Global Focus on Knowledge Lecture Series

“Energy and the Earth”

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1. Economic Development and Energy

- Transition of Energy Sources:

  ▪the First Industrial Revolution

  steam engine and coal,

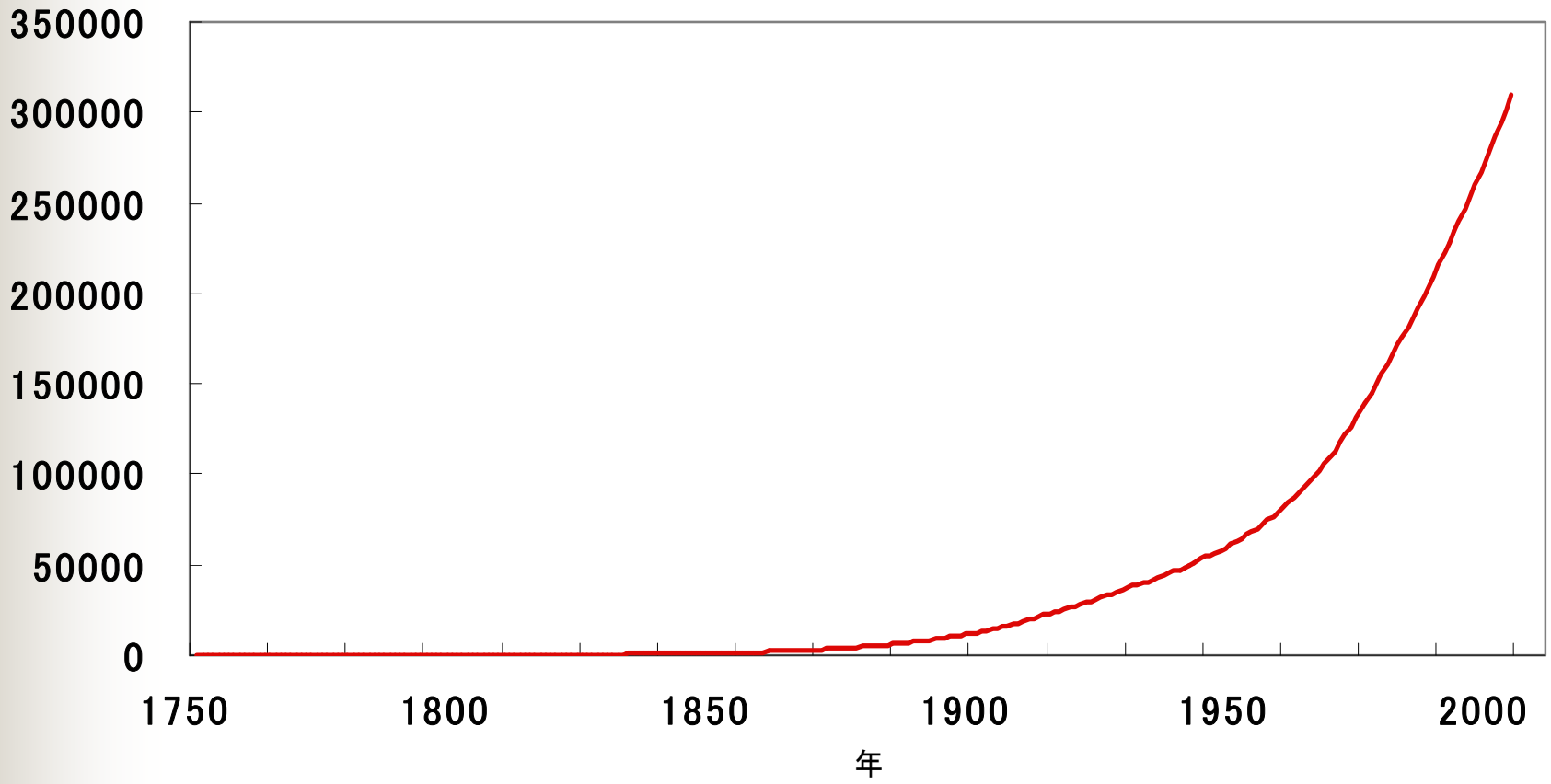
