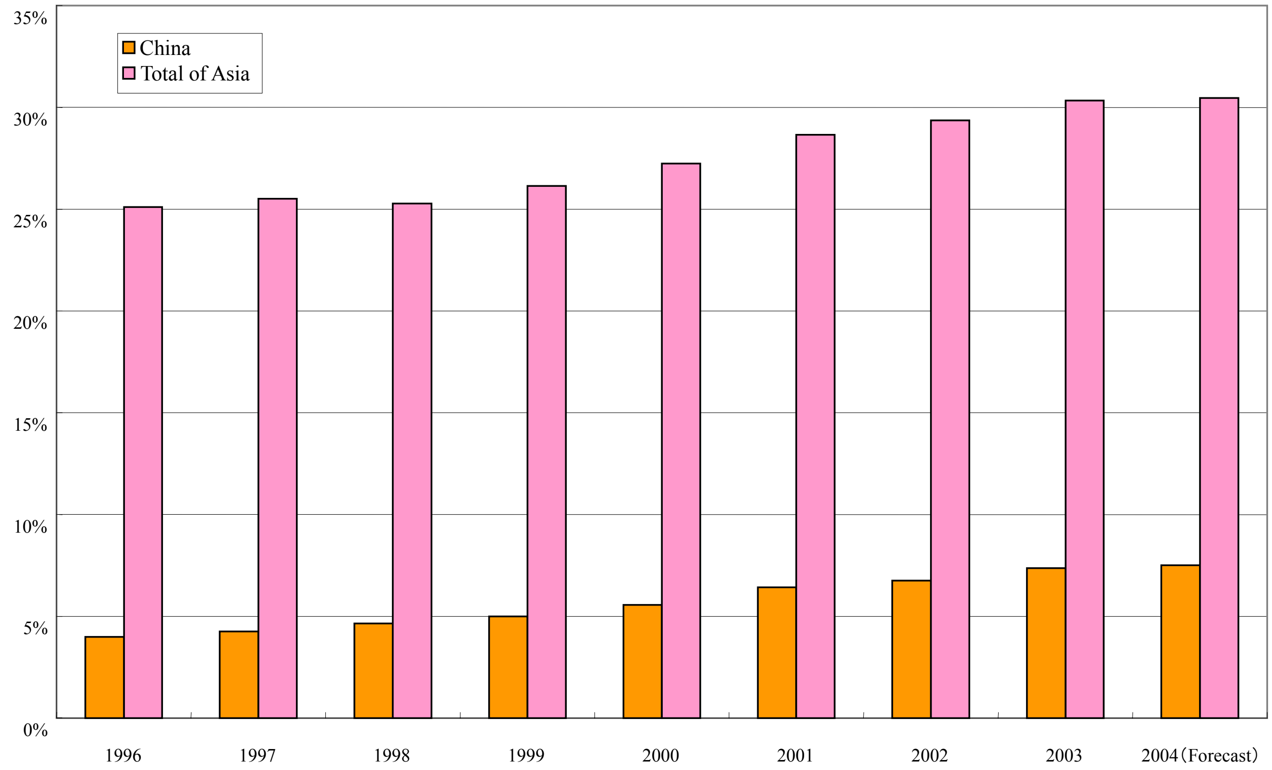
Note: The following points apply to the reference sections, as with the main document:
The Middle East is not included in Asia. Turkey is not included in the Middle East but is included in Western Europe.

Fig. 1 Changes in Petroleum and Naphtha Prices (since January 2001)
January 2002 = 100



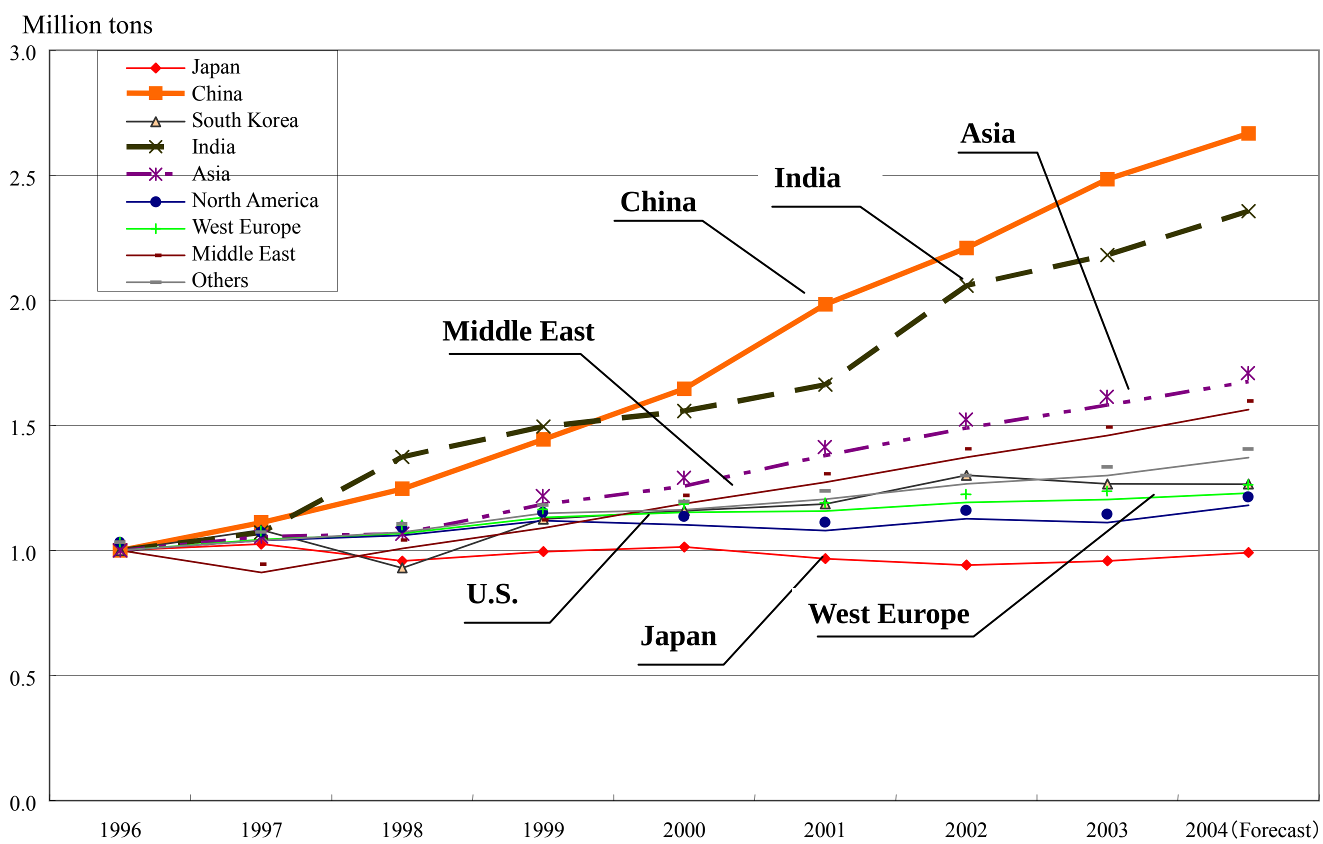
* Data is based on the Ministry of Finance's Trade Statistics of Japan.
Crude oils' HS codes are 270900090, 271019162, 270919172.

