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Globalization and urban environmental change in the Asia Pacific Region

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Outline of talk

- Background
  - Socio-ecological systems (SESs) and urban development
  - Globalization and urban development
- Selected evidence of unique urban SES relationships in the Asia Pacific region
- Conclusions

Background

Socio-ecological systems

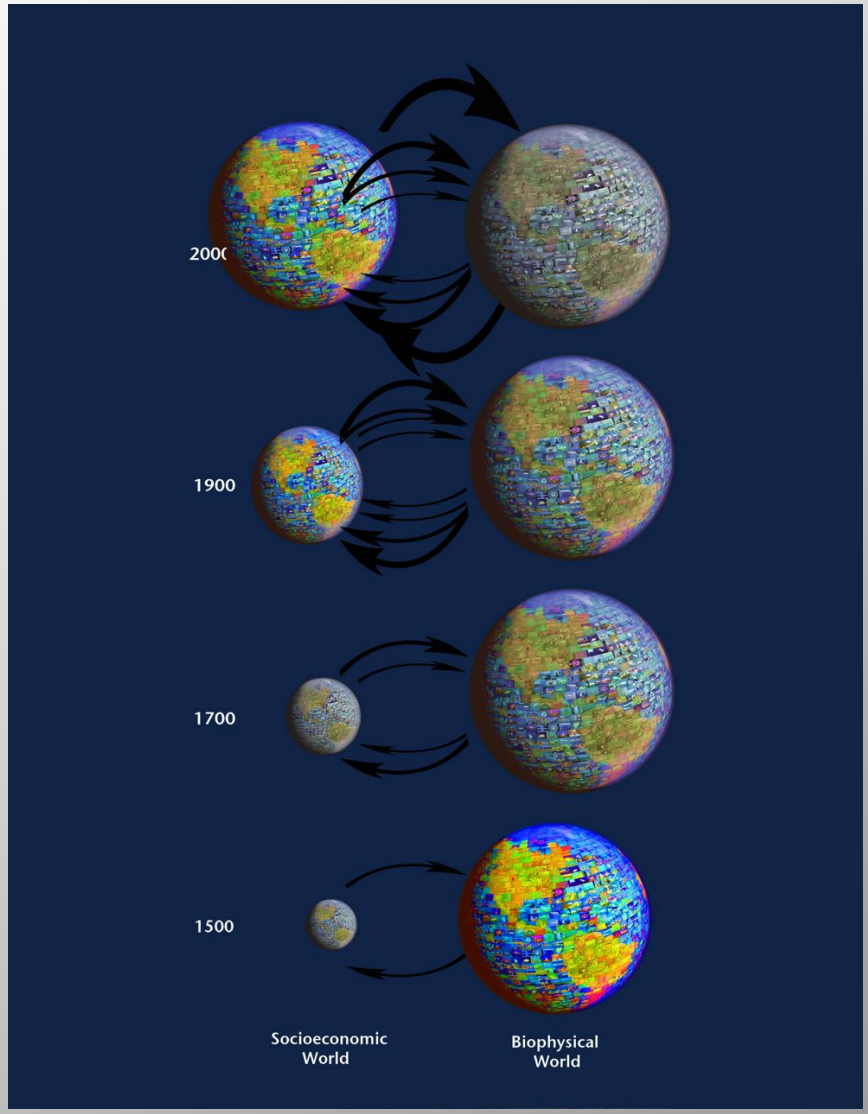
- Socio-ecological systems are composed of coupled “human” or “social” spheres and “environmental” or “ecological” spheres (SES). AKA as “coupled human and natural systems (CHANS)”
- Activities and changes in one sphere are dependent upon and interact with elements and processes in the other
- One way to make these linkages is through the concept of “ecosystem services”

Socio-ecological system change over time

- The social or human sphere has dramatically changed over the past 150 years in terms of absolute size and intensity of activities as well as in relative size and interaction with the ecological sphere;

- The implication is that the social sphere has grown and has increasingly linked (in more, deeper and more complex ways) to the environmental or ecological sphere;

Socio-ecological systems



Globalization

- Globalization is defined as:

  "…the *widening*, *deepening* and *speeding up* of worldwide interconnectedness in all aspects of contemporary social life, from the cultural to the criminal, the financial to the spiritual" (Held, et al, 1999)