  beginning of global warming

  ▪the Second Industrial Revolution

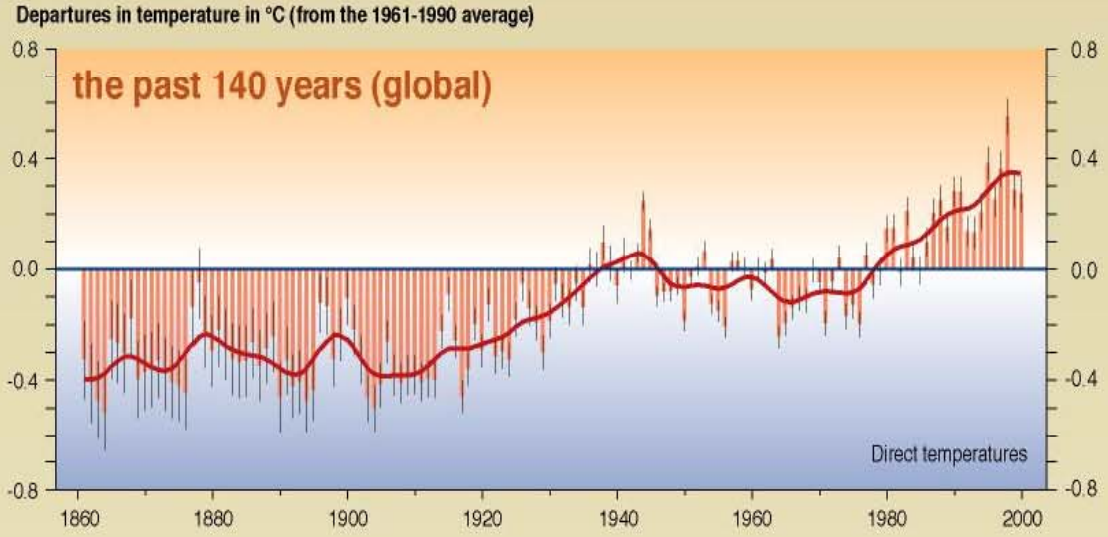
  distribution of electricity,

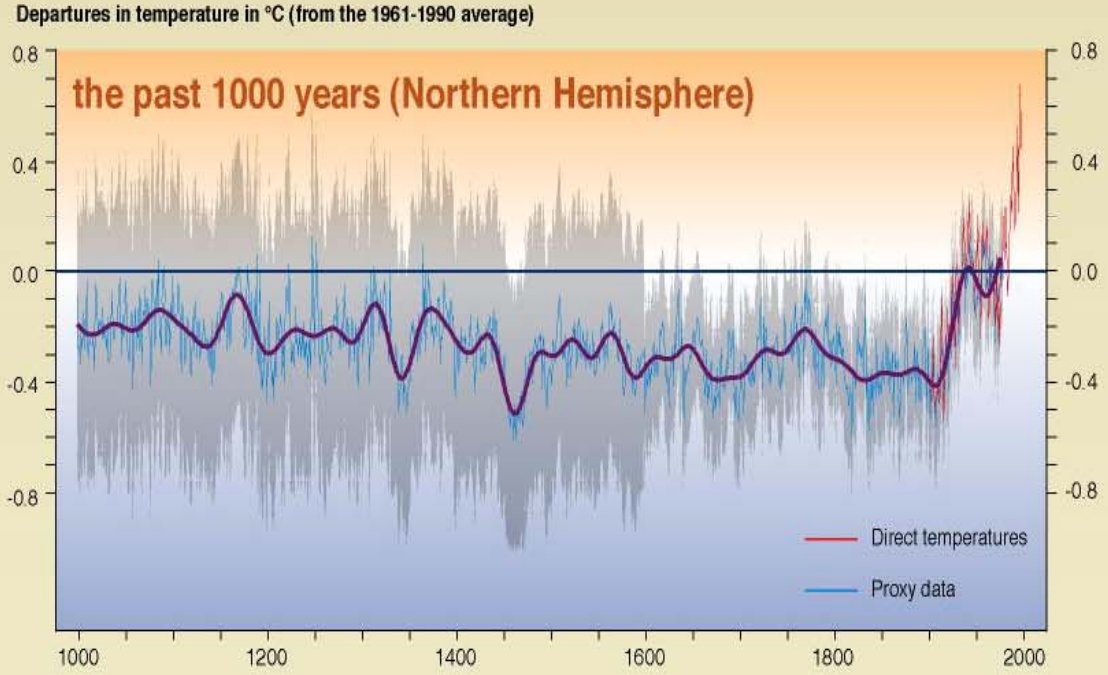
  invention of the automobile

CO2 Concentration in the Air (million ton)



Variations of the Earth's surface temperature for...





