Japanese Energy Policy & Asian Energy Challenges

The British Institute of Energy Economics
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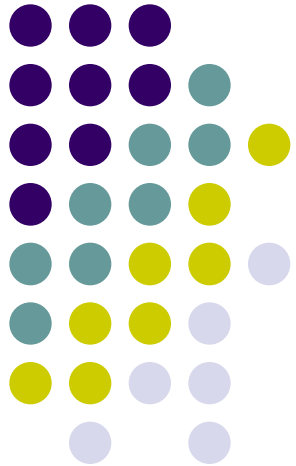


Energy Indicators of Japan

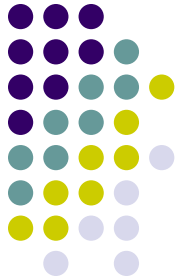
(1945~2003)

	unit	1945	1960	1975	1990	2003
GDP/capita	1000 yen	**240**	**709**	**1,926**	**3,658**	**4,124**
Energy use /capita	1000 kcal	**3,744**	**9,191**	**34,365**	**37,859**	**41,517**
Oil supply/year	1000 kl	**248**	**33,543**	**263,483**	**306,813**	**304,618**
Oil import/year	1000 kl	**-**	**32,919**	**262,785**	**286,128**	**286,511**
Coal supply/year	1000 t	**26,736**	**63,420**	**82,281**	**116,882**	**165,525**
Coal import/year	1000 t	**297**	**8,595**	**62,339**	**104,835**	**164,188**
Town gas supply/year	billion kcal	**-**	**19,593**	**78,599**	**152,560**	**261,510**
Electricity generation /year	billion kwh	**47** (1946)	**115**	**476**	**857**	**1,094**

Source: *Energy-Verification of 50 Years after WWII*, (in Japanese), Denryokushinpousha, 1995
*The history of the Energy Industry after the War, (*in Japanese*),* Toyokeizaishinpousha 1986
Mr. Chang Ping, EDMC,IEEJ (for 1990 & 2005 data)

Note: The years in the above table are the Japanese Fiscal Years (April ~ March)

Six Phases of Japanese Energy Policy Development



- **Phase 1 (1945~1951): Economic recovery and readjustment of energy policies**
- **Phase 2 (1952~1961): Economic development and modernization of energy industry**
- **Phase 3 (1962~1972): High economic growth and comprehensive energy policies**
- **Phase 4 (1973~1985): Oil shocks and the shift to energy efficient industrial structure**
- **Phase 5 (1986~1996): Liberalization of energy market and the issue of global warming**
- **Phase 6 (1997~): Globalization of energy market and the commitment to the Kyoto Protocol**

Phase 1: Economic recovery and readjustment of energy policies (1945~1951)

Main features

- Complete devastation by the defeat in World War II
- Restructuring of political, economic and social system under the control by the GHQ (the occupation from 1945 till 1951)
- Limited energy resources: coal, hydro and wood/charcoal
- High level of state intervention in the energy industry
- By 1951 Japan recovered the pre-war level (1934~36 average) in real GDP, industry output, etc.,

Phase 2: Economic development and modernization of energy industry (1952~1961)

Main Features

- In April 1952, Japan recovered its independence (San Francisco Peace Treaty).

- GDP as well as energy demand grew very fast during this period:

  ［average GDP growth］ 9.7% per annum

  ［average energy demand growth］ 9.3% per annum

- The Shift from coal to oil was accelerated as called “ liquid energy revolution”.

- Preparation for peaceful use of nuclear energy initiated.

Phase 3: High economic growth and comprehensive energy policies (1962~1972)

Main features

- **In April 1964, Japan joined the OECD (Organization for Economic Co-operation and Development).**

- **Energy demand grew even faster than GDP growth during Phase 2:**

  [average GDP growth] 10.2% per annum

  [average energy demand growth] 11.9% per annum

- **Oil became the dominant primary energy source (75% by 1972).**

- **Diversification of energy sources started by the entry of nuclear power and LNG (liquefied natural gas)**

- **Environmental pollution, due mainly to rapid increase in energy use, became a major national agenda.**

Phase 4: Oil Shocks and the shift to energy efficient industrial structure (1973~1985)

Main Features

- Oil shocks of the 1970s severely shook the Japanese economy built on the abundance of cheap oil.

- GDP growth suddenly slowed down to less than a half of the previous decade:

  [FY 1973~78 average] 3.7% (-0.2% in FY 1974)

- A new set of energy policies from emergency response to technological development played an important role.

- The oil shocks forced and accelerated the self-renewal of the Japanese industrial structure (like an insect **“casting off the skin”**).

Phase 5: Liberalization of energy market and the issue of global warming (1986~1996)

Main features

- **Strong yen following the Plaza Agreement in September 1985 increased the trade surplus of Japan ($100billion in 1986).**

  [Exchange rate of yen] $240/yen (prior to the Plaza Agreement)→$120/yen (end 1987)

- **Trade friction with the USA intensified, which pressed Japan to deregulate the domestic market to absorb increased imports.**

- **In April 1986, "Maekawa Report" called for the stimulation of domestic consumption through the deregulation of various sectors including the energy sector.**

- **In October 1990, the cabinet decided " Action Plan to Arrest Global Warming" preceding to the adoption of the UNFCCC (United Nations Framework Convention on Climate Changes) in June 1992.**

- **GDP grew by 3.2% while energy consumption grew by 3.1%.**

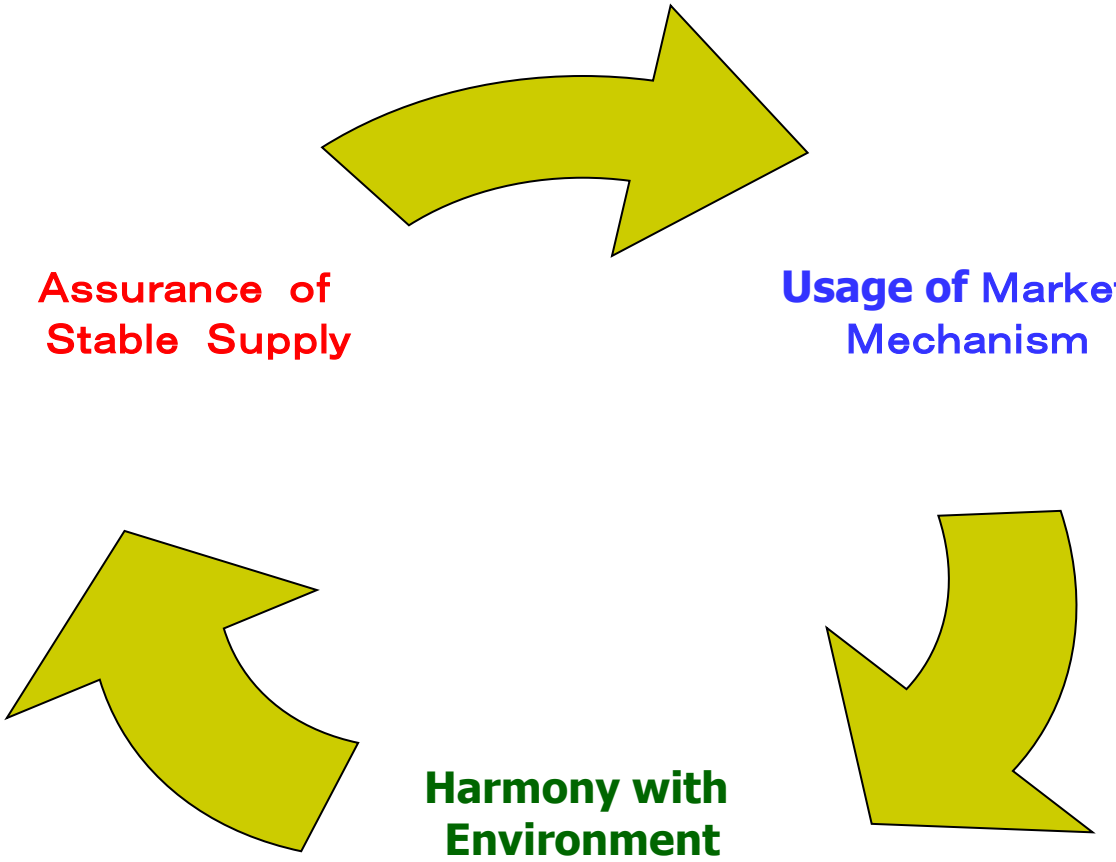
Phase 6: Globalization of energy market and the commitment to the Kyoto Protocol (1997~)

Main Features

- Deregulation of the oil sector completed by 2002, and the remaining energy sectors accelerated the process.
- Domestic coal production finally ended in 2002 by closing its over 200 years' history.
- Japan has been deeply involved with the prevention of global warming after the adoption of the Kyoto Protocol in December 1997 (Japan was the host of the COP 3).
- More recently, energy security came back to the driver's seat as geopolitical tensions mounted along with the tightening of the oil markets.

3 Pillars of Energy Policy of Japan

-The Basic Law on Energy Policy Making (June 2002)-



Total Primary Energy Supply of Japan
—Evolution from 1952 to 2000—

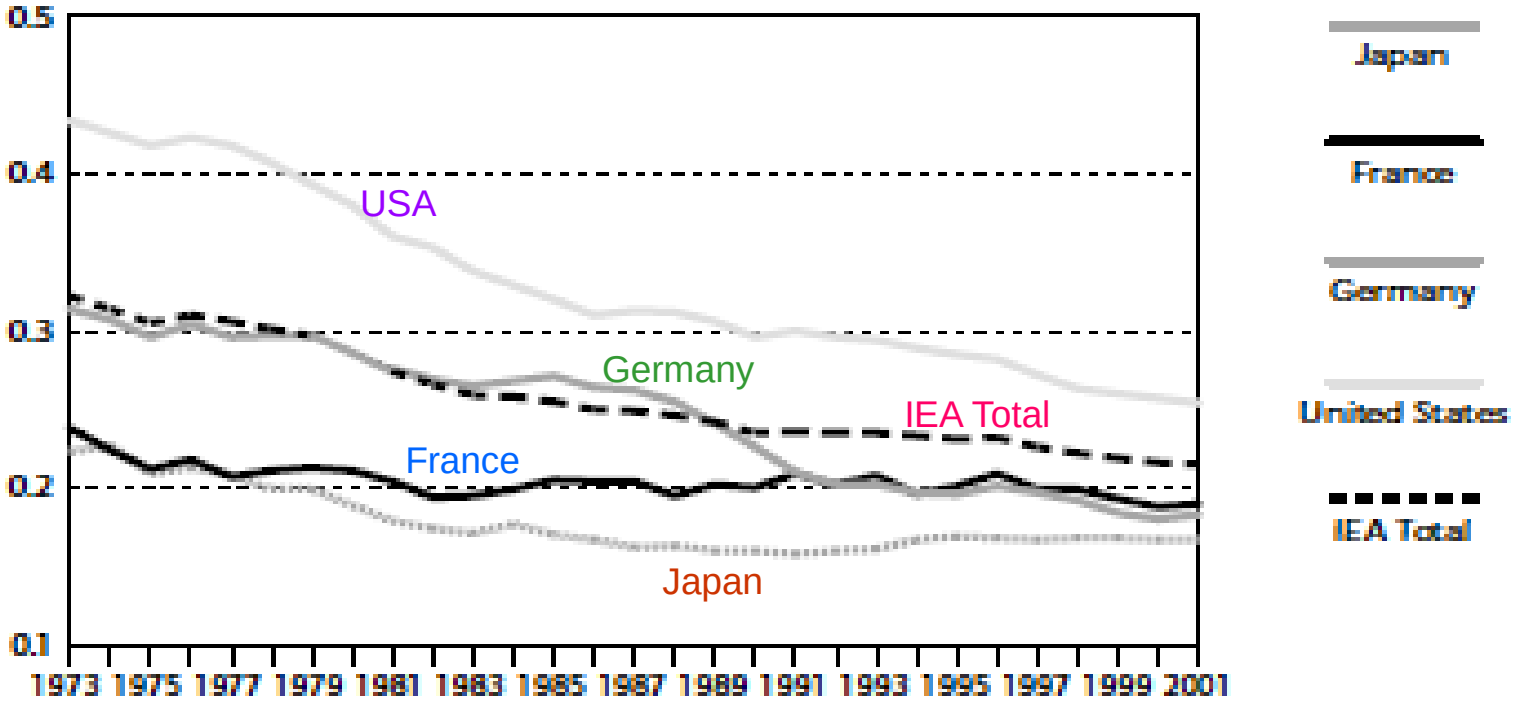
		1952	1962	1972	1985	2000
TPES	10000 billion kcal	52.6	125.3	387.4	459.7	524.7
oil	%	11	46.9	75.5	56.3	49.9
coal	%	49	37.2	17.0	19.4	18.3
hydro	%	32	12.2	5.6	4.7	1.4
gas/wood	%	8	3.7	1.0	9.4	13.7
nuclear	%	-	-	0.6	8.9	16.0
geo/wind	%	-	-	-	1.3	0.7