Fig. 2 Changes in Percentages of Global Demand for Ethylene Derivatives Held By China and Asia



(Based on 2004 versions of datasheets for each country)

Fig. 3 Changes in Demand for Ethylene Derivatives by Region 1996 = 1.0



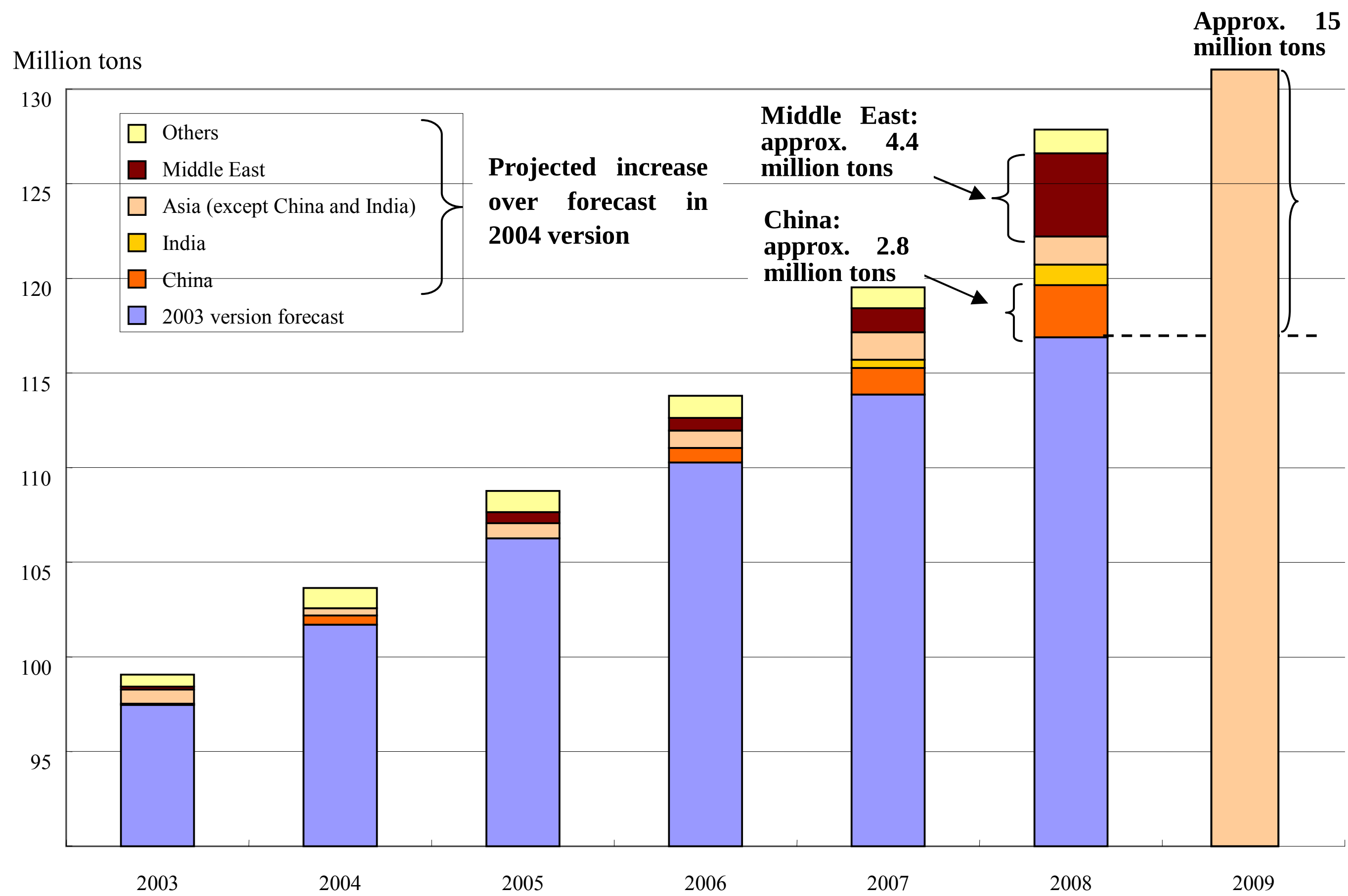
(Based on 2004 versions of datasheets for each country)

(1) Impact on Production Forecasts from New Production Expansion Plans (mainly China and Middle East)

- Many new production expansion plans for both ethylene and propylene have emerged over the past year, mainly from China and the Middle East. As a result, the 2008 ethylene derivatives production forecast has been increased by about 11 million tons in the Fiscal 2004 version as compared to the Fiscal 2003 version. Likewise the 2008 propylene derivatives production forecast has been raised by about three million tons. [Refer to figures (4)-1 and (4)-3].

  There are also expected to be increases in the 2008 production forecasts for polyethylene, polypropylene, vinyl chloride resins, benzene, para-xylene, styrene monomers and others. [Refer to Table (4)-4.]
- Among those ethylene production expansion plans drafted in 2004, in addition to those plans that are not reflected in the production forecasts in the Fiscal 2004 version, it is assumed that there is about 18 million tons globally in other production plans that currently are not expected to be up and running by 2009 (planned fiscal year is "2010 or later" or "Undecided"). [Refer to Table (4)-2.]