SYR - FIGURE 2-3

WMO UNEP

■Post-war Energy Revolution

・Primary energy source shifted from coal to oil

Development of new oil fields and decline in transportation costs

Organization of OPEC

・High-speed growth

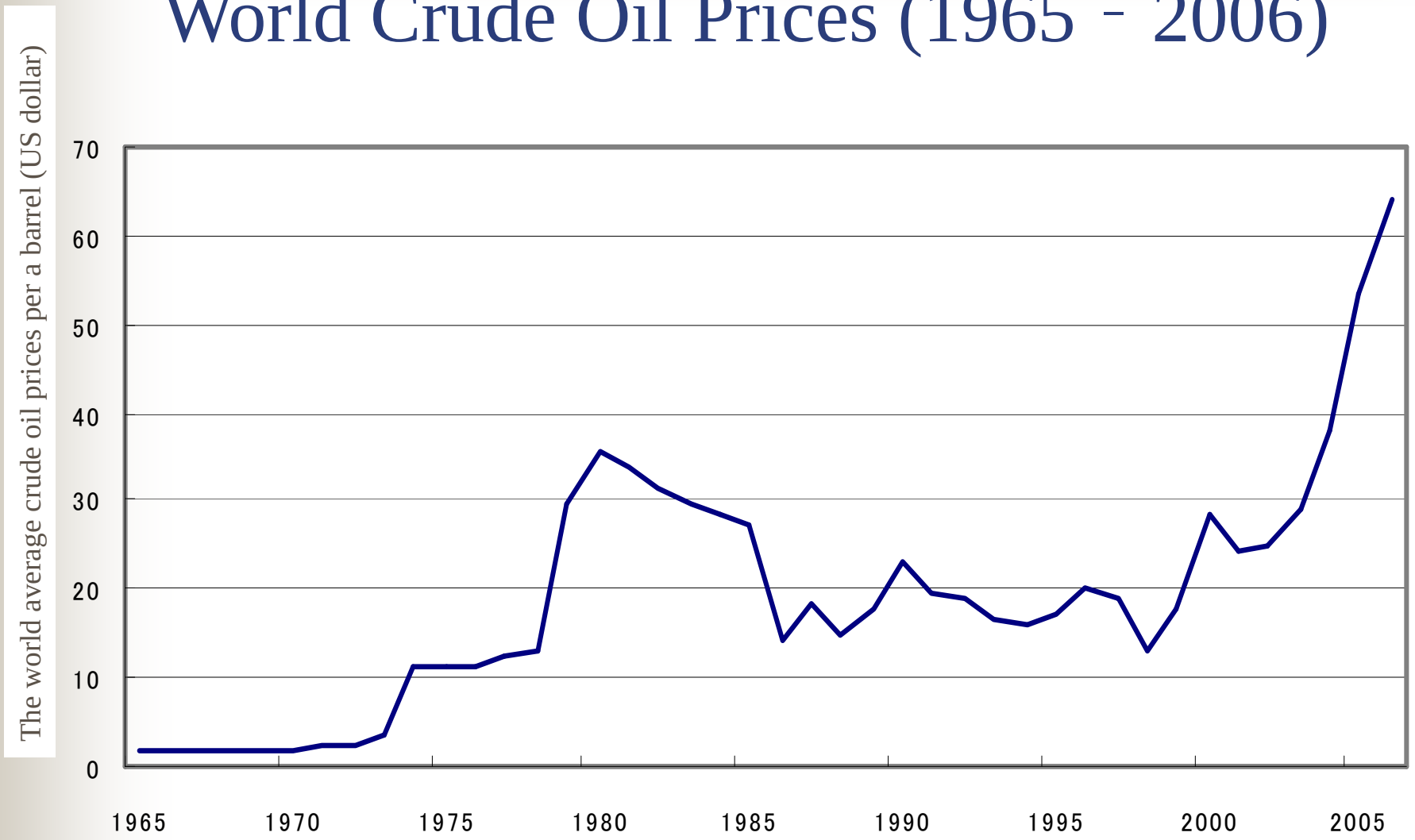
Mass consumption of resources, mass production, mass consumption

・Oil shock 1973-74, 1979-80

・And nuclear power…

What will the future of nuclear power be? Recycling of used nuclear fuels.

World Crude Oil Prices (1965 - 2006)



- Club of Rome “The Limits to Growth” 1972

  limits of resources
- Oil crisis 1973-74
- “Small is Beautiful” E.F. Schumacher (1973).
- Rise of global environment problems

  Brundtland Commission 1987

  “Our Common Future”, sustainable development

  formation of IPCC 1988

  the Rio Earth Summit 1992

Why Global Environment Problems Emerged

- Changes in “Spirit of the Time”
- Opposing factors , recession of crisis awareness
  - Decrease in crude oil price
  - Advance of neo-liberalism
- Promoting factors
  - Destruction of the Cold War framework
  - Actual temperature rise, might be late（？）