Source: Energy-Verification of 50 Years after WWII, Denryokushinnpousha,1995
Energy Policies of Japan (2003 Review), IEA, 2003

Energy Efficiency of Japan (1)

Energy Intensity in Japan and in Other Selected IEA Countries, 1973 to 2001

(toe per thousand US$ at 1995 prices and purchasing power parities)

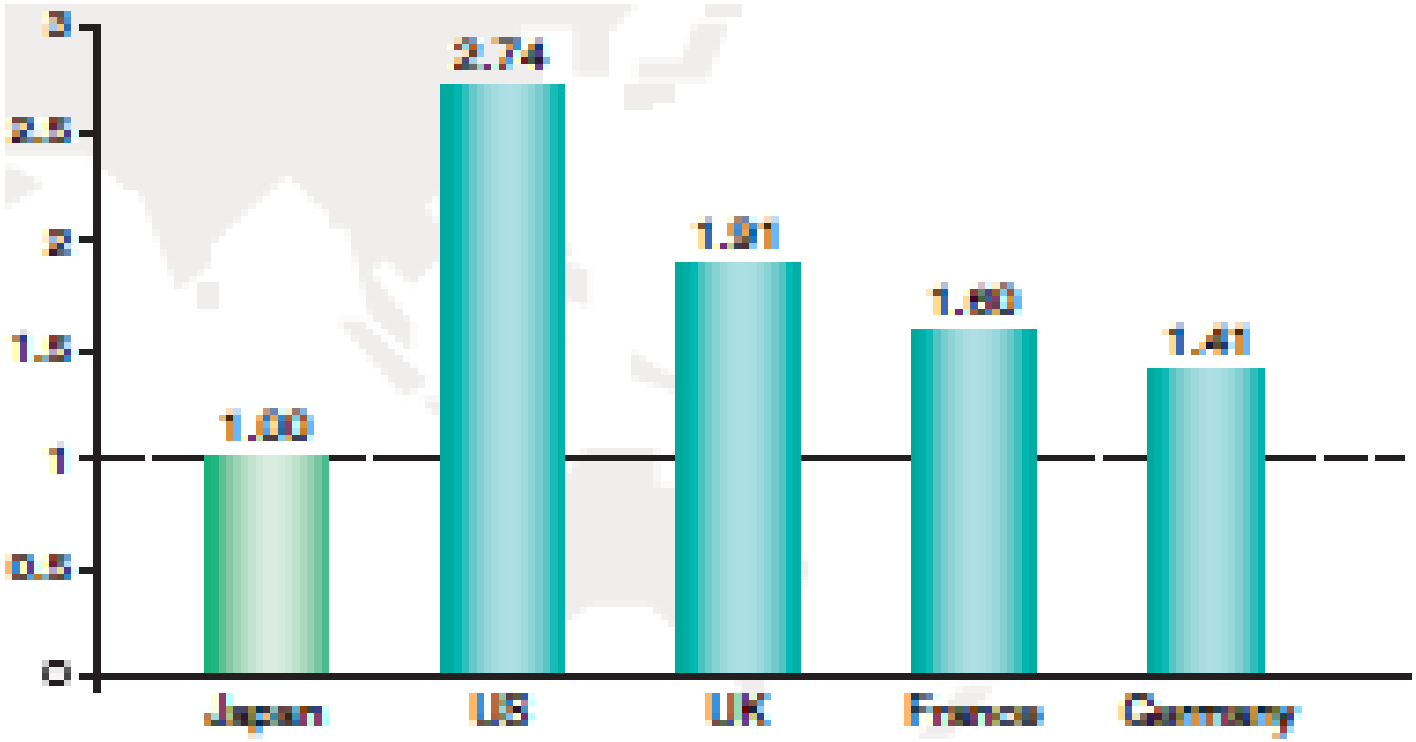


Sources: *Energy Balances of OECD Countries*, IEA/OECD Paris, 2003 and *National Accounts of OECD Countries*, OECD Paris, 2003.

Note: copied from Energy Policies of Japan (2003 Review),IEA,2003)

Energy efficiency of Japan (2)

-Comparison of energy consumption per GDP in 2001-



Source: Institute of Energy Economics, Japan
Note: copied from Energy in Japan, METI,2005

Japanese international energy cooperation

Three Categories

(1) International

Cooperation through an international organization or network

(2) Regional

Cooperation through a regional forum or network

(3) Bilateral

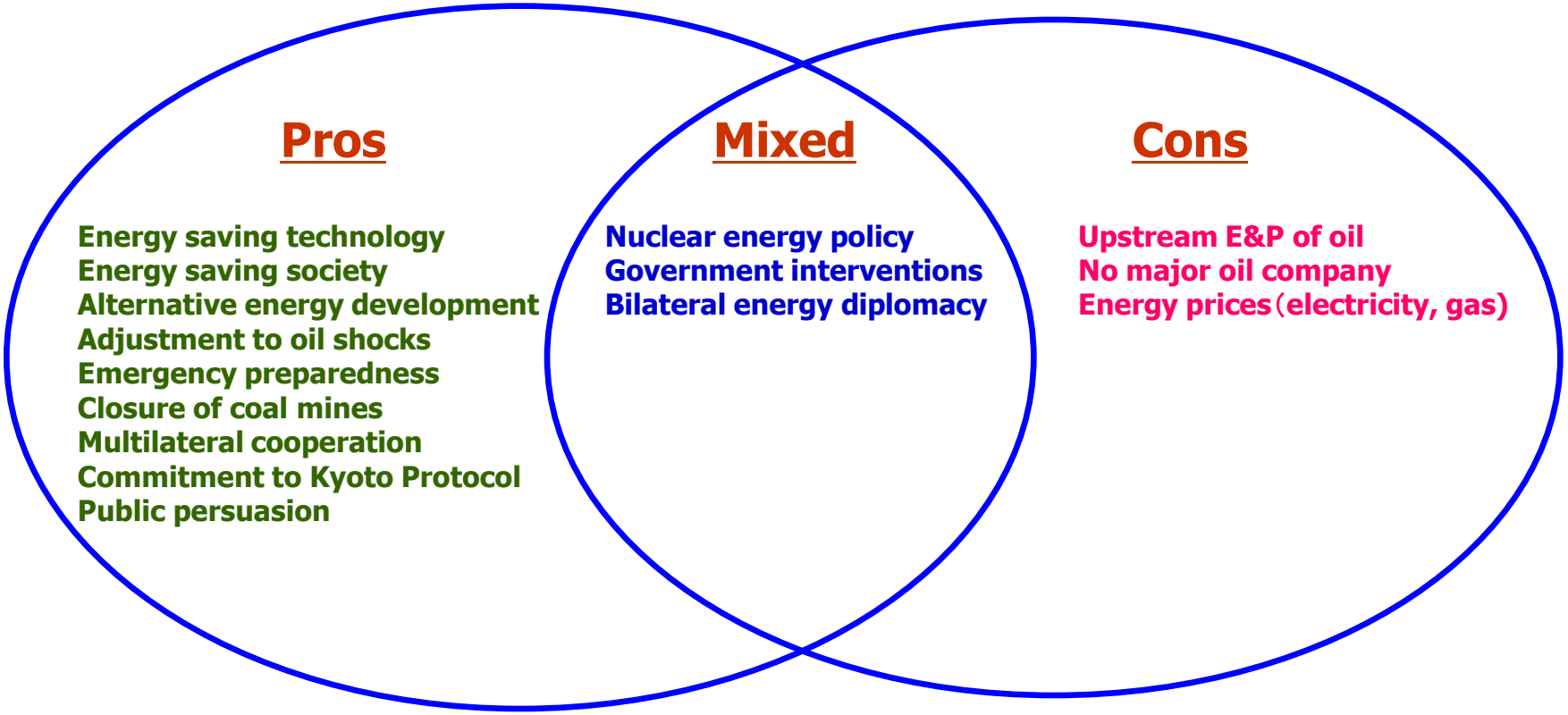
Cooperation with specific countries

International	Regional	Bilateral
IEA	APEC (Asia Pacific Economic Cooperation)	China
IAEA	APERC (A -P Energy Research Center)	India
IEF (International Energy Forum)	ASEAN+3 (China, Japan & Korea)	Russia
JODI (Joint Oil Data Initiative)	Asian IEF	Middle East countries
Others	Others	Others

Energy Power Games involving Japan (Examples)

	Core Factor	Players	Main Developments	Expectation
Asian Premium （FOB prices of Middle East crude oil for Asia was on average $1/b higher than for North America/Europe.）	Interaction between buyers' power and sellers' power	・Middle East exporters ・Asian importers (Japan, India, China etc.,)	・The Asian Premium of Middle East crude oil (particularly Saudi) emerged around 1992. ・Japan was by far the largest importer of ME oil, but took no action against this premium over years. ・Indian Gov. publicly complained of the premium in 2002, then Japan joined by raising her voice.	When the buyers power may effectively prevail, the premium will narrow or disappear.
East China Sea Gas Development (While EEZs of Japan and China overlap, China started offshore gas development near the hypothetical Median Line.)	Confrontation or cooperation	・Chinese Gov. ・CNOOC ・Japanese Gov. ・Teikoku Oil	・In 1969/1970, Japanese companies applied for test-drilling right of oil and gas, which was kept on the shelf by Japanese Gov. (Teikoku Oil was awarded the right in 2005). ・In 2003, CNOOC started to drill in the gas field close to the Japan-China Median Line. ・In 2005, Japanese Gov. announced about the possible linkage of Chinese gas fields to Japanese fields based on the geological survey of 2004. ・The Gov. talks started in Oct.2004 and the sixth round is expected to take place in March 2006.	The business-first-principle will prevail.
East Siberian Oil Pipeline (This pipeline is expected to mitigate Asian dependency on Middle East oil.)	Interaction between an energy giant and two big buyers	・Russian Gov. ・Transneft ・Chinese Gov. ・CNPC ・Japanese Gov.	・In 1998, Yukos and CNPC planned to build an oil pipeline from Angarusk to Daging (North China). ・In 2003, after talks with Japanese Gov., Russian Gov. decided on a pipeline from Angarusk to Nakhodka, with a spur to Daging. ・In 2005, Russian Gov. decided on two-staged construction of this pipeline; ①Tayshet to Skovorodino (near Daging), then ②Scovorodino to Perevoznaya (near Nakhodka)	Russia will continue to play power games with China and Japan till the end.