- Globalization is not a single variable but a complex set of phenomena, captured in a large number of different variables

Globalization

- Previously indicators of the widening and deepening focused on, *inter alia*, the increasing number of multi-lateral and bi-lateral agreements and levels of trade, the increasing number of countries receiving Foreign Direct Investments (FDI) and other forms of capital and quantity of inflows and stocks, international travel, immigration sources and destinations, etc

Globalization

- Emphasis on socio-ecological development includes additional indicators such as increasing number and size of impacted ecosystems, spread of diseases, movements and concentrations of toxics, air pollutants, energy supplies, invasive species, etc;

Globalization

- Widening processes have attributed to the formation of a world city system in which urban regions articulated to the system are connected through economic, political, social and biological (genetic, species, population, etc), ecosystem services, waste/emissions flows;
- Deepening processes have attributed to “world city formation” or the accumulation of the world’s capital in the major metro region and increased consumption of ecosystem services, increased interference with biogeochemical flows, more intensive reliance on social responses as ecosystem functions deteriorate, etc

Globalization

- The speeding up of interconnections have been facilitated by advanced technologies in telecommunications and transport and indicators of increasing speed include, for example, in the speed of transactions (and the lower relative costs of communications and people and goods movement)

- Increasing rates of change can also been observed in the socio-ecological systems, which are changing faster than previously experienced

Globalization

- Moreover, changing speeds and timing also influences the patterning of “environmental transitions” (McGranahan et al, 2001). In the past the transition from one set of environmental conditions to another took a longer period of time than it does today and occurred in a more simultaneous fashion.
- Given current patterns experienced by rapidly developing world cities, relationships that define the structure of urban environmental transition may no longer exit;

Selected evidence of unique urban SES relationships in the Asia Pacific region associated with globalization

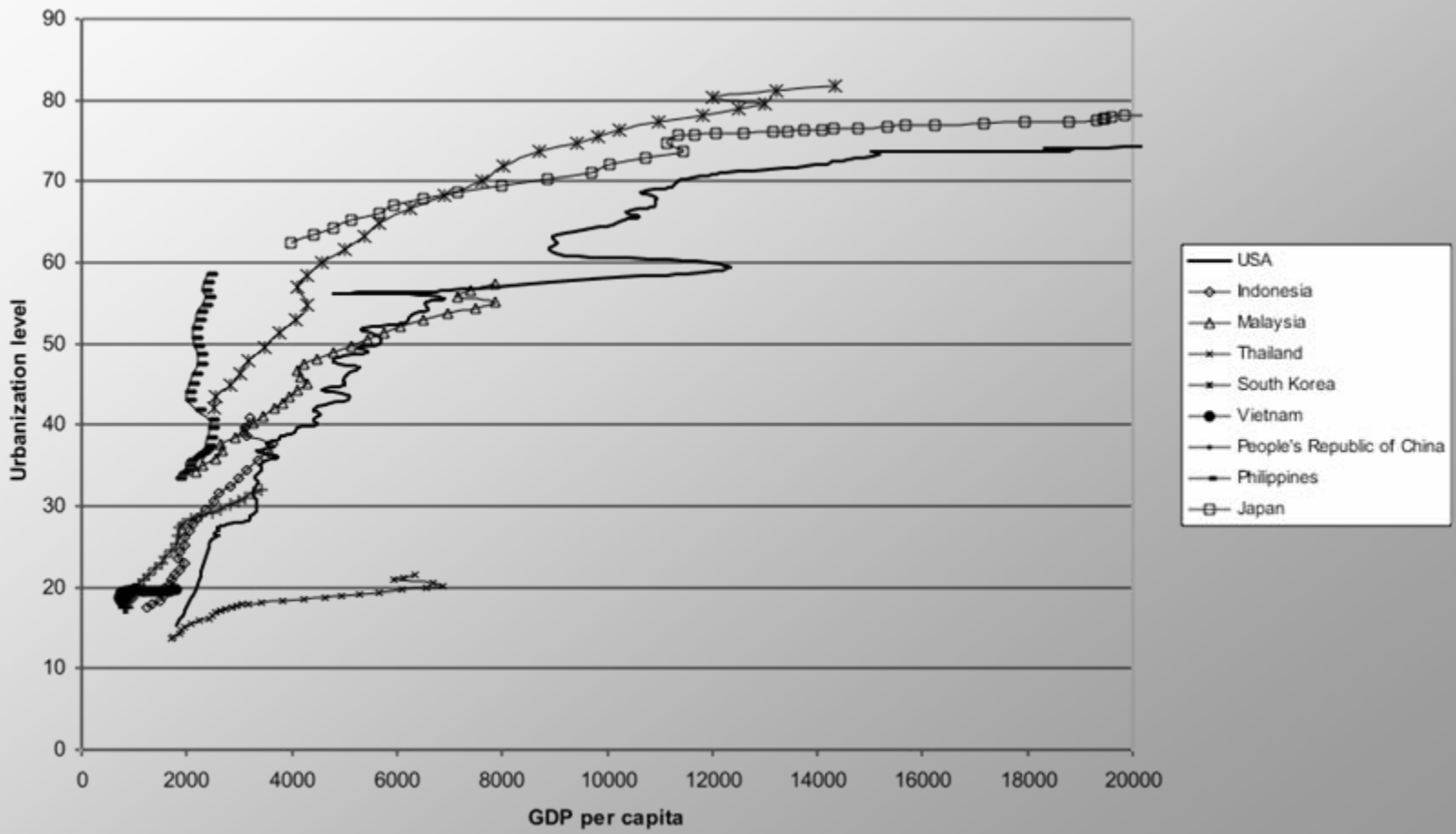
Comparative impacts of Globalization in the Asia Pacific