Energy Consumption and Industrial Structure

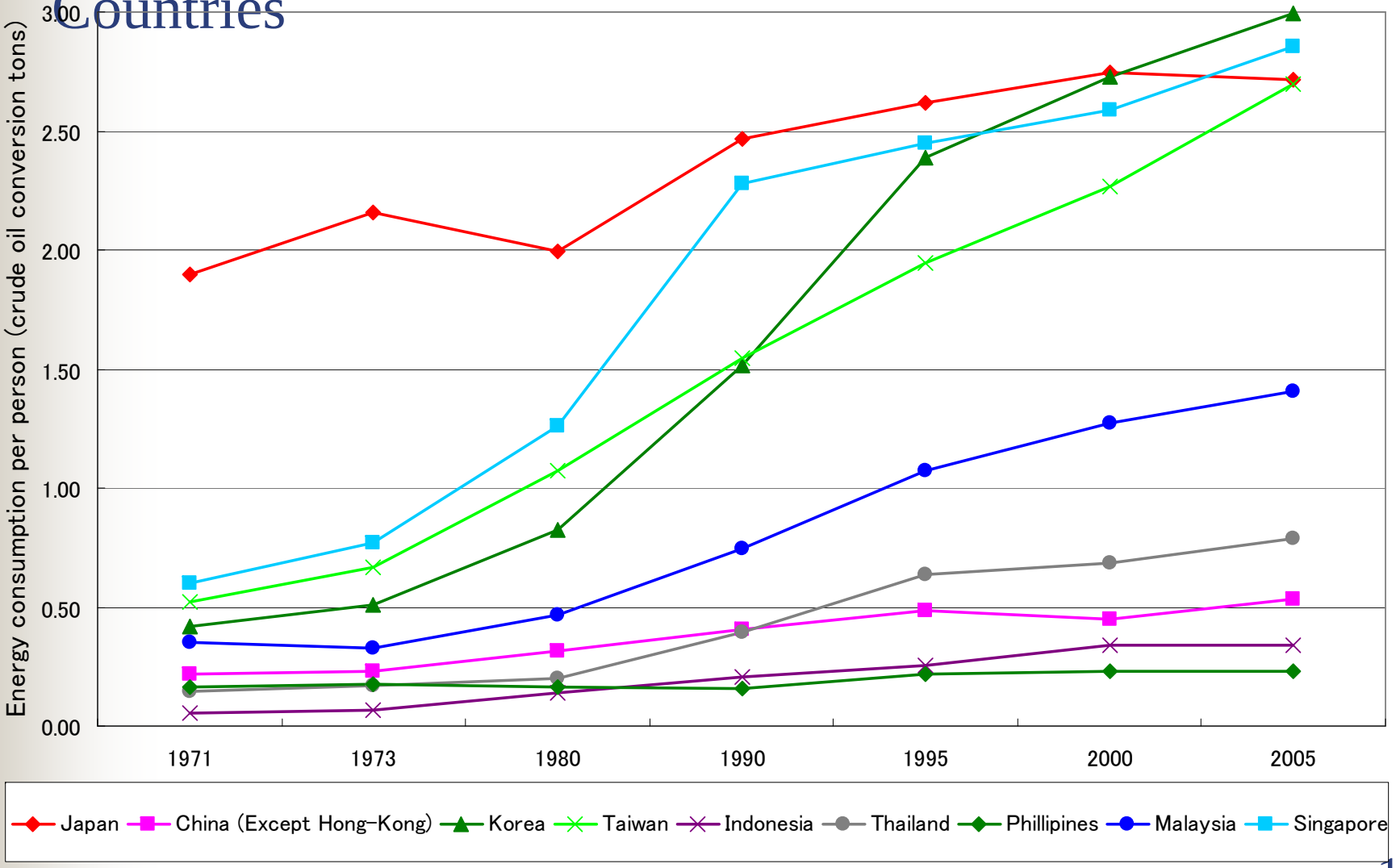
- Upgrading of Industrial Structures

  Will “trend toward service economy” or “Informatization” reduce energy consumption?