Pros and cons of Japanese energy policies



Socio Economic Conditions of Asia

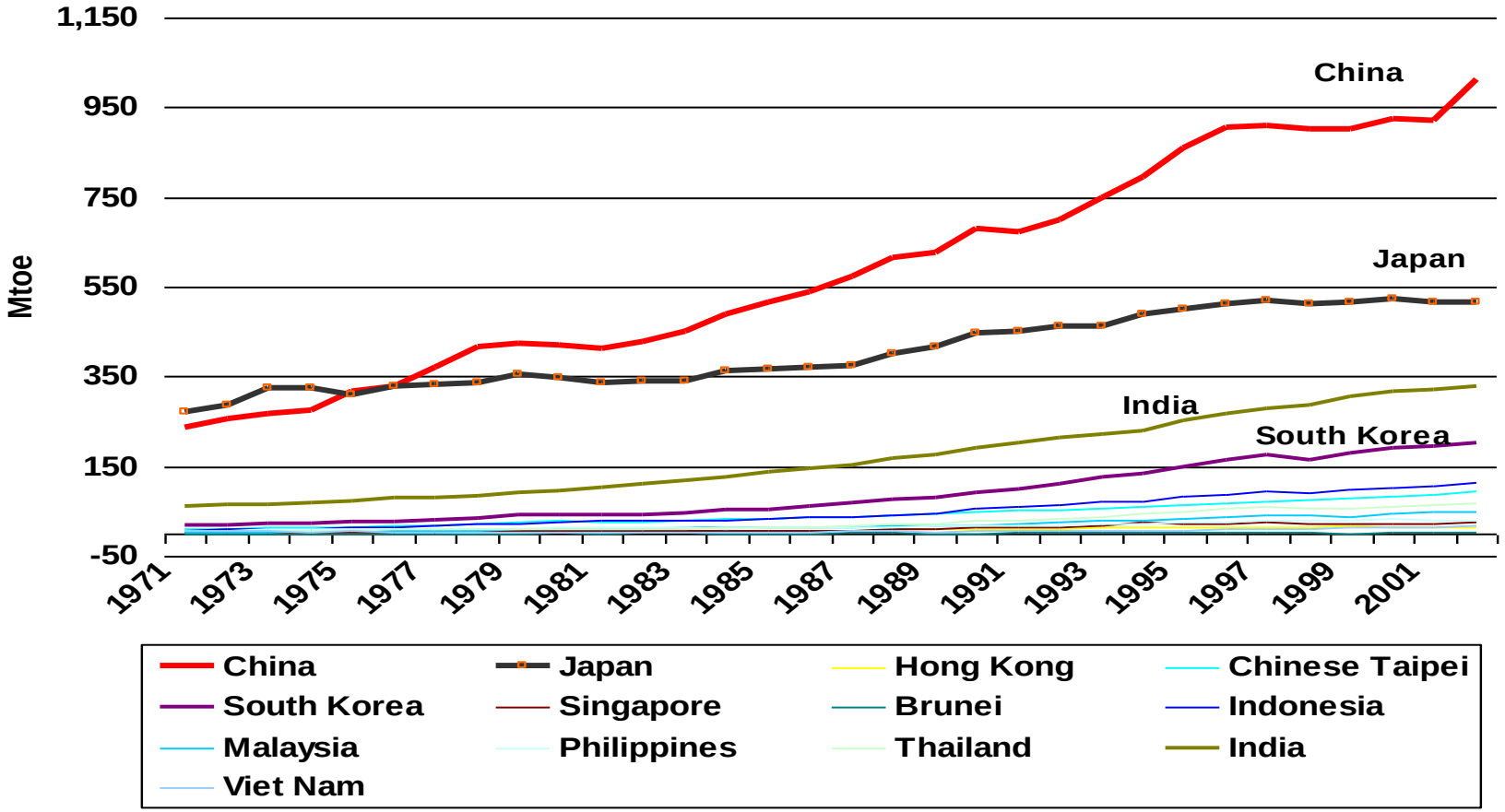
- Asia is the center of growth in the global economy.
- The growth of energy demand and CO2 emissions keeps pace with GDP growth.

				Share in the World		Annual Growth
	Unit	**1973**	**2002**	**1973**	**2002**	**1973-2002**
GDP	Billion USD	3,056	8,914	19%	25%	3.8%
Population	Million	1,309	1,947	34%	32%	1.4%
Energy Demand	Mtoe	675	2,152	12%	23%	4.1%
CO2 Emissions	Mt-C	582	1,712	14%	26%	3.8%

Note: South West Asia is not included in the table above.

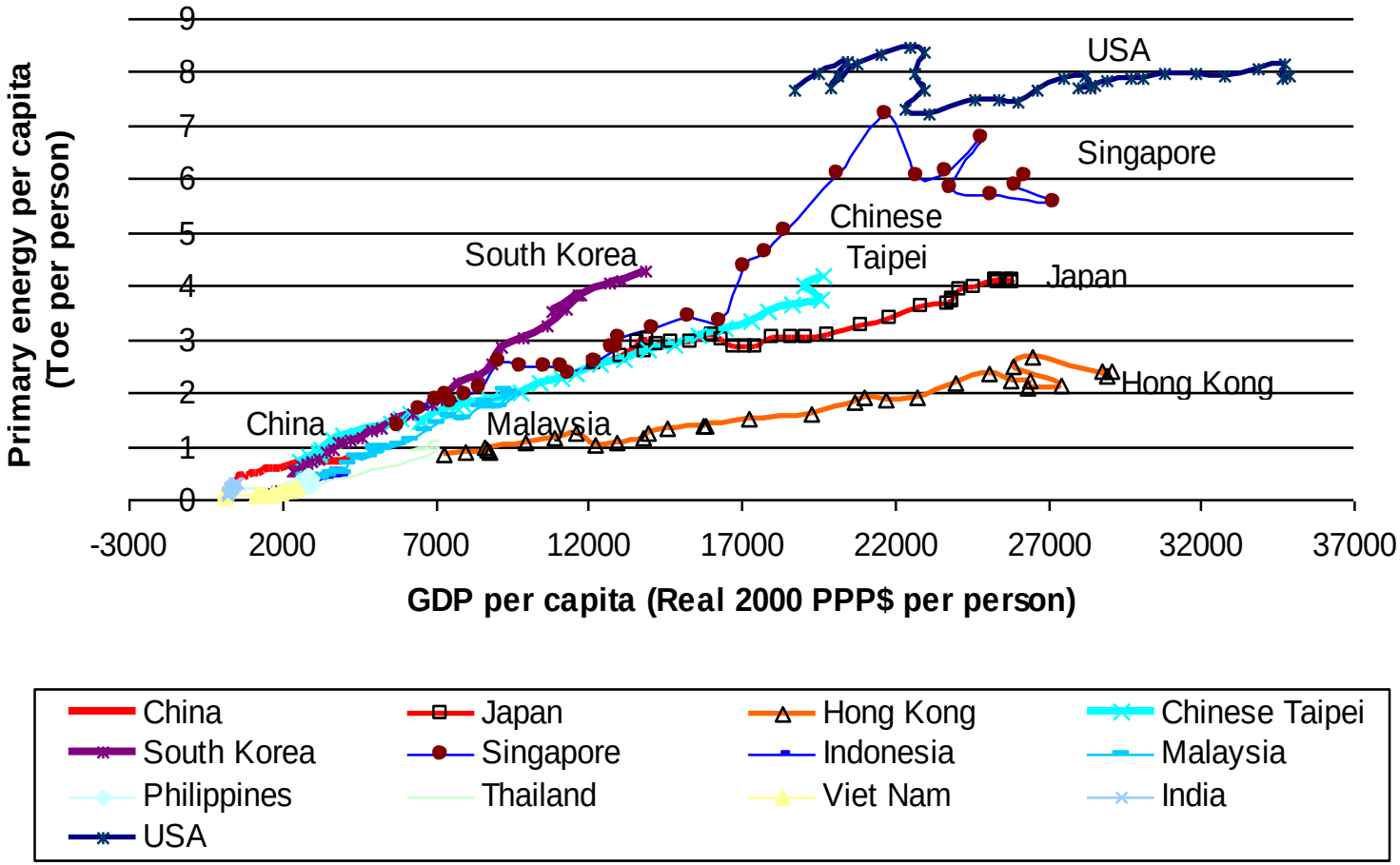
Source: World Bank (2004), "World Development Indicators"

Energy Demand in Asia



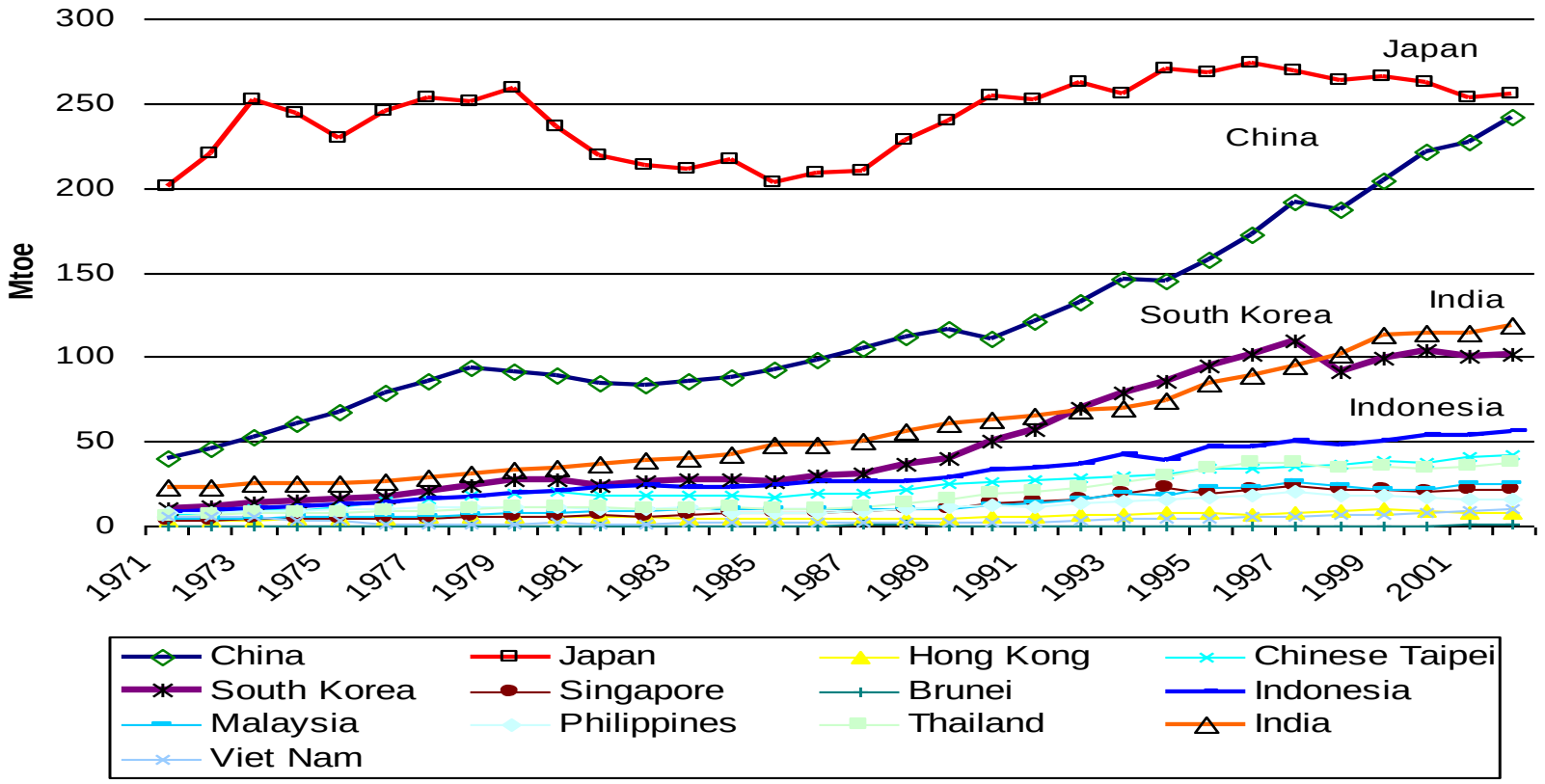
Source: IEA (2004), "Energy Balances of OECD and Non-OECD Countries"