- Globalization has impacted urban development in the Asia Pacific in following 4 ways:
  - Widening: changes in SESs are being experienced sooner (at lower levels of GDP per capita or lower urbanization levels) than in the past
  - Deepening: the extent of impact of social sphere on biophysical sphere in some cases is less intensive per capita, but potentially larger in absolute value and in other cases larger in impact per capita
  - Speeding up: the speed of SESs change is more rapid than previously experienced;
  - Speeding up: previously experienced sequential patterns associated with impact-responses are now experienced more simultaneously

Comparative widening

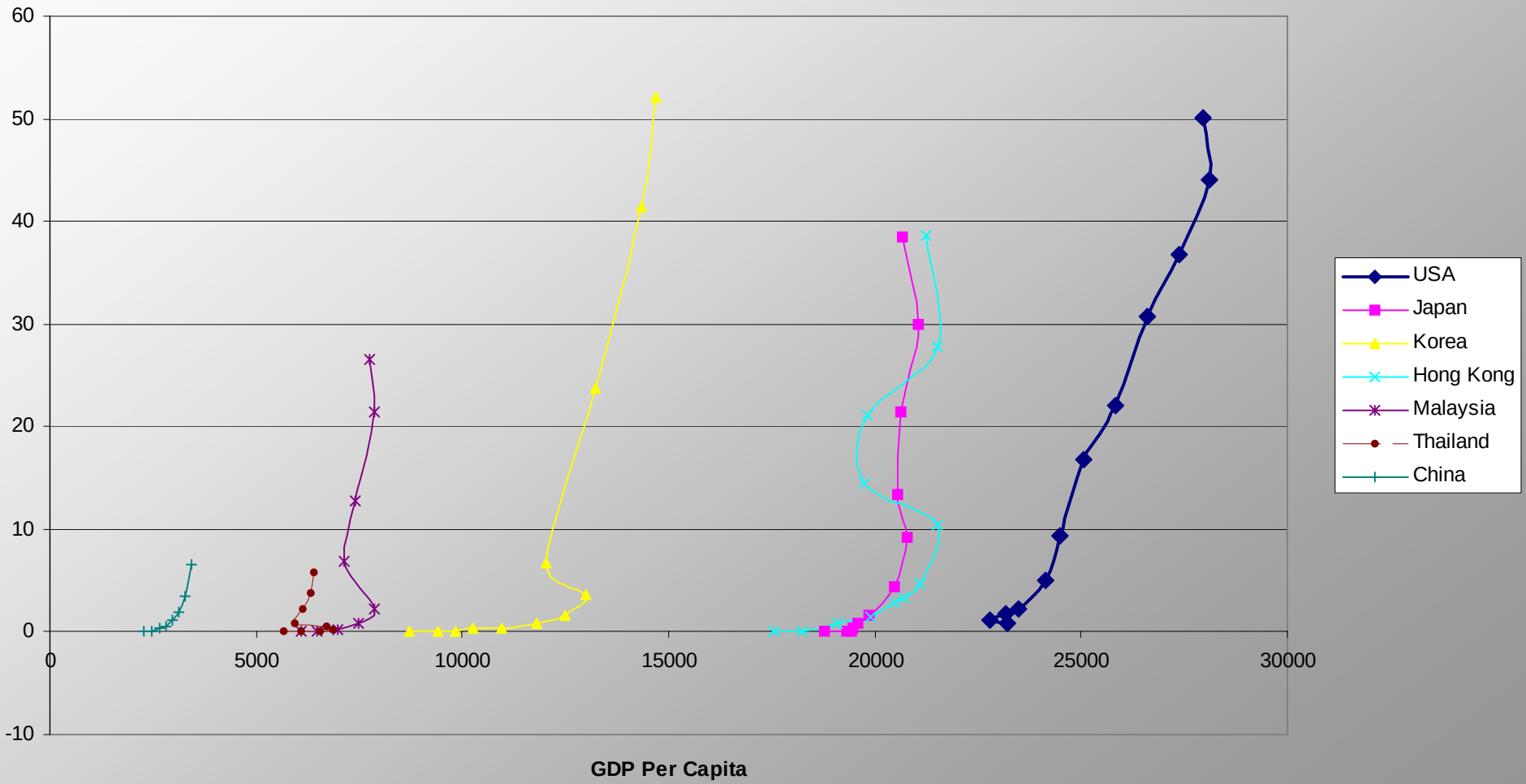
- Some changes within urban regions of the Asia Pacific are being experienced at lower economic or urbanization levels than in the past
  - Major development patterns, such as urbanization, are occurring at lower levels of income
  - Technologies are diffusing at lower levels of income
  - Ecological degradation, such as transportation CO2 emissions, is occurring at lower levels of income
  - Shifts in energy sources are occurring at lower levels of urbanization