Fig. 4-1 Impacts on Ethylene Derivatives Production Forecasts (as compared to Fiscal 2003 version) (ethylene conversion)



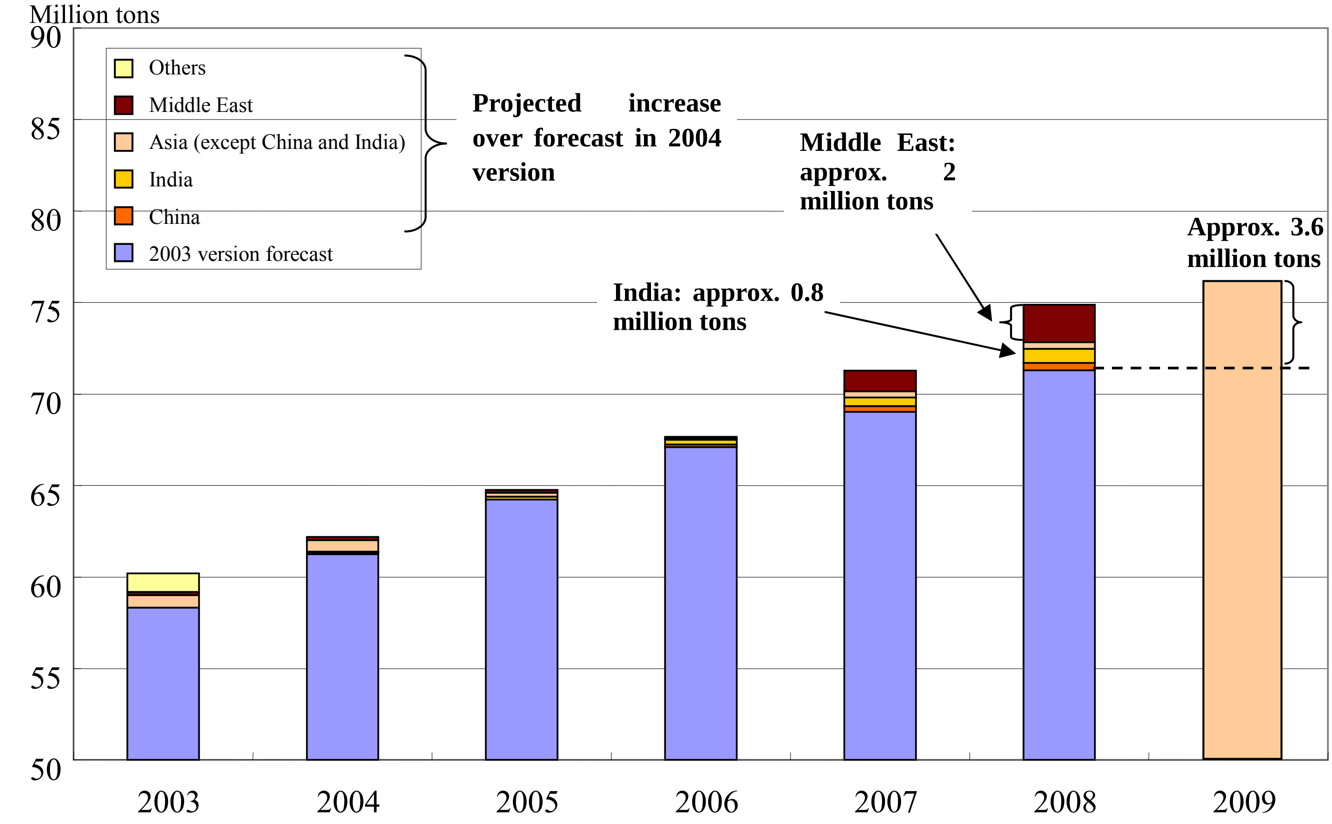
(Based on 2003 and 2004 versions of datasheets for each country)

Table. 4-2 Production Capacity of New Expansion Plans for Ethylene Production from 2009 (not reflected in Fiscal 2004 version of output forecasts)

Asia (China, Hong Kong, Taiwan, Singapore, others)	Middle East
Approx. 6 million tons	Approx. 12 million tons

(Chemical Division's estimates based on documents from the Supply/Demand Trend Seminar WG)

Fig. 4-3 Impacts on Propylene Derivatives Production Forecasts (as compared to Fiscal 2003 version) (propylene conversion)



(Based on 2003 and 2004 versions of datasheets for each country)

Table 4-4 2008 Production Forecasts for Major Petrochemical Products (as compared to Fiscal 2003 version)

(Unit: million tons)

	LDPE	HDPE	PS	SM	PVC	VCM	EDC	EG
Fiscal 2004 Version	42.7	34.7	16.0	29.4	34.5	30.9	40.2	20.9
Fiscal 2003 Version	39.5	30.7	16.3	27.5	32.1	30.6	41.1	17.2

	PP	AN	Benzene	Toluene	Xylene	PX	PTA
Fiscal 2004 Version	47.9	5.5	43.3	18.4	32.5	28.6	39.7
Fiscal 2003 Version	44.2	5.5	40.7	17.6	34.0	26.8	35.2

(Based on 2003 and 2004 versions of datasheets for each country)

(2) Impact of Chinese Economic Trends on Chinese Demand (trial calculation)

- Each year Chinese demand for major petrochemical products such as ethylene and propylene has tended to take a larger percentage of the overall global demand for these products and this trend is expected to continue. [Refer to tables 6-1 and 6-2.]
- Chinese supply and demand trends are being established based on the forecasted economic growth rate of 8.5% between 2006-2008 and a growth rate of 8.0% in 2009. Trial calculations have been made of the possible impacts on Chinese demand assuming that this economic growth rate changes by ±2%. Based on these trial calculations, demand for ethylene derivatives could increase by about 2.3 million tons or decrease by about 2.2 million tons, while the demand for propylene derivatives could increase by roughly 1.3 million tons or decrease by about 1.2 million tons. In either case it is assumed that there will be a significant impact on demand. [Refer to figures 7-1, 7-2 and 7-3.]