Income and Energy Demand (1971-2002)



Source: Asia Pacific Energy Research Centre (2005)

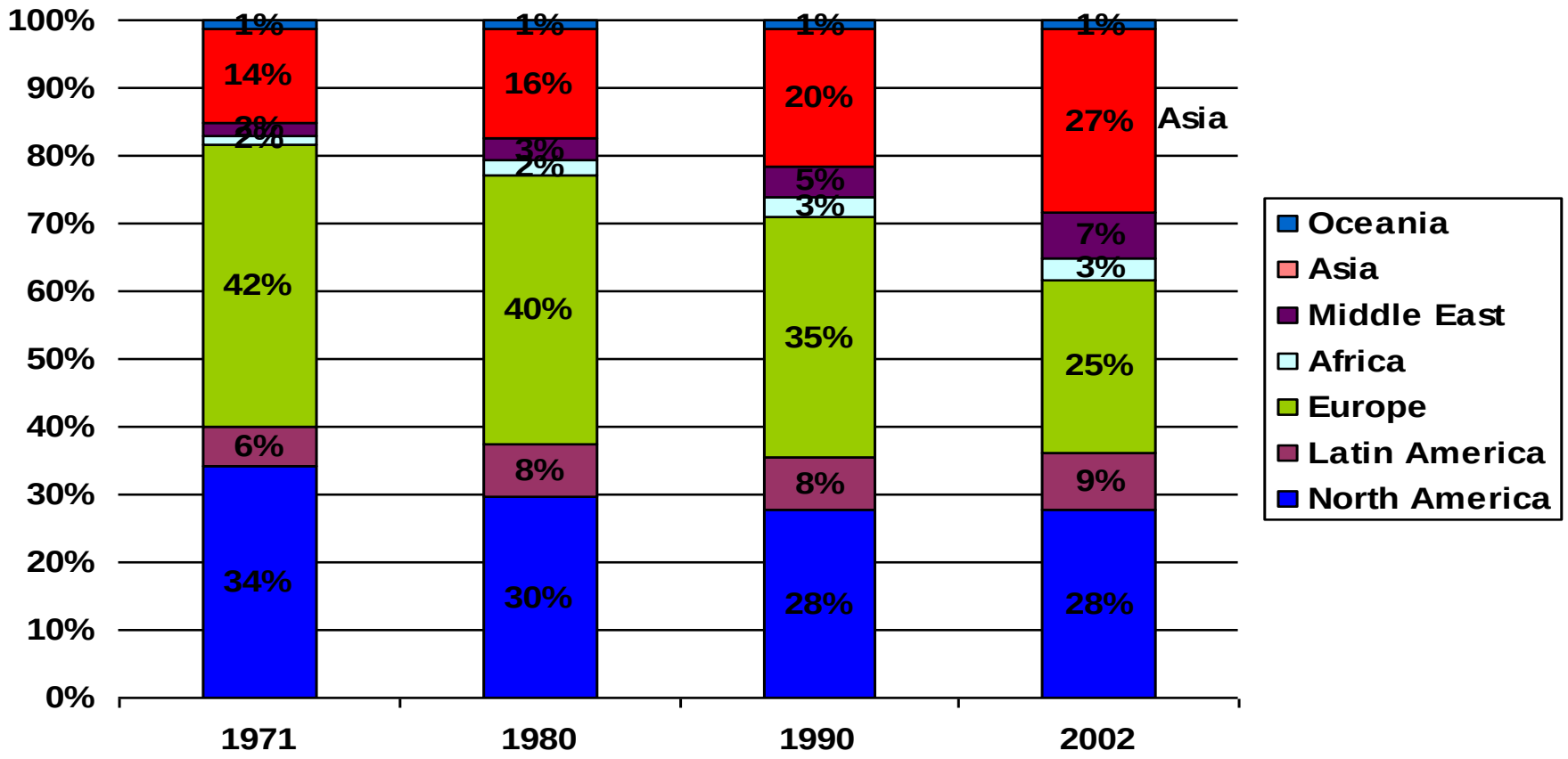
Oil Demand in Asia



Source: IEA (2004), "Energy Balances of OECD and Non-OECD Countries"

Asia's Share in World Oil Demand

Rising Share of Asia in the World



Source: IEA (2004), "Energy Balances of OECD and Non-OECD Countries"

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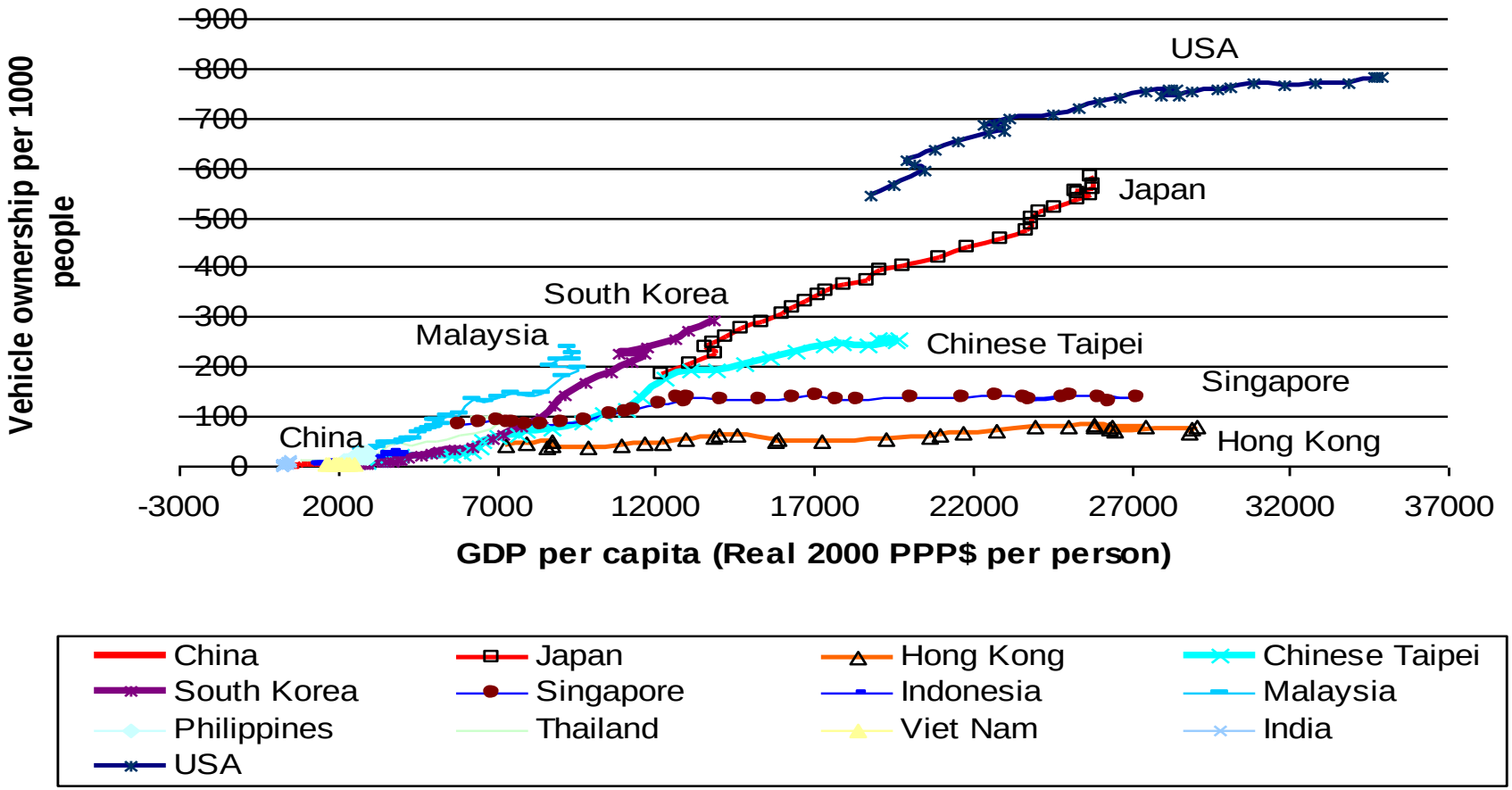
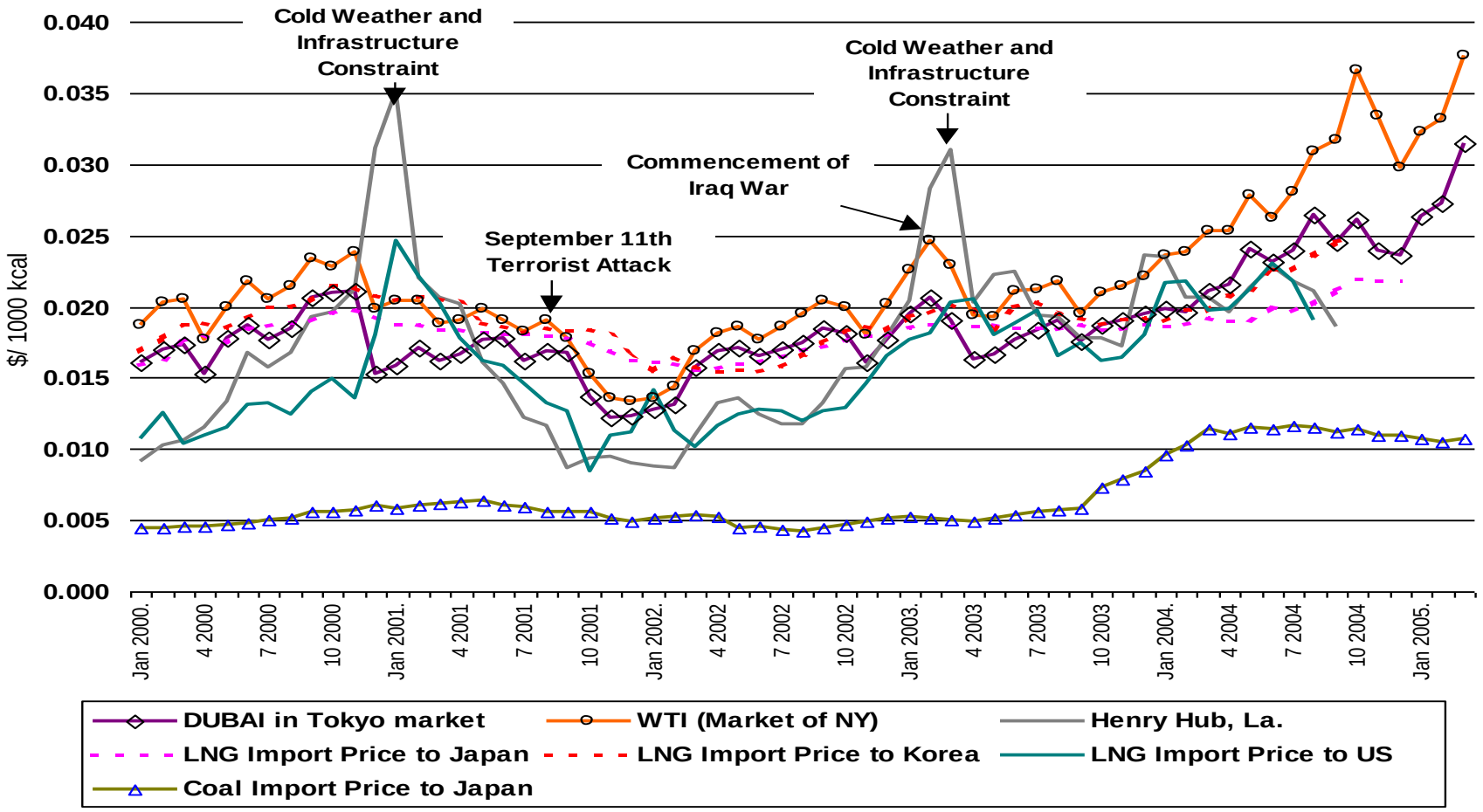
Income and Vehicle Ownership (1971-2002)