Comparative changes in urbanization levels: USA and selected Asian economies

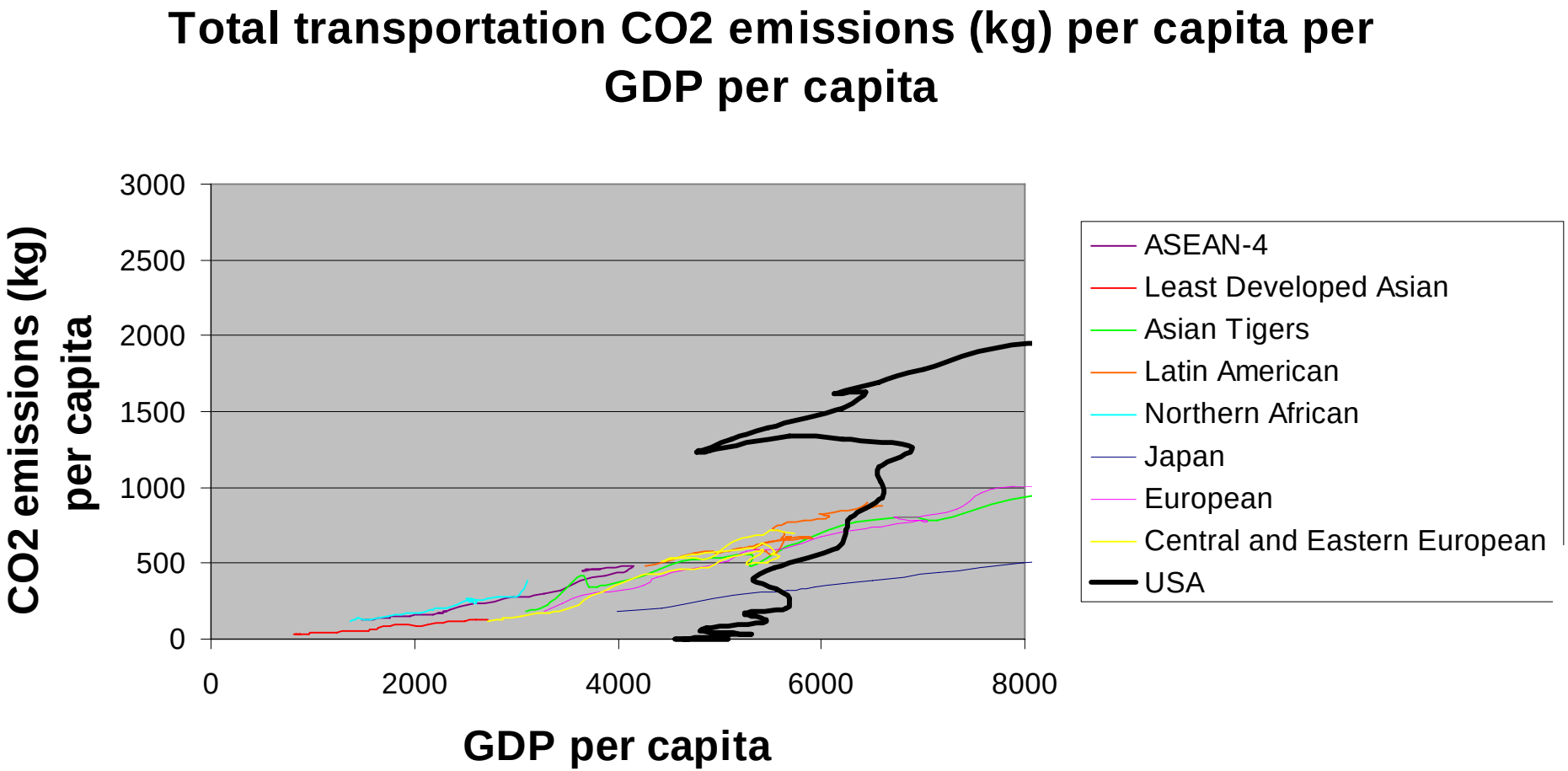


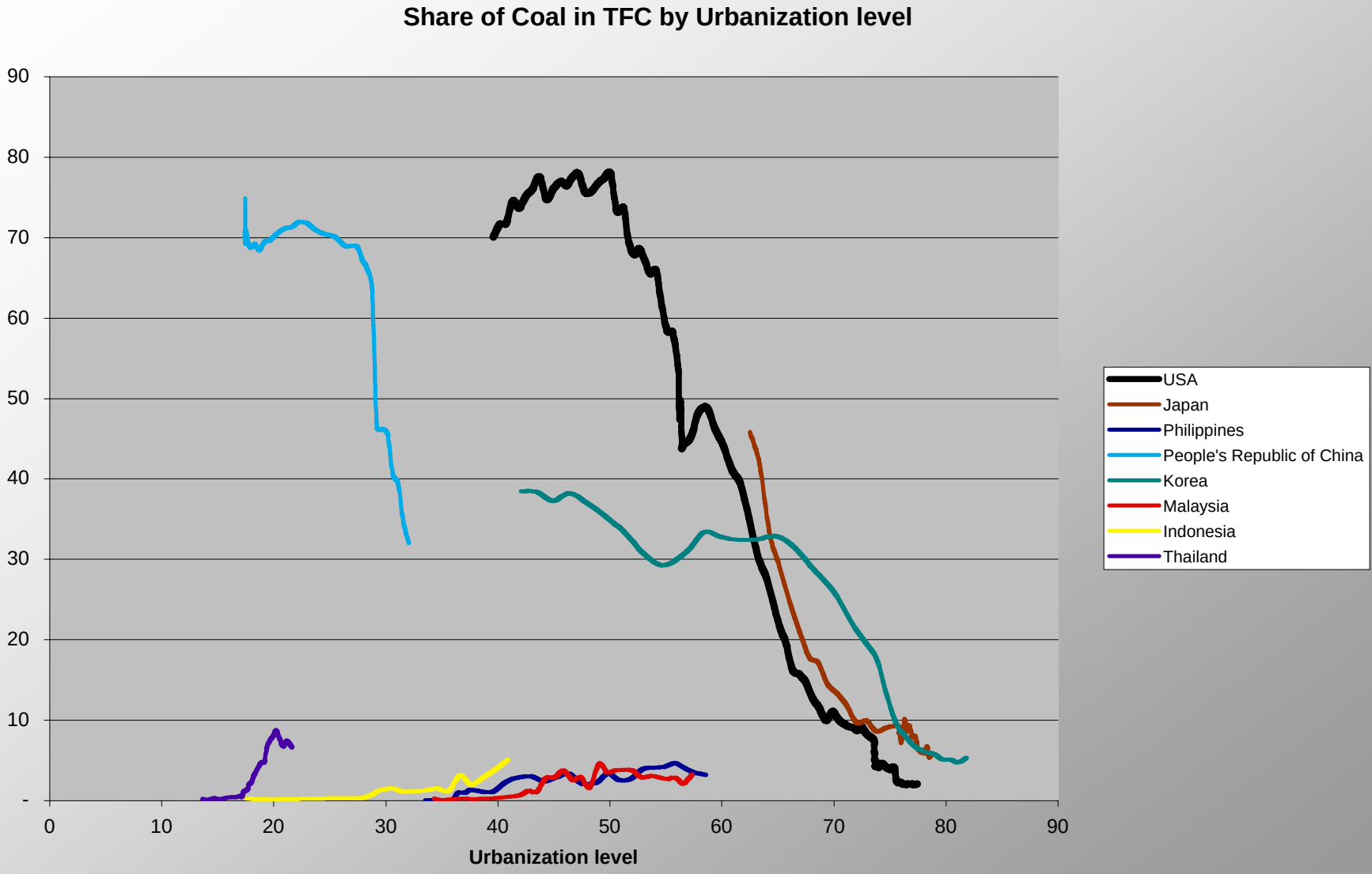
Technological Diffusion

Comparison of Growth in ICT (Internet) Penetration by National GDP per capita