- Increase in Income, Pursuit of Convenience and Comfort

  Increase in energy consumption

Energy Consumption per- Person in East Asian Countries



GDP Composition Ratio in Asian Countries

(2006, unit: %)

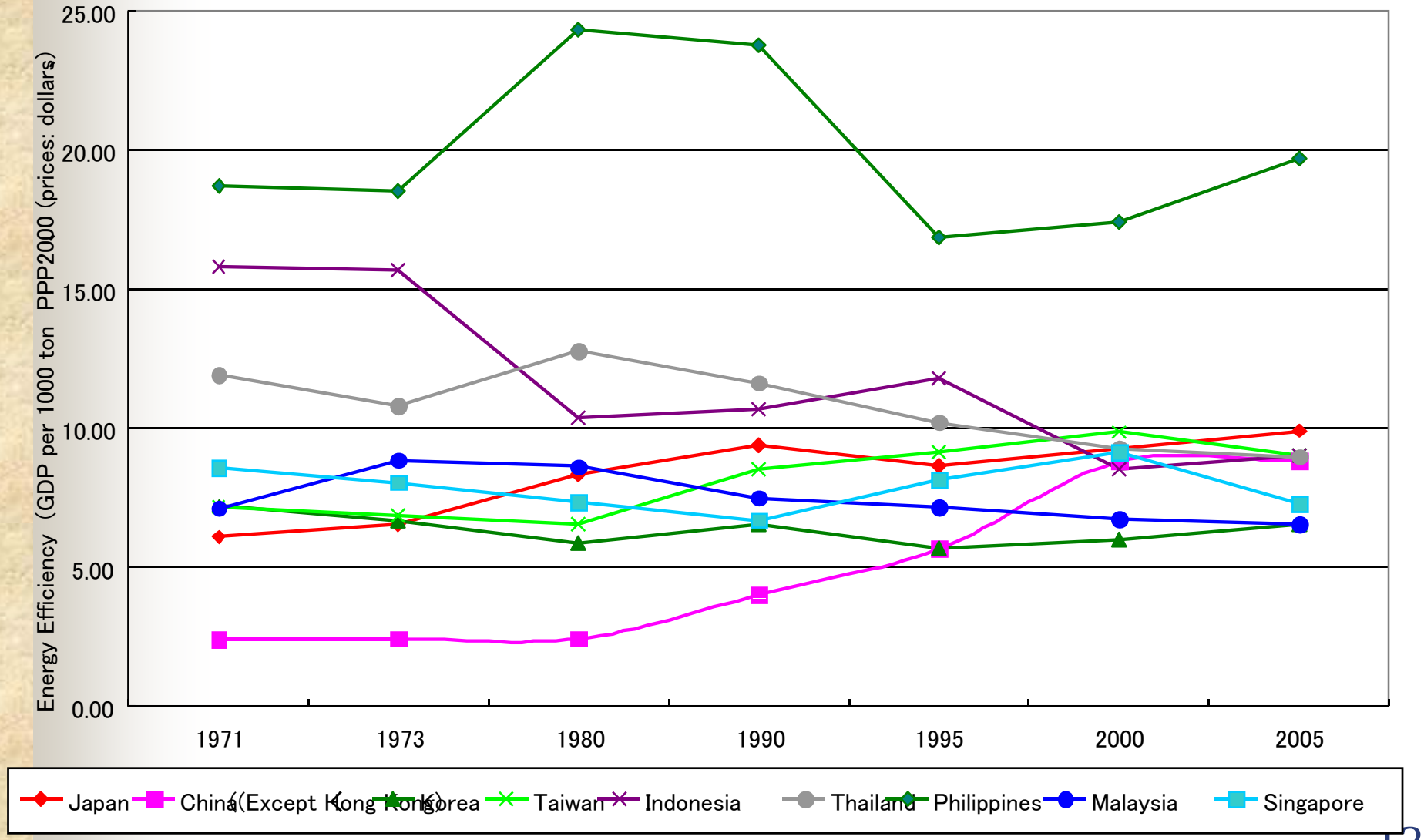
	the 1st	the 2nd	the 3rd
Japan(2000)	1.3	27.3	70.8
Singapore	0.1	33.0	66.9
Indonesia	12.9	47.0	40.1
China	11.8	48.7	39.5
Vietnam	20.4	41.6	38.1
India	17.5	27.9	54.6
Philippines	14.2	31.6	54.2

- resource : ADB, *Key Indicators 2007.*

Interpretation of Statistics

- Energy density, energy efficiency
- What is GDP?
- Choice of exchange rate
- What is economical growth?

Energy Efficiency in East Asian Countries



Basic Formula

$$EM = GDP \cdot \frac{EM}{GDP} = P \cdot \frac{GDP}{P} \cdot \frac{EC}{GDP} \cdot \frac{EM}{EC}$$

$$= Y \cdot \Gamma \qquad = \quad P \cdot y \cdot I \cdot e$$

thus

$$\dot{EM} = \dot{P} + \dot{y} + \dot{I} + \dot{e} \qquad (\dot{} \text{ rate of change})$$

EM : total emission, P : population, EC : energy consumption,

Y: GDP、 y :GDP per person、 Γ : emission density、 I: energy density, e : emission coefficient