Rising vehicle ownership would give upward pressure on oil demand.



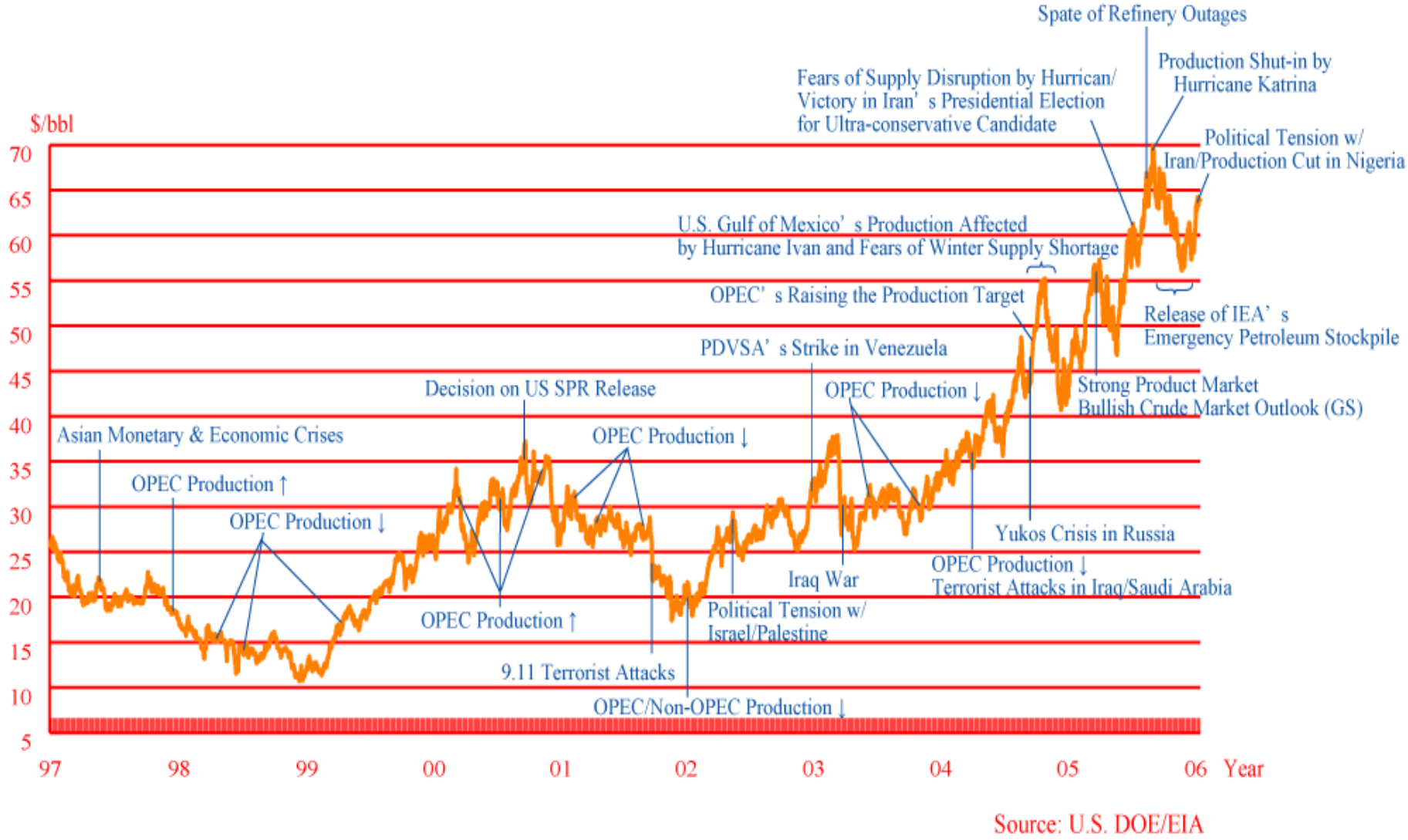
Source: Asia Pacific Energy Research Centre (2005)

Rising Energy Prices



Source : Asia Pacific Energy Research Centre (2005)

Oil Price Changes (1997-Jan.2006)



Source: U.S. DOE/EIA

Local Air Quality: SOx and NOx

(In 1998; World Bank Data)

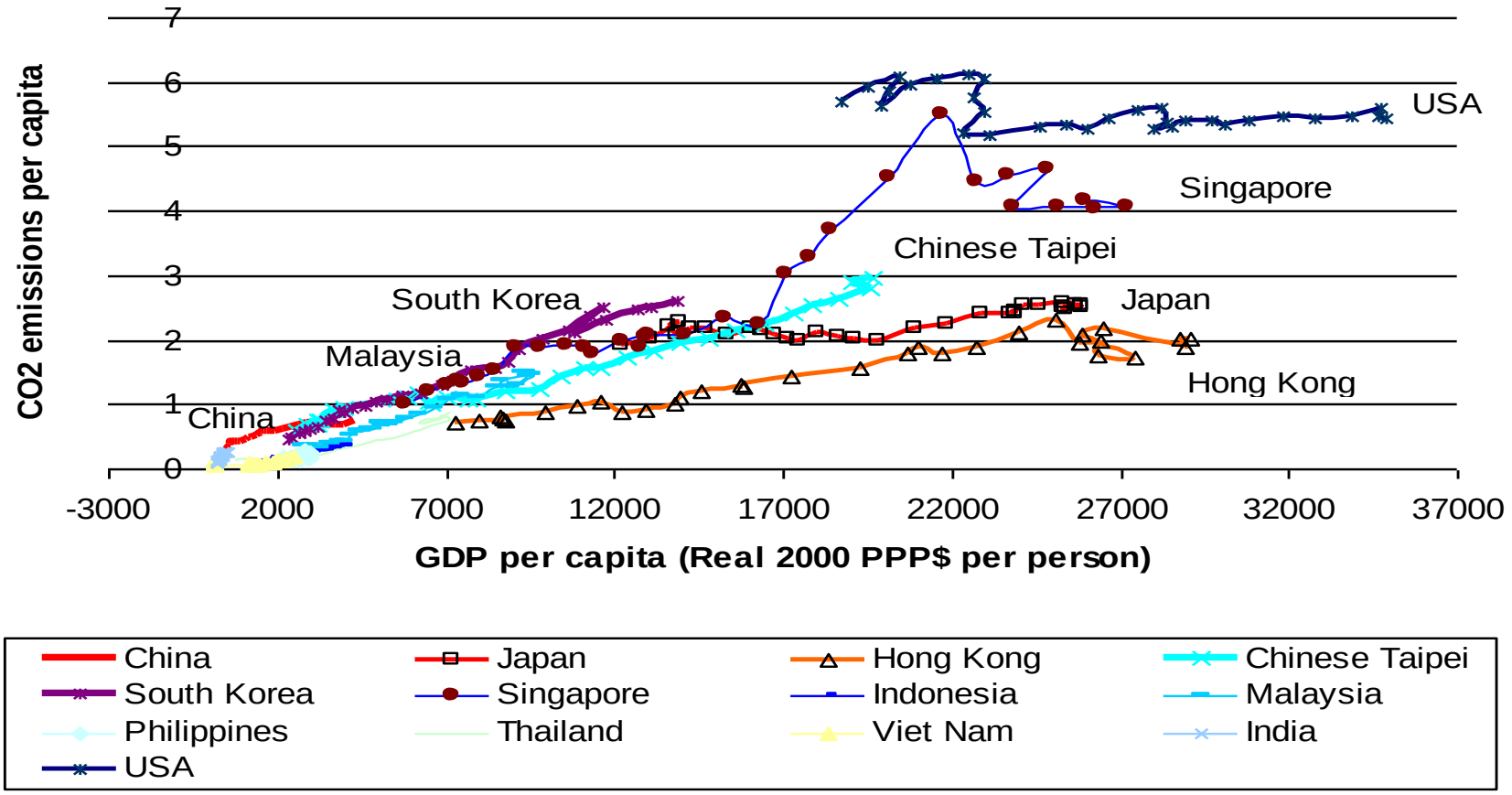
Sulfur Dioxide

	Economy	City	micrograms per m^3
1	China	Guiyang	424
2	China	Chongquing	340
3	China	Taiyuan	211
4	Iran, Islamic Rep.	Tehran	209
5	China	Zibo	198
6	China	Quingdao	190
7	China	Jinan	132
8	Brazil	Rio de Janeiro	129
9	Turkey	Istanbul	120
10	China	Anshan	115
11	Russia	Moscow	109
12	China	Lanzhou	102
13	China	Liupanshui	102
14	Japan	Yokohama	100
15	China	Shenyang	99
16	China	Beijing	90
17	Poland	Katowice	83
18	China	Tianjin	82
19	Korea	Taegu	81
20	China	Chengdu	77