Comparative emergence of transportation CO2 emissions

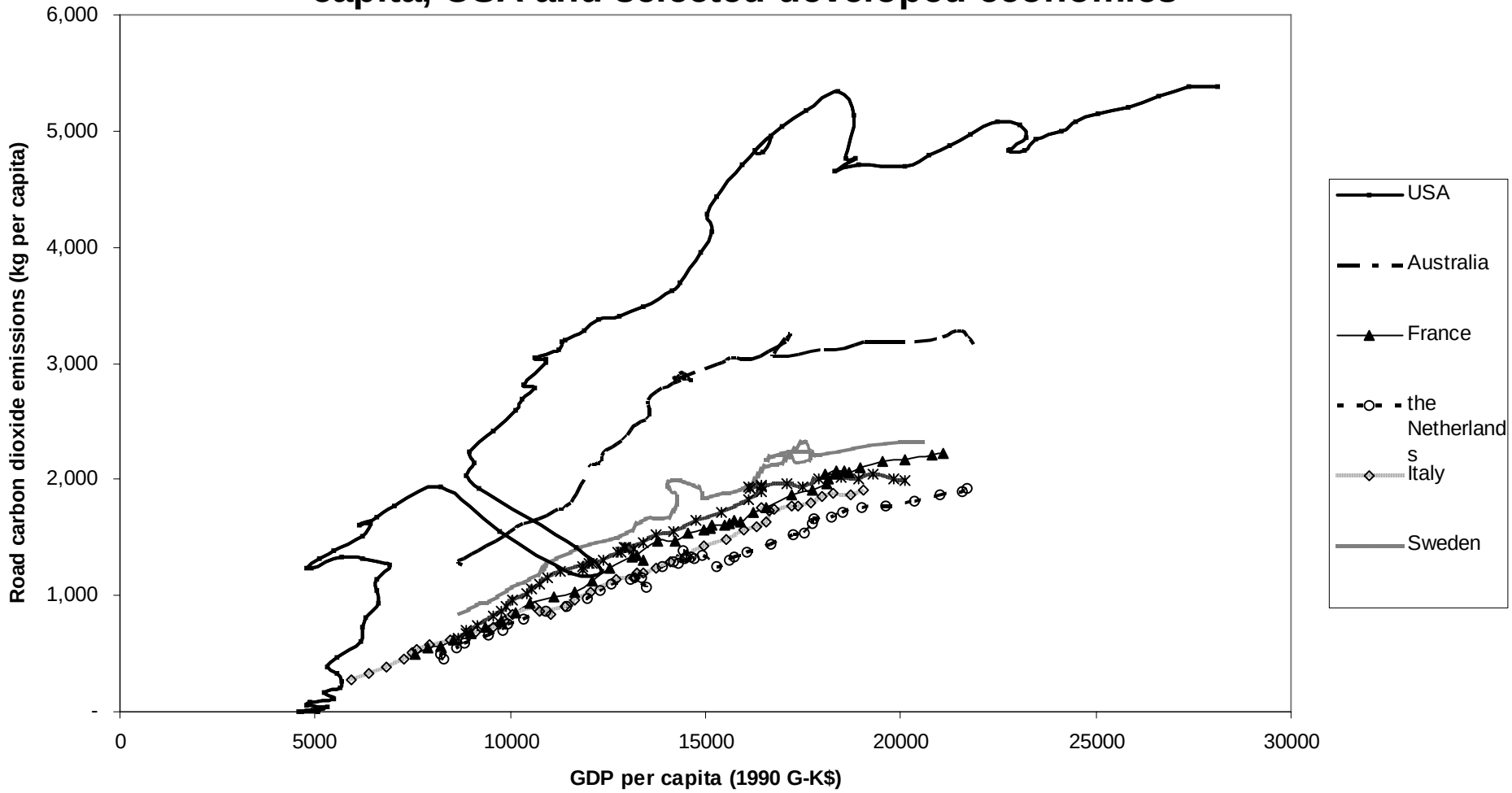



Share of Coal in TFC by Urbanization level
90
80
70
60
50
40
30
20
10
-
0
10
20
30
40
50
60
70
80
90
Urbanization level
USA
Japan
Philippines
People's Republic of China