Table 6-1 Changes in Percentage of Global Demand held by China (1996, 2003, 2009) (ethylene derivatives)

	Ethylene	LDPE	HDPE	PS	SM	PVC	VCM	EDC	EG
1996	4.1%	10.5%	7.3%	11.4%	3.8%	8.8%	6.2%	2.2%	8.6%
2003	6.2%	16.3%	14.4%	18.3%	15.1%	20.6%	13.1%	24.4%	24.6%
2009	9.9%	18.2%	17.0%	21.4%	17.6%	29.2%	18.0%	10.7%	34.0%

(Based on 2004 versions of datasheets for each country)

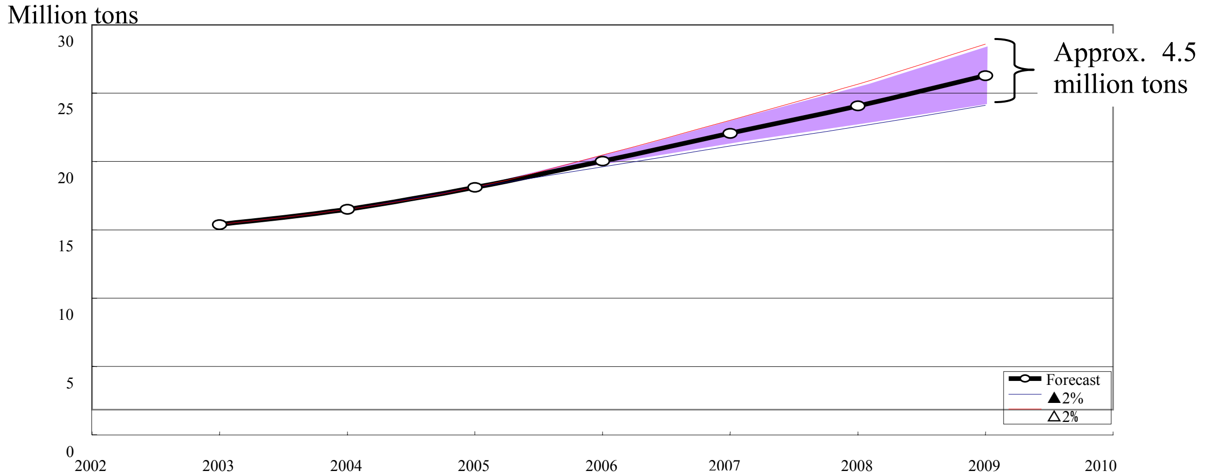
Table 6-2 Changes in Percentage of Global Demand held by China (1996, 2003, 2009) (propylene derivatives)

	Propylene	PP	AN
1996	4.5%	11.2%	6.8%
2003	9.9%	19.4%	16.5%
2009	12.7%	24.6%	17.3%

(Based on 2004 versions of datasheets for each country)

Fig. 7-1 Impact of Future Chinese Economic Trends on Chinese Demand (ethylene derivatives) (ethylene conversion)

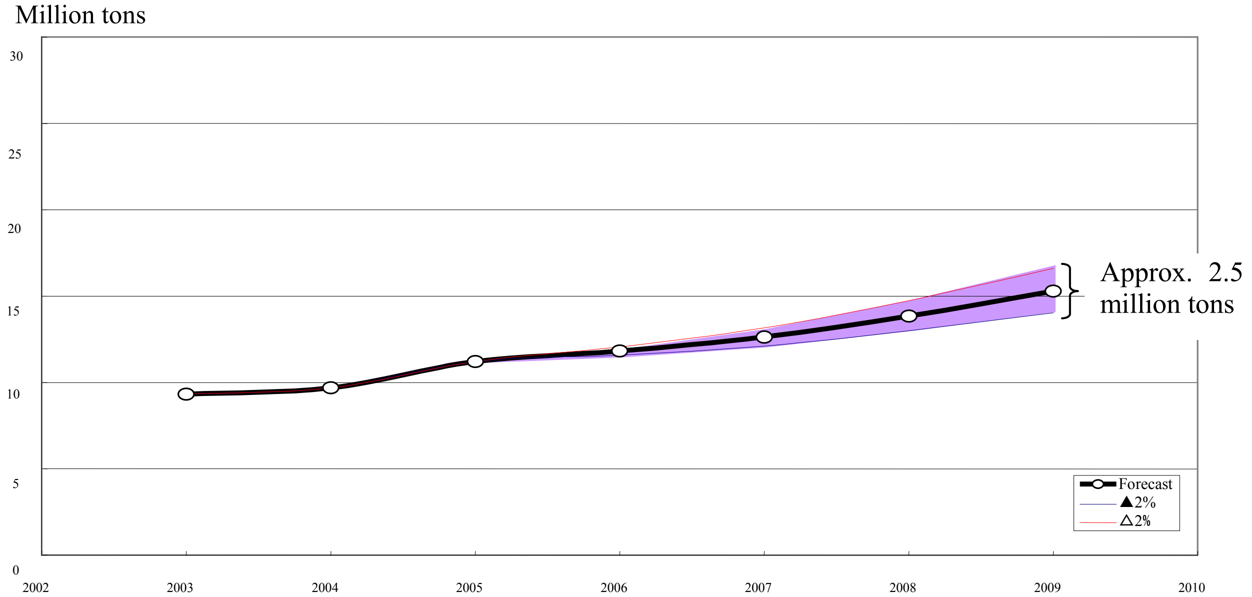
— Impact on Chinese ethylene derivatives demand in 2009 on premise that growth rate from 2006 is in a ±2% range of current forecast —



(Chemical Division's estimates)

Fig. 7-2 Impact of Future Chinese Economic Trends on Chinese Demand (propylene derivatives) (propylene conversion)

— Impact on Chinese propylene derivatives demand in 2009 on premise that growth rate from 2006 is in a ±2% range of current forecast —



(Chemical Division's estimates)

Table 7-3 Impact of Future Chinese Economic Trends on Chinese Demand (major petrochemical products)

	Ethylene derivatives	LDPE	HDPE	PS	SM	PVC	VCM	EDC	EG
+2%	2.3	0.6	0.5	0.2	0.3	1.1	0.6	0.0	0.9
▲2%	-2.2	-0.6	-0.5	-0.2	-0.3	-1.0	-0.6	0.0	-0.8