Nitrogen Dioxide

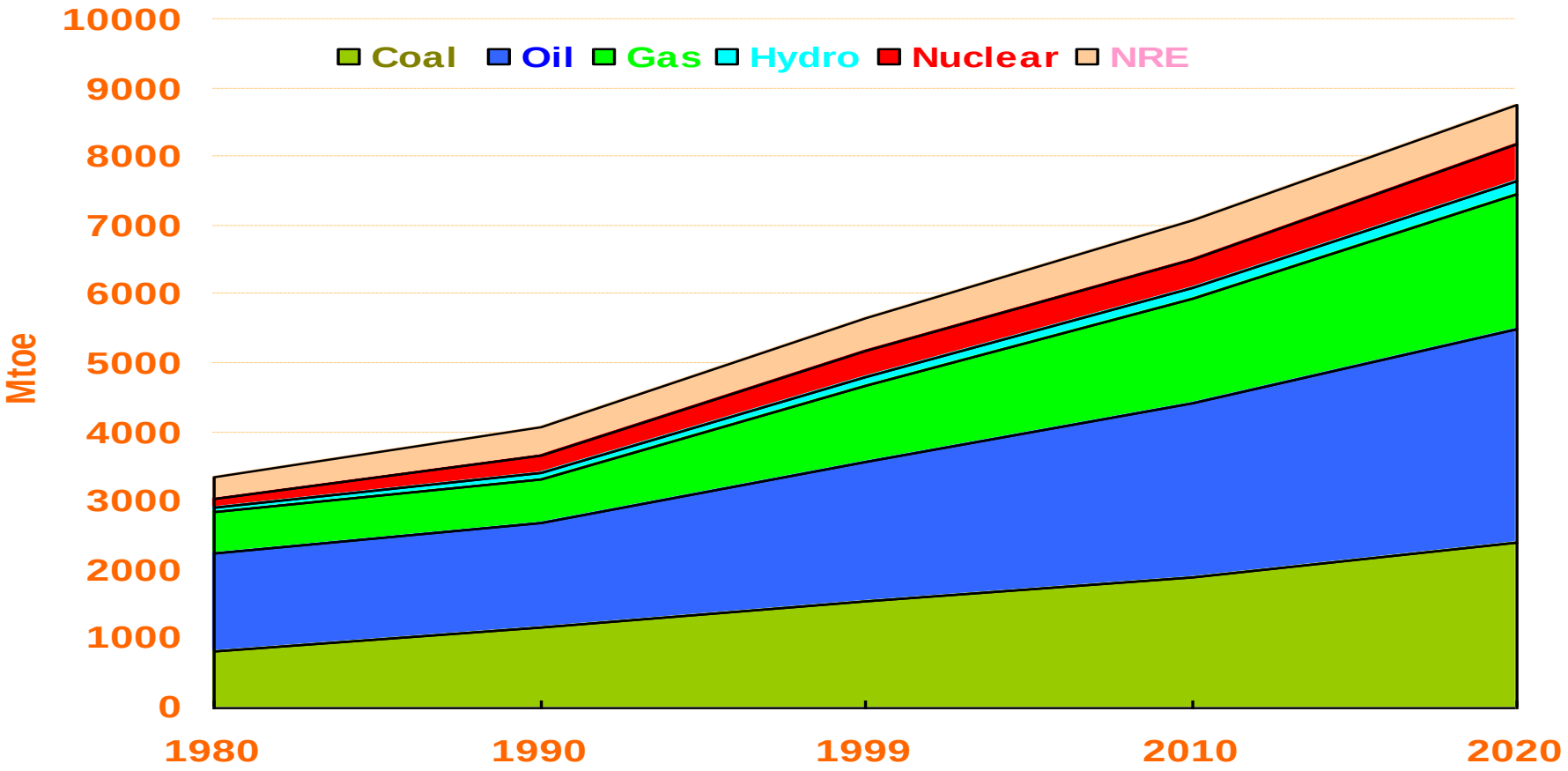
	Economy	City	micrograms per m^3
1	Italy	Milan	248
2	China	Guangzhu	136
3	Mexico	Mexico City	130
4	Bulgaria	Sofia	122
5	China	Beijing	122
6	China	Lanzhou	104
7	China	Dalian	100
8	Argentina	Cordoba City	97
9	China	Zhengzhou	95
10	China	Anshan	88
11	Brazil	Sao Paulo	83
12	Australia	Sydney	81
13	Chile	Santiago	81
14	Poland	Katowice	79
15	United States	New York	79
16	United Kingdom	London	77
17	China	Chengdu	74
18	United States	Los Angeles	74
19	China	Shanghai	73
20	China	Shenyang	73

Income and CO2 Emissions (1971-2002)



Source: Asia Pacific Energy Research Centre (2005)

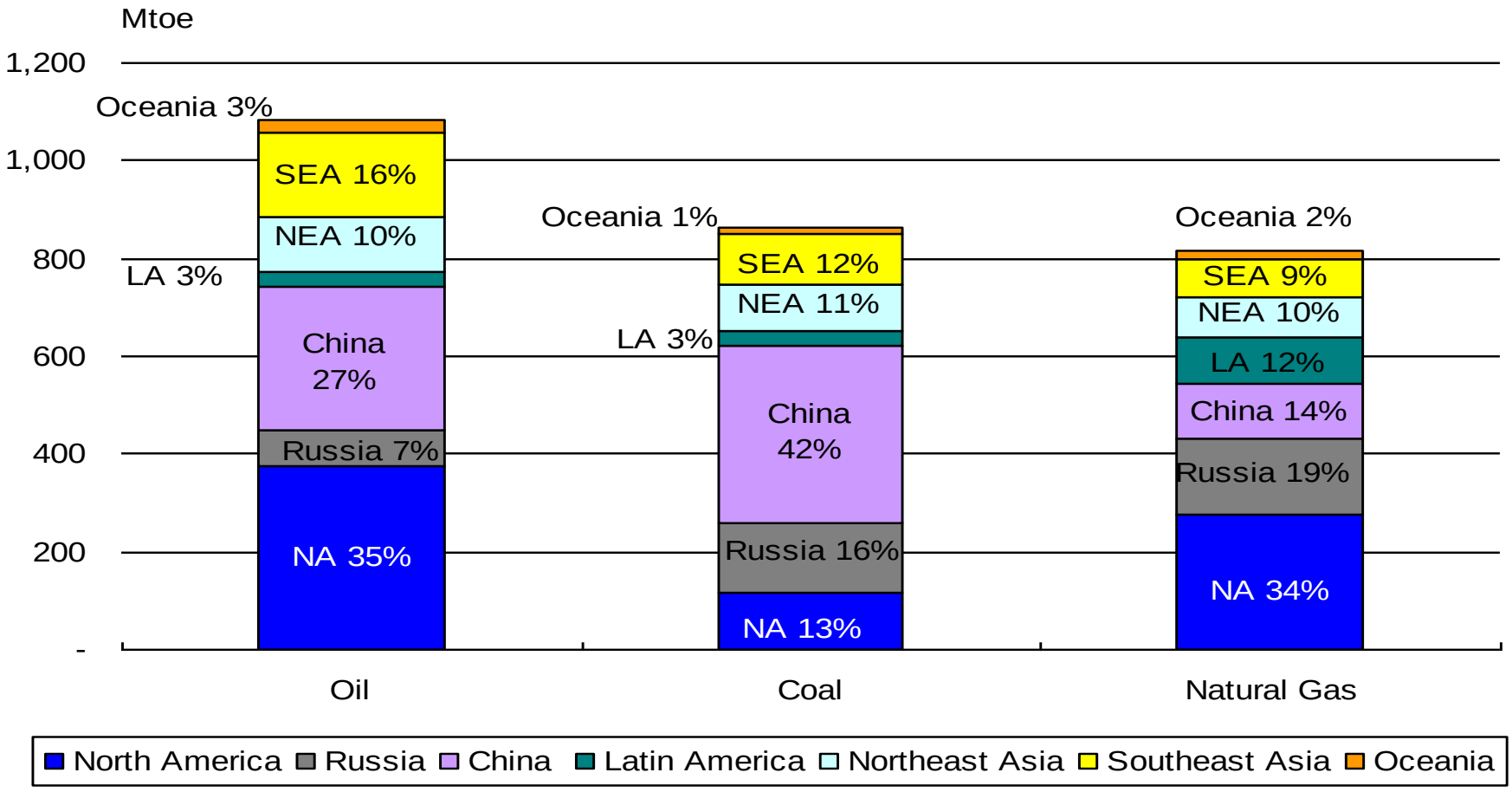
APEC Total Primary Energy Demand Outlook



(Source) APERC (2002), "APEC Energy Demand and Supply Outlook"

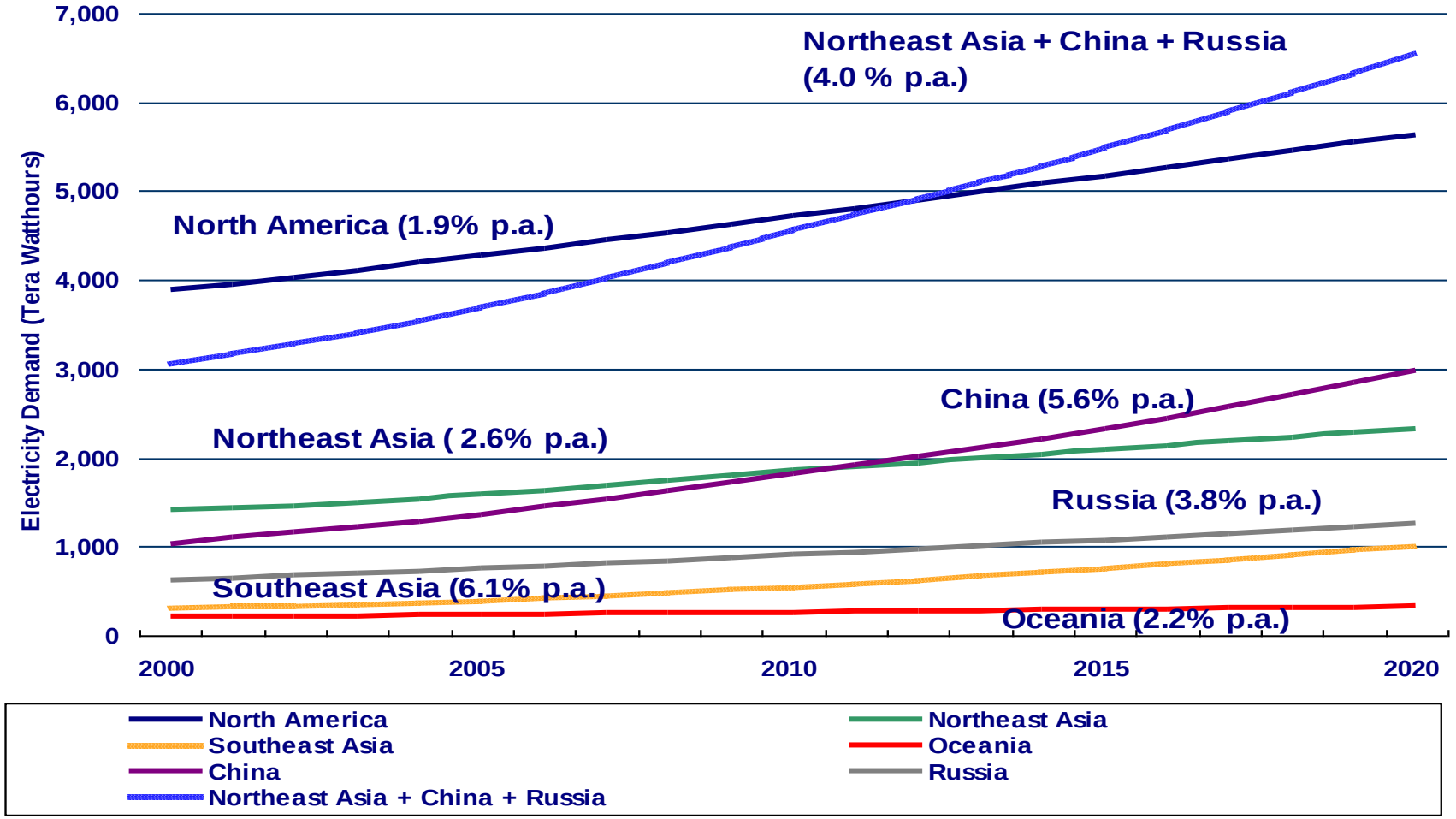
APEC Energy Demand Growth (1999-2020)