Korea
Malaysia
Indonesia
Thailand

Comparative deepening

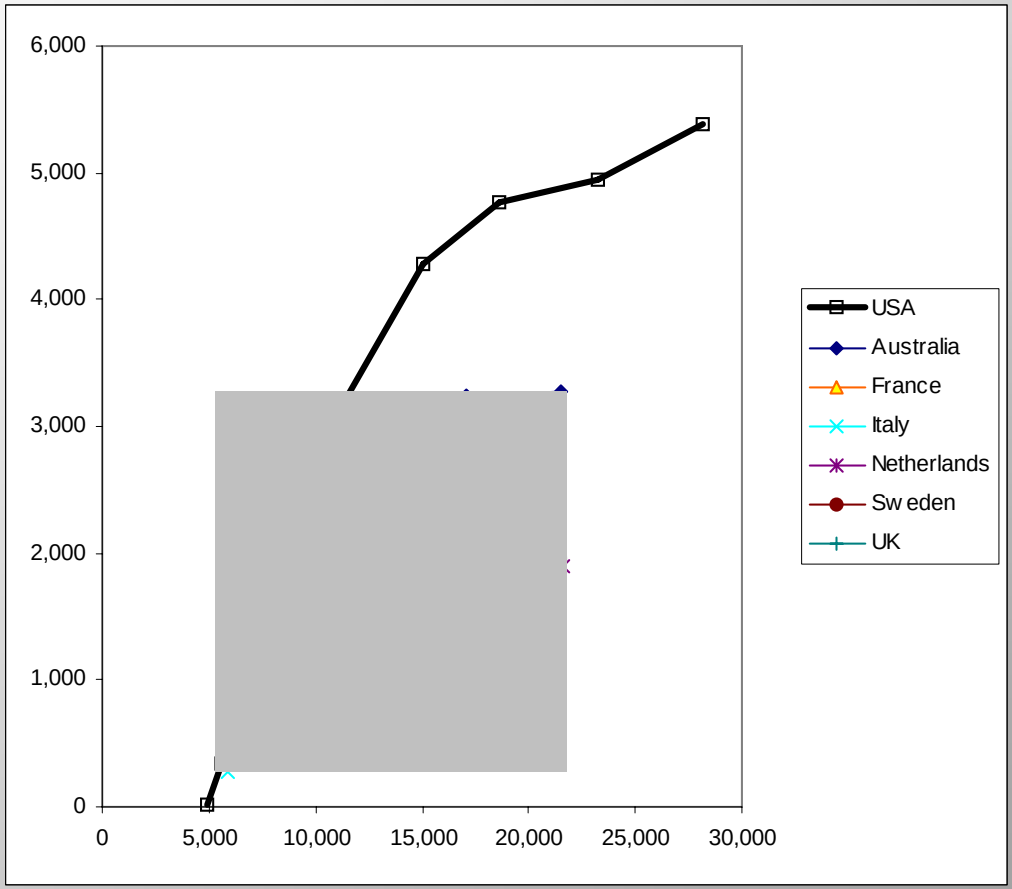
- For some impacts changes are less intensive per capita, but potentially larger in absolute value. For other impacts changes are more intensive per capita;
  - For some nations in the region transportation-related CO_2 emissions are lower then previously experienced
  - Total CO2 emissions per capita are lower than some developed countries at all levels of GDP
  - Consumption is higher per capita for some ecosystem goods and services