	Propylene derivatives	PP	AN
+2%	1.2	1.1	0.1
▲2%	-1.2	-1.1	-0.1

(Chemical Division's estimates)

[Reference 1] Changes among China's Importing Partner Countries for Major Petrochemical Products (comparison between 1996 and 2004)

LDPE				HDPE			
1996		2004		1996		2004	
1. South Korea	31%	1. Malaysia	17%	1. South Korea	33%	1. South Korea	28%
2. U.S.	14%	2. Saudi Arabia	11%	2. U.S.	19%	2. India	10%
3. Japan	10%	3. Singapore	10%	3. Japan	14%	3. Saudi Arabia	10%
		6. Japan	8%			7. Japan	5%

* Based on Chinese Maritime Customs Statistics (using HS39011000) * Based on Chinese Maritime Customs Statistics (using HS39012000)

PS				SM			
1996		2004		1996		2004	
1. Japan	31%	1. Taiwan	31%	1. South Korea	65%	1. Japan	37%
2. Taiwan	30%	2. South Korea	19%	2. Japan	29%	2. South Korea	30%
3. South Korea	19%	3. Hong Kong	18%	3. Russia	2%	3. U.S.	9%
		5. Japan	6%				

* Based on Chinese Maritime Customs Statistics (using HS39031900) * Based on Chinese Maritime Customs Statistics (using HS29025000)

PVC				VCM			
1996		2004		1996		2004	
1. Japan	38%	1. Taiwan	31%	1. U.S.	24%	1. Japan	64%
2. South Korea	16%	2. Japan	28%	2. Hong Kong	18%	2. South Korea	22%
3. Taiwan	15%	3. South Korea	11%	3. Japan	18%	3. Taiwan	9%

* Based on Chinese Maritime Customs Statistics (using HS39041000) * Based on Chinese Maritime Customs Statistics (using HS29032100)

EDC				EG			
1996		2004		1996		2004	
1. South Korea	34%	1. U.S.	33%	1. Japan	34%	1. Canada	27%
2. U.S.	30%	2. South Korea	23%	2. Canada	34%	2. Saudi Arabia	20%
3. Japan	28%	3. Saudi Arabia	20%	3. U.S.	17%	3. Taiwan	13%
		5. Japan	5%			6. Japan	5%

* Based on Chinese Maritime Customs Statistics (using HS29031500) * Based on Chinese Maritime Customs Statistics (using HS29053100)

PP				AN			
1996		2004		1996		2004	
1. South Korea	40%	1. South Korea	31%	1. U.S.	38%	1. South Korea	29%
2. Japan	17%	2. Taiwan	16%	2. South Korea	29%	2. U.S.	29%
3. U.S.	11%	3. Singapore	10%	3. Japan	24%	3. Taiwan	22%
		6. Japan	7%			4. Japan	20%

* Based on Chinese Maritime Customs Statistics (using HS39021000) * Based on Chinese Maritime Customs Statistics (using HS29261000)

[Reference 2] Forecasted Japanese Production Capacity and Amounts for Major Petrochemical Products in 2009

(Unit: million tons)

	Ethylene	LDPE	HDPE	PS	SM	PVC	VCM	EDC	EG
Production capacity	7.4	2.3	1.2	1.0	3.3	2.4	3.1	3.9	1.0
Production volume	7.0	2.0	1.0	0.9	3.3	2.1	3.0	3.6	0.7

	Propylene	PP	AN
Production capacity	5.9	3.0	0.8
Production volume	6.1	3.1	0.6

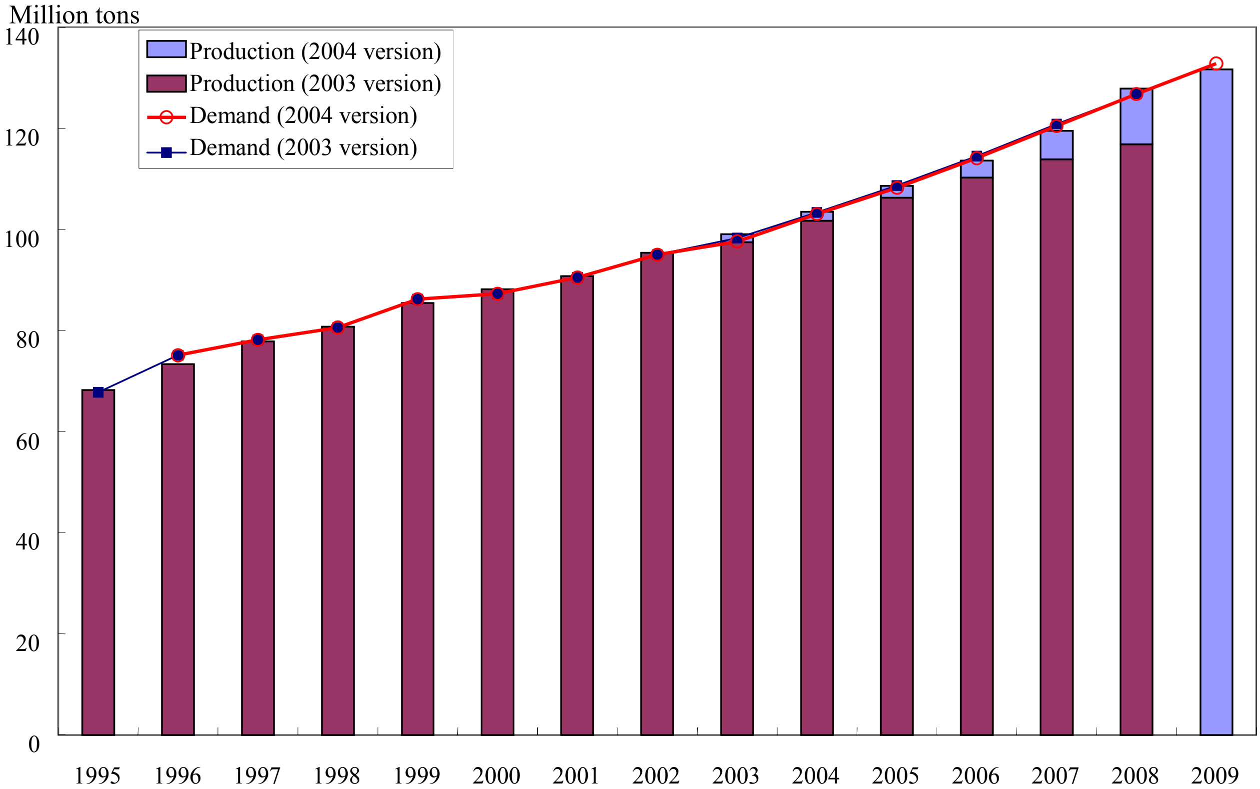
(Based on 2004 versions of datasheets for each country)