(Regional Shares of Increment)



(Source) APERC (2002), "Energy Demand and Supply Outlook 2002

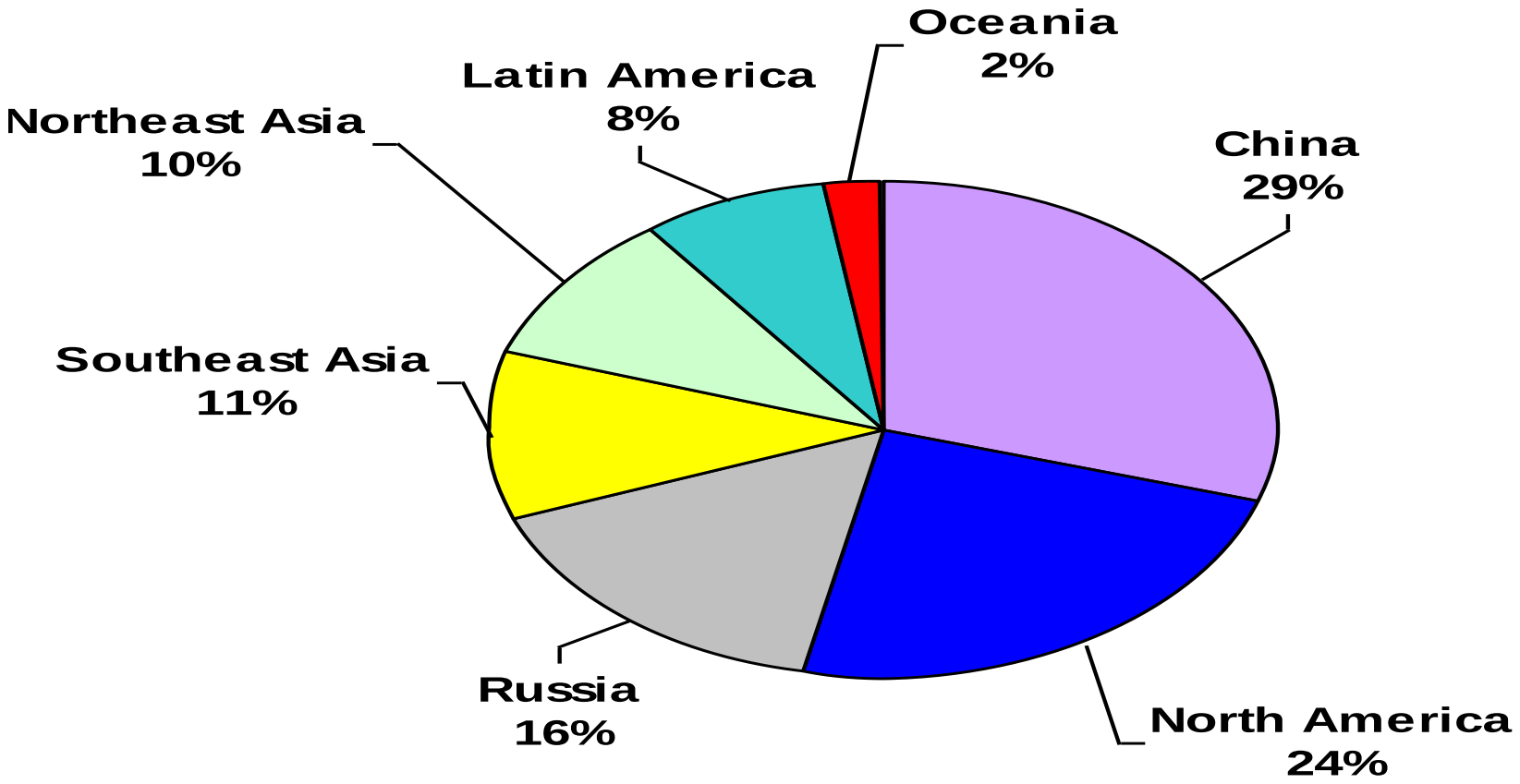
APEC Electricity Demand Growth



(Source) APERC (2002), "APEC Energy Demand and Supply Outlook"

APEC Energy Investment Requirements

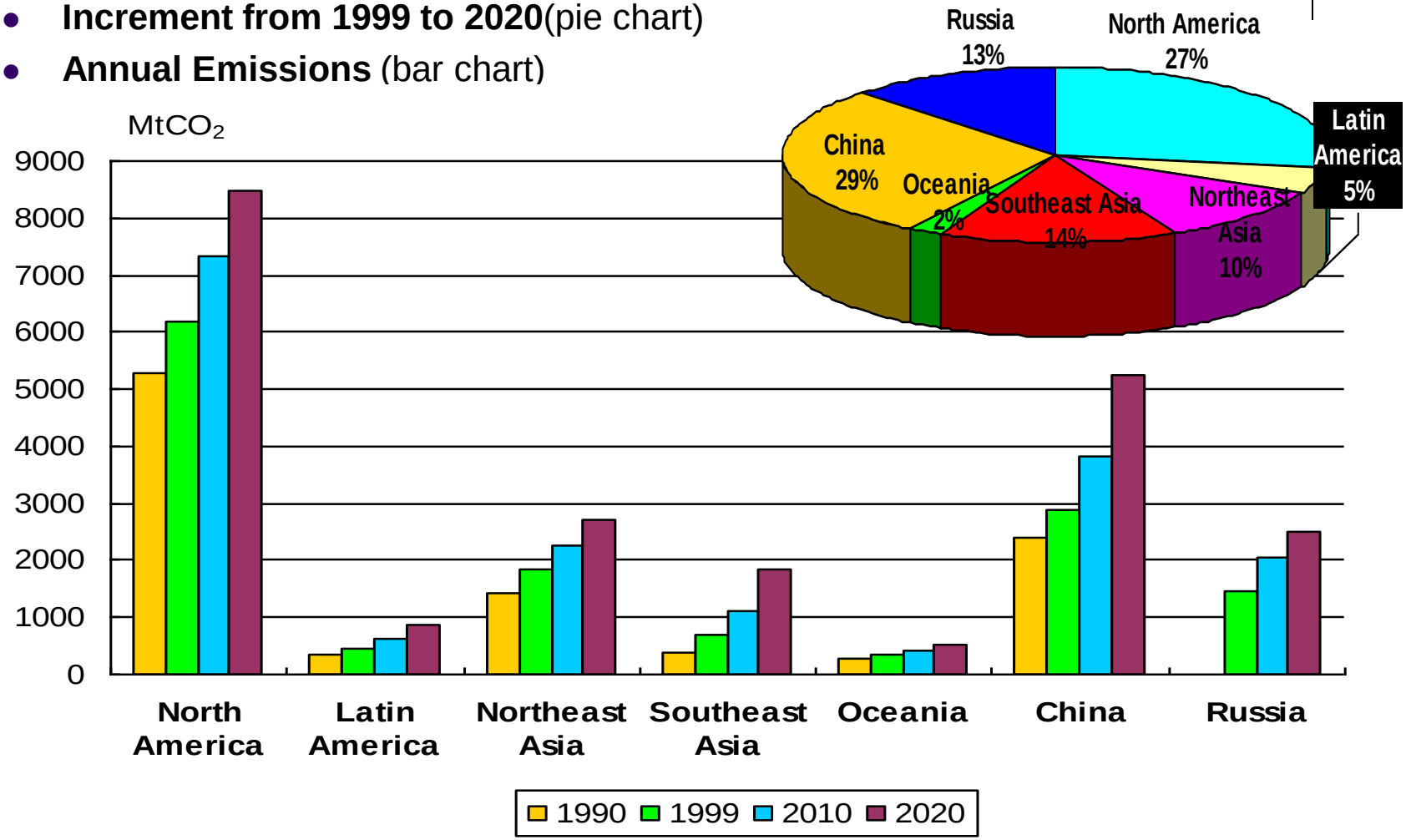
(Total $3.4 – 4.4 trillion: 2000 to 2020)



(Source) APERC (2003), "APEC Energy Investment Outlook for the APEC Region"

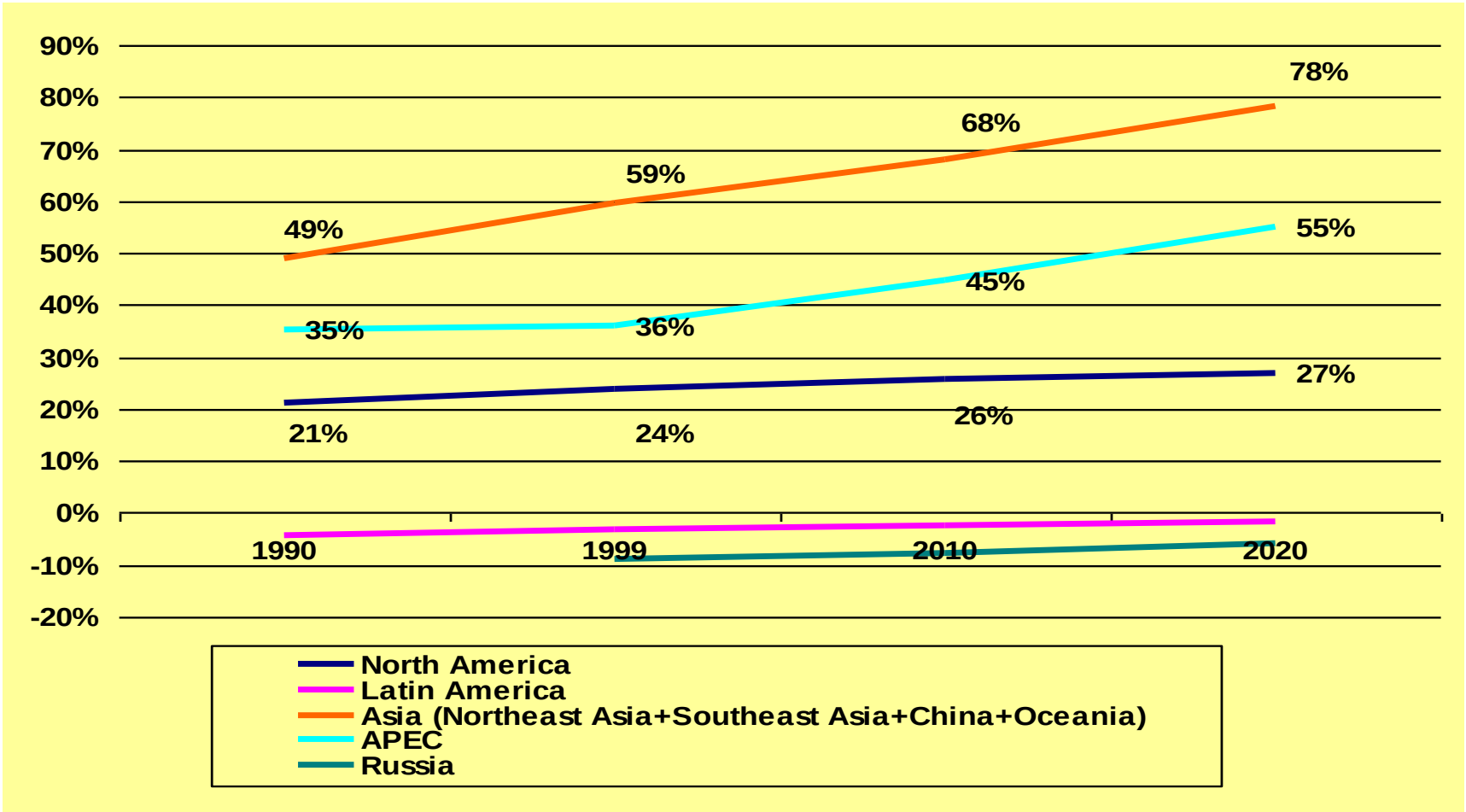
APEC CO2 Emissions (1999-2020)

- **Increment from 1999 to 2020**(pie chart)
- **Annual Emissions** (bar chart)



(Source) APERC (2002), "APEC Energy Demand and Supply Outlook 2002"

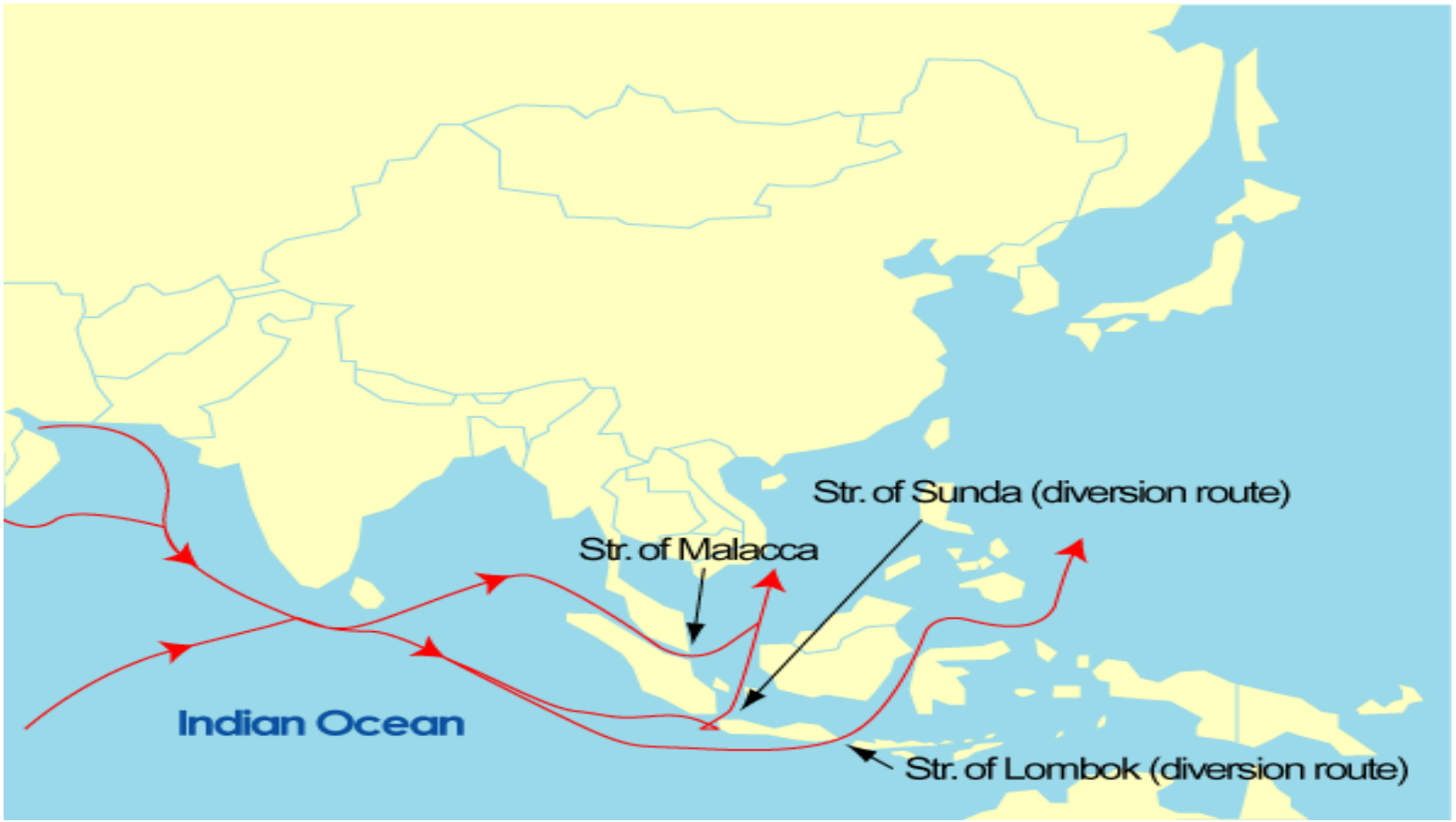
Regional Outlook for Oil Import Dependency



(Source) APERC (2002) "APEC Energy Demand and Supply Outlook"

Sea Lane Chokepoints in Asia

-Malacca Straits: 900km long with over 12mb/d oil flow
-Shallow with the narrowest part just 500m wide near Singapore
-Very congested with more than170 ships per day (over 300 DWT)
-Lombok & Sunda: Diversion routs with 4~5 extra days (round trip)



Topography of the Straits of Malacca

Oil Stockpiling in Asia

	Days of net imports or consumption	Actual or Target	Time	Notes
JAPAN (IEA member)	91 (Government) 82 (Industry) (days of net imports)	actual actual	Nov. 2005 Nov. 2005	Government stocks held by JOGMEC
Korea (IEA member)	55 (Gov.) 54 (Ind.) (days of net imports)	actual actual	Nov. 2005 Nov. 2005	Government stocks held by KNOC
China	20 (Gov.) = 16mm^3 (days of consumption)	target	by 2010	Four facilities to be constructed by 2008~2009
India	45 (Gov.) =15mt (days of consumption)	Target (5mt as 1st phase)	by 2015	Three facilities to be constructed by 2007
Chinese Taipei	22 (Gov.) 60 (Ind.) (days of consumption)	actual actual	Sept. 2005 Sept. 2005	Government stocks held by CPC
ASEAN	(1) Virtually none as emergency stocks. (2) Discussions on emergency stocks started in March 2002 under ASEAN Council on Petroleum (ASCOPE). "AEAN Joint Stocks" as an option. (3) APSA (ASEAN Petroleum Security Agreement; 1986) as a conceptual base.			

APEC Energy Security Initiatives (1)

APEC=Asia Pacific Economic Cooperation (21 economies)

- September 2000: APEC Senior Officials' Meeting discussed the measures to respond to oil price volatility.
- October 2001: APEC Leaders endorsed APEC Energy Security Initiative（ESI), a policy package developed by the APEC Energy Working Group (EWG).
- July 2002: APEC Energy Ministers directed the APEC EWG to work on enhancement of energy security through short-term and long-term measures.
- June 2004: Energy Ministers discussed ESI and issued a joint statement; "Energy Security in APEC : Cooperation for Sustainable Future".

APEC Energy Security Initiatives (2)

- **Joint Oil Data Initiative: Joint Initiative to improve oil data transparency - APEC, IEA, EU, OLADE, OPEC and UN.**
- **Sea-Lane Security: EWG to review the activities implemented by APEC Transportation Working Group and the International Maritime Organization, and identify additional actions.**
- **Real-Time Emergency Information Sharing: EWG to work together to identify contacts to share information in case of an emergency, and establish a system for sharing information.**
- **Oil Supply Emergency Response: EWG to implement a feasibility study of joint stockpiling by net oil importing economies of APEC and other interested APEC economies.**
- **Non-Petroleum and Longer-Term Concerns: EWG to consider broader issues to enhance energy security**

ASEAN+3 Common Energy Goal

ASEAN (Association of South East Asian Nations: 10 Members)

+3 (China,Japan, Korea)

- June 2004: ASEN+3 Energy Ministers Meeting in Makati City, The Philippines
- Joint Ministerial Declaration: " Forging Closer ASEAN+3 Energy Partnership" (9 June 2004)
- Common Energy Goal

" Recognizing Asia's growing demand for energy and depletion of fossil fuels , we resolve to achieve, through ASEAN+3 Energy Partnership, our common goal of greater energy security and sustainability in our region which will become the largest energy consuming region in the world"

- Note: "Common Goal" is a sign of maturity of cooperation in Asia

World population growth: What would this be telling us?

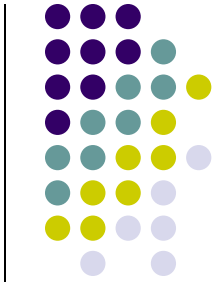
Year	Total (billion)	Growth Rate(%)	Developing Countries(%)	Developed Countries(%)
0001	**0.25**	-	-	-
1600	**0.5**	-	-	-
1830	**1.0**	-	-	-
1930	**2.0**	-	-	-
1950	**2.5**	-	**67.7**	32.3
1975	**4.1**	2.0	**74.3**	25.7
2000	**6.1**	1.6	**80.3**	19.7
2005*	**6.5**	1.2	**81.3**	18.7
2030*	**8.1**	0.7	**84.7**	15.3
2050*	**8.9**	0.3	**86.3**	13.7

Source: Mr. Saishu (before 1950) , United Nations (after 1950: * prospects)

The Era of "HEAT"

- Human activities have imposed accumulating environmental burdens on the mother earth ever since the Industrial Revolution .
- The level of environmental burdens is believed to have exceeded the self-cleaning or self-recovering capacity of the nature since around the turn of the century.
- In the 21st century, for the first time, the tension between human beings and the earth has become palpable.
- I call this century **the era of "HEAT"**, HUMAN-EARTH-TENSION.
- This new tension will affect geopolitical developments leading to the creation of derivative tension among nations and regions.

Energy use and its environmental Implications



- The growth of the world population is unstoppable, although it will slow down. The world population will double in only 55 years between 1975 and 2030.
- The world energy demand will increase by 1.7% per year (2002-2030: IEA projection) much faster than the population growth.
- Accordingly, the global energy related CO2 emissions will also increase by 1.7% per year (2002-2030).
- More than two-thirds of the energy-related CO2 emission increase will come from the developing countries.
- Some 80 to 85% of the global CO2 emissions comes from energy use.

The Japanese Energy Model: a solution?

- Energy saving and energy efficiency will hold the key to arrest the CO_2 emissions.
- Japan has developed itself as **the world most energy-saving and energy-efficient society** in industrial, commercial, transport and residential sectors through technological innovation, regulations, policy incentives and public persuasion.
- In the era of HEAT, the application of **the Japanese energy model** will be of great value to the developing countries, Asia in particular.
- As the Japanese energy model is **not a "one-size-fits-all"** type, it should be tailor-made for specific countries of application.

Footnotes to the Japanese Energy Model

- Policy measures should be **understandable**.
- Policy measures should be **cost effective**.
- Reasonable **lead-time** is needed for any measures to take effect.
- Energy technologies should **not be too expensive**.
- Policy incentives such as tax incentives should be **carefully designed**.
- Energy saving efforts should **not be too painful**.
- **Energy education** should be given to the younger generation.
- Every effort should be **sustainable**.

Asian Energy Challenges at a Glance