(3) Supply and Demand Balance for Ethylene Derivatives

- When comparing the supply and demand balances for ethylene derivatives for the Fiscal 2004 and 2005 versions, it is clear that the strong increase in demand from Asia, particularly China, has resulted in many new production expansion plans over the past year and a further increase in the forecasted production amount. Meanwhile there have been sharp increases in the prices of naphtha and other raw materials used in petrochemical products, along with the sharp rise in petroleum prices, and there has also been a substantial rise in the prices of these products. However, presently there have been no major changes to the global economic trends that could impact the market for petrochemical products. As such, there are not expected to be any major changes in trends from the Fiscal 2003 version. This result suggests that the supply and demand balance will remain tight in the Fiscal 2004 version. However, the condition forecasted in the Fiscal 2003 version of demand exceeding production (by about 10 million tons) is expected to be eliminated [Refer to Fig. (8)].

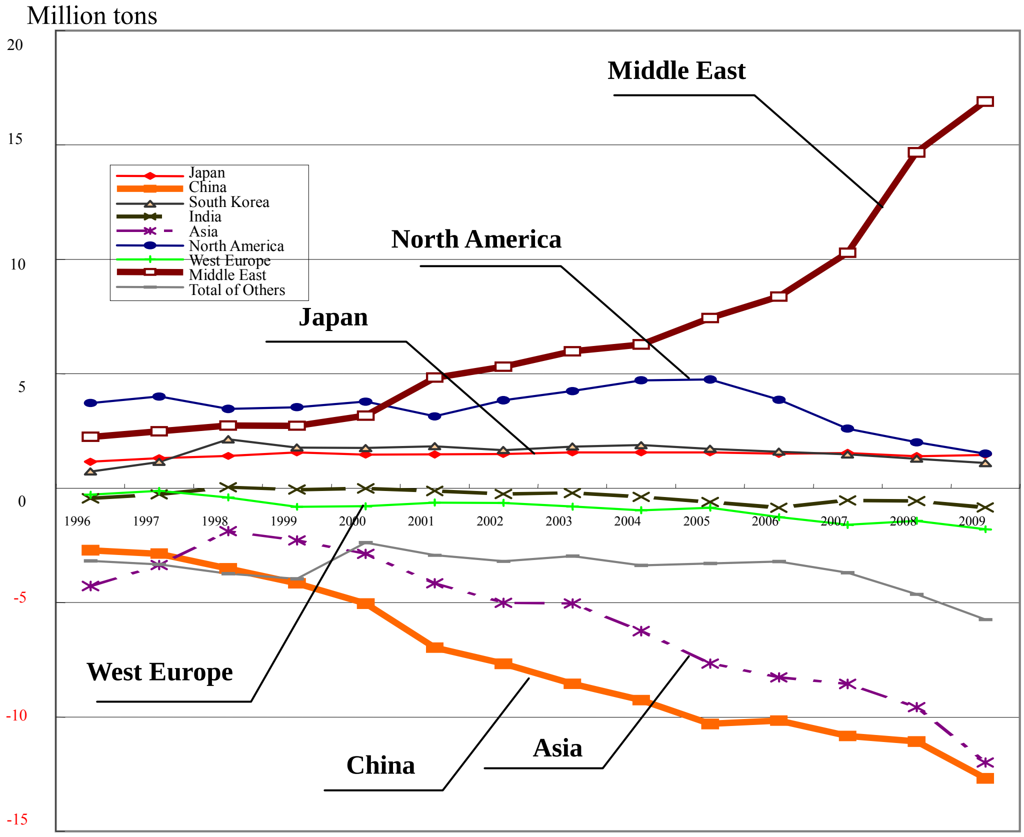
- Looking at the ethylene derivatives supply/demand balance for each region, excess imports in Asia and excess exports in the Middle East are both expected to increase further in size toward 2009. The pace for bolstering production capacity in the Middle East, where there are cost competitive advantages based mainly on ethane gas, will likely exceed the pace for bolstering production capacity in regions were demand is expected to be strong, such as China. [Refer to figures (9) and (10).]

Fig. 8 Ethylene Derivatives Production and Demand Forecasts (as compared to Fiscal 2003 version) (ethylene conversion)



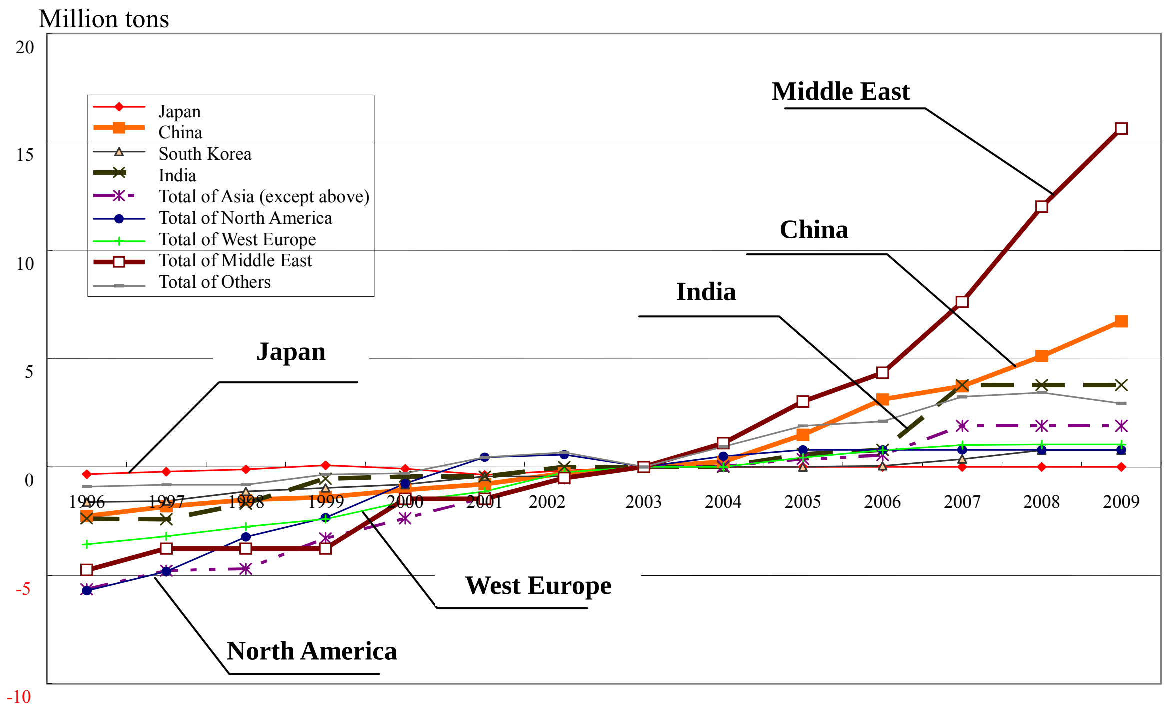
(Based on 2003 and 2004 versions of datasheets for each country)

Fig. 9 Outlook for Changes in Ethylene Derivatives Supply/Demand Balance by Region (ethylene conversion)



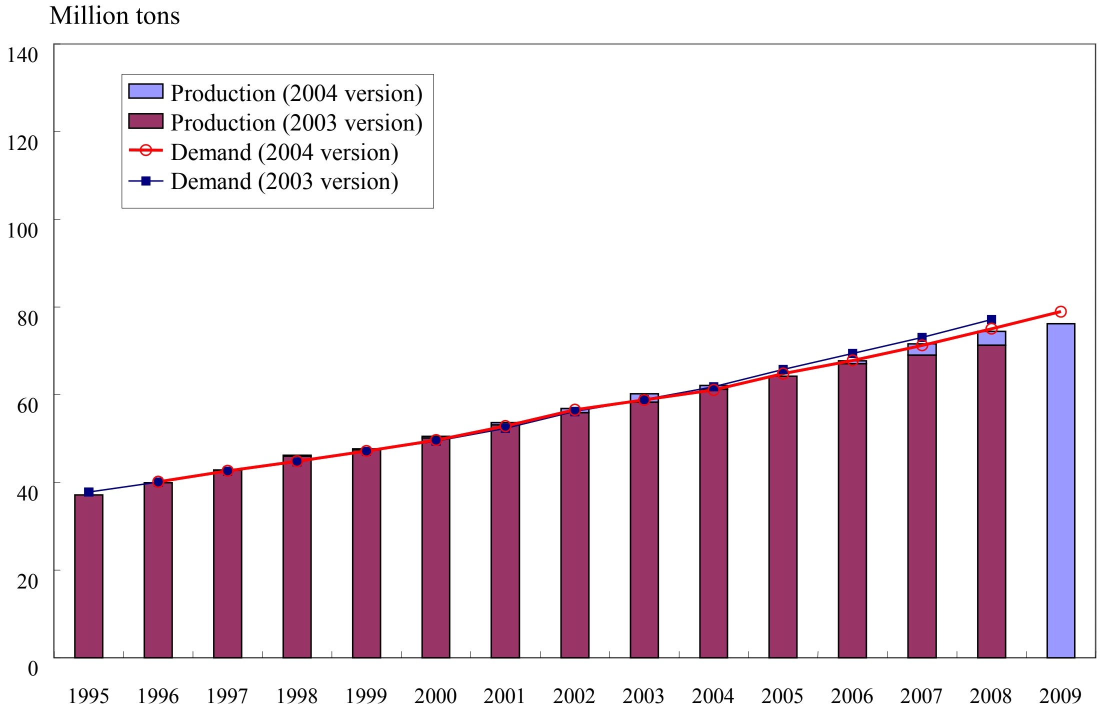
(Based on 2004 versions of datasheets for each country)

Fig. 10 Changes in Outlooks for Ethylene Production Capacities by Country and Region (as compared to 2003)



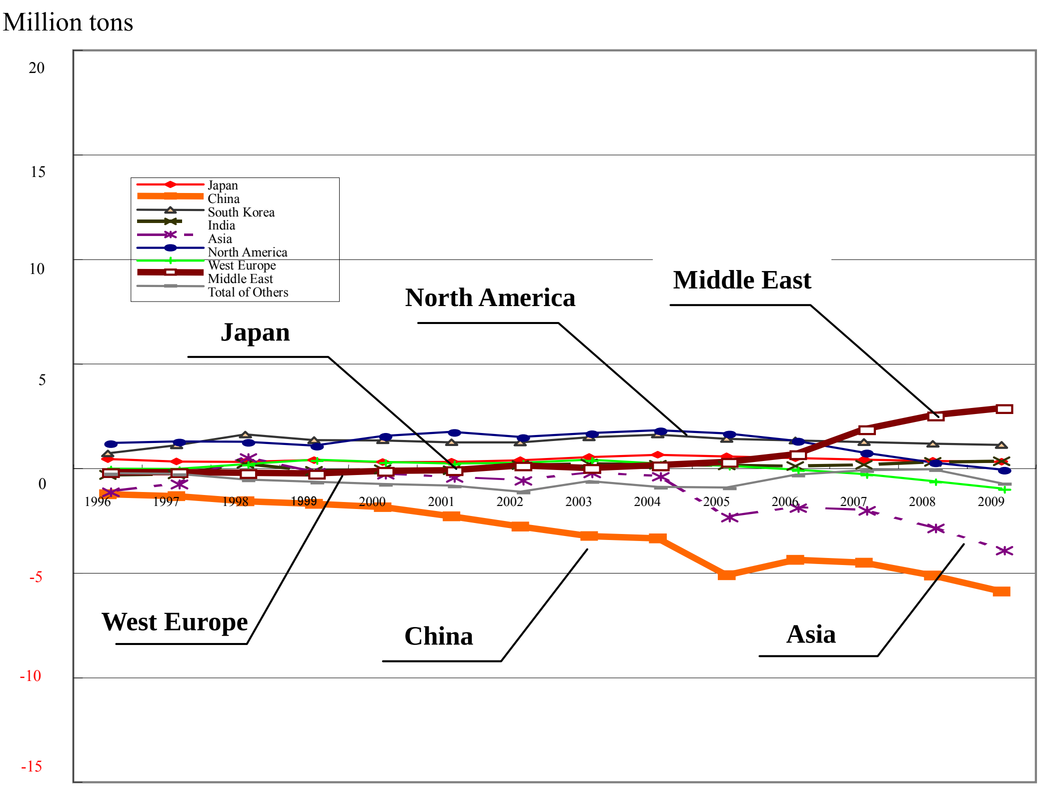
(Based on 2004 versions of datasheets for each country)

Reference 3-1 Propylene Derivatives Production and Demand Forecasts (as compared to Fiscal 2003 version) (propylene conversion)



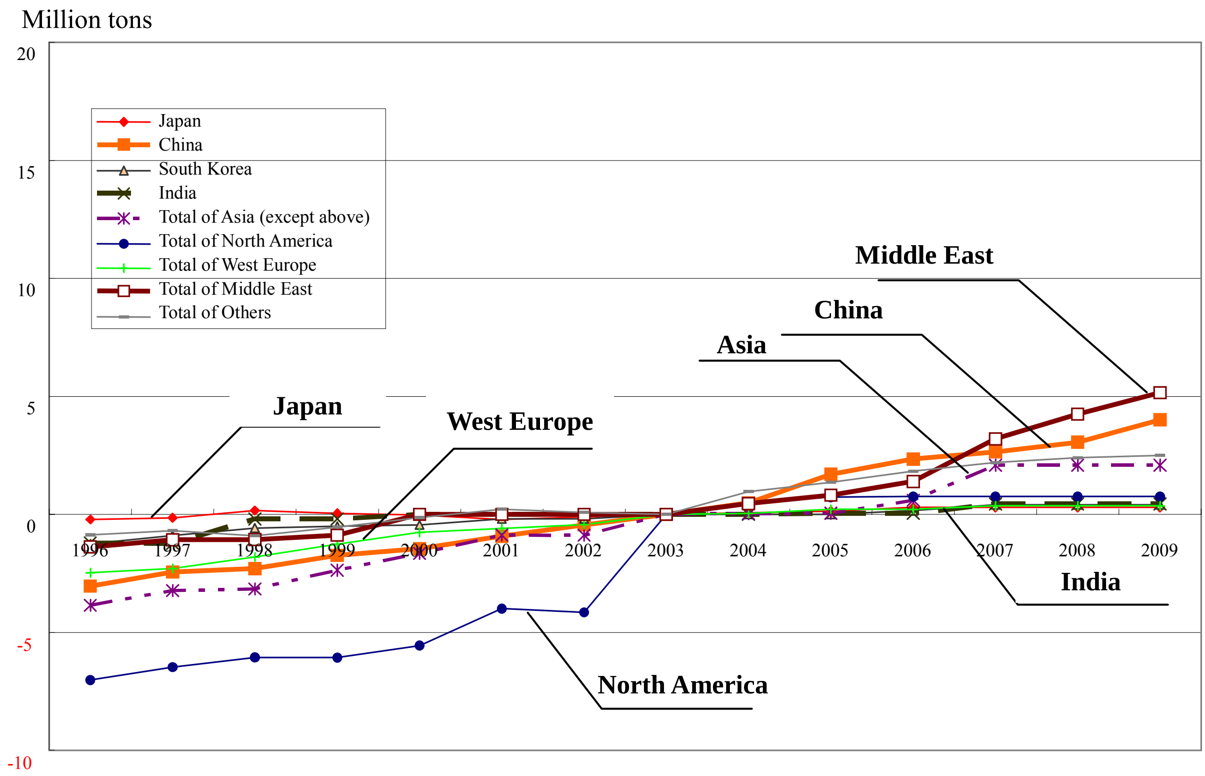
(Based on 2003 and 2004 versions of datasheets for each country)

Reference 3-2 Outlook for Changes in Propylene Derivatives Supply/Demand Balance by Region (propylene conversion)



(Based on 2004 versions of datasheets for each country)

Reference 3-3 Changes in Outlooks for Propylene Production Capacities by Country and Region (as compared to 2003)



(Based on 2004 versions of datasheets for each country)

(Reference)

Methods for calculating the forecasts of global supply and demand of petrochemical products

1. Production capacity

This is calculated by totaling the capacities expected to be added by 2007 by each country for each product according to published plans and adding this total to the current capacity.

2. Production volume

Production volumes are calculated for each country and region based on the production capacities determined in the above step and in consideration of various factors that can influence production volume such as past operating results at the plants and forecasted demand for each country and regions.

3. Demand (domestic demand)

(1) Actual results

This is calculated by adding the imported volume to the obtained production volume and then subtracting the export volume from this total. (Export and import amounts in the form of products are not included in the domestic demand.)

- Demand (domestic demand) = (production + import) - export

(2) Demand forecasting

Based on the medium-term forecast of GDP growth rate, the demand for each particular product is calculated by multiplying the forecast GDP by its medium-term elasticity of demand to GDP. In some cases, different forecasting methods have been used in view of the situation in particular countries.

Demands for ethylene and propylene have been calculated on the basis of the projected production volumes.

4. Balance between demand and supply

This is calculated as the difference of production from demand according to the country and the product.

- Demand-supply balance = production – demand

5. Ethylene units

The following figures were used as the ethylene conversion and polypropylene conversion units for each derivative. LDPE: 0.98, HDPE: 1.04, SM: 0.29, PVC: 0.50, VCM: 0.49, EDC: 0.29, EG: 0.66, PP: 1.03, AN: 1.09

6. Ethylene conversion formula

Production: (LDPE) + (HDPE) + (SM) + (EG) + (PVC) + (VCM balance) + (EDC balance) + (others)

Domestic Demand: (LDPE) + (HDPE) + (SM) + (EG) + (PVC) + (others)