Figure 2: Road carbon dioxide emissions per capita by GDP per capita, USA and selected developed economies



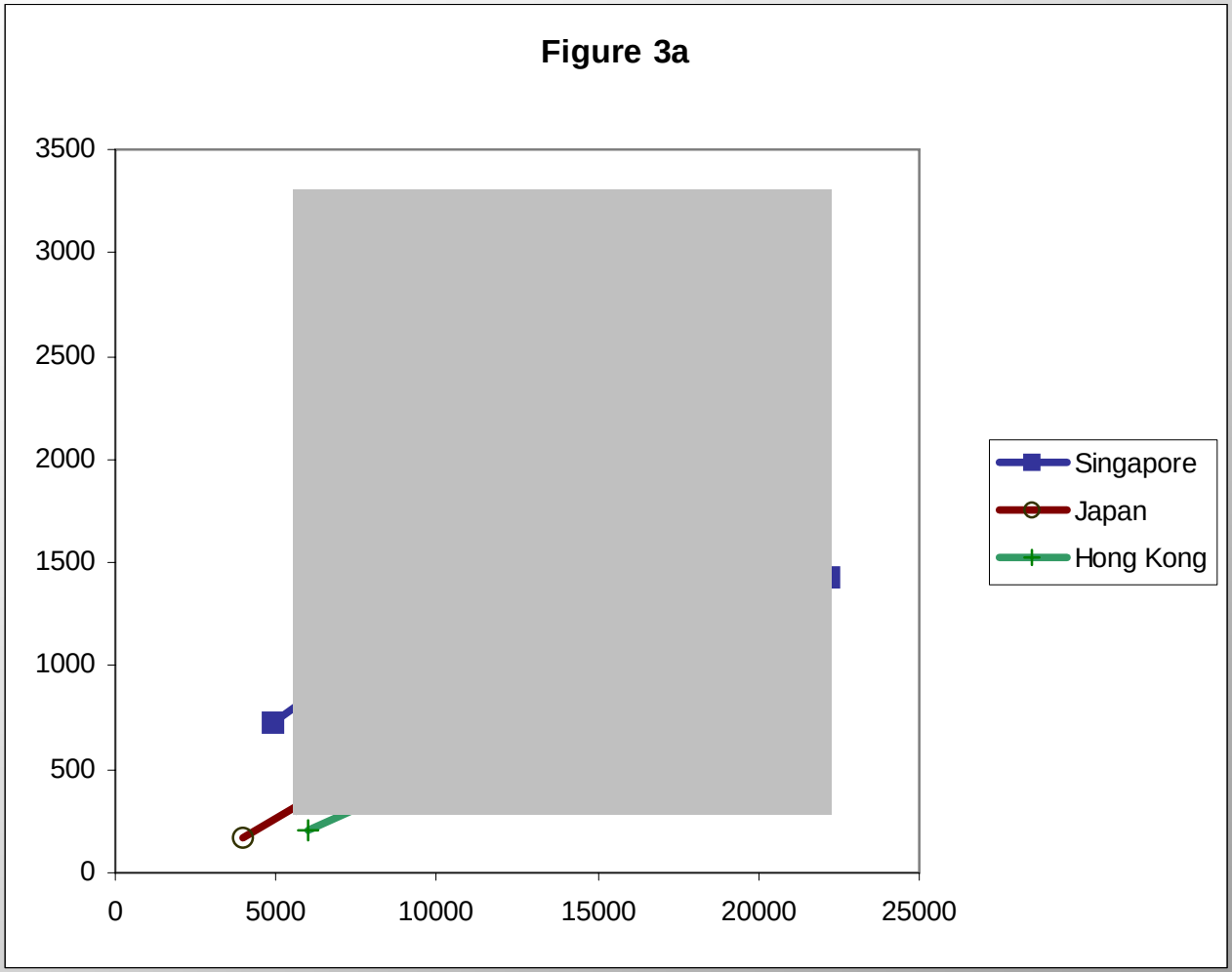
Source: Marcotullio 2006

Simplified chart of comparative developed economy trends with shaded area between the Netherlands and Australian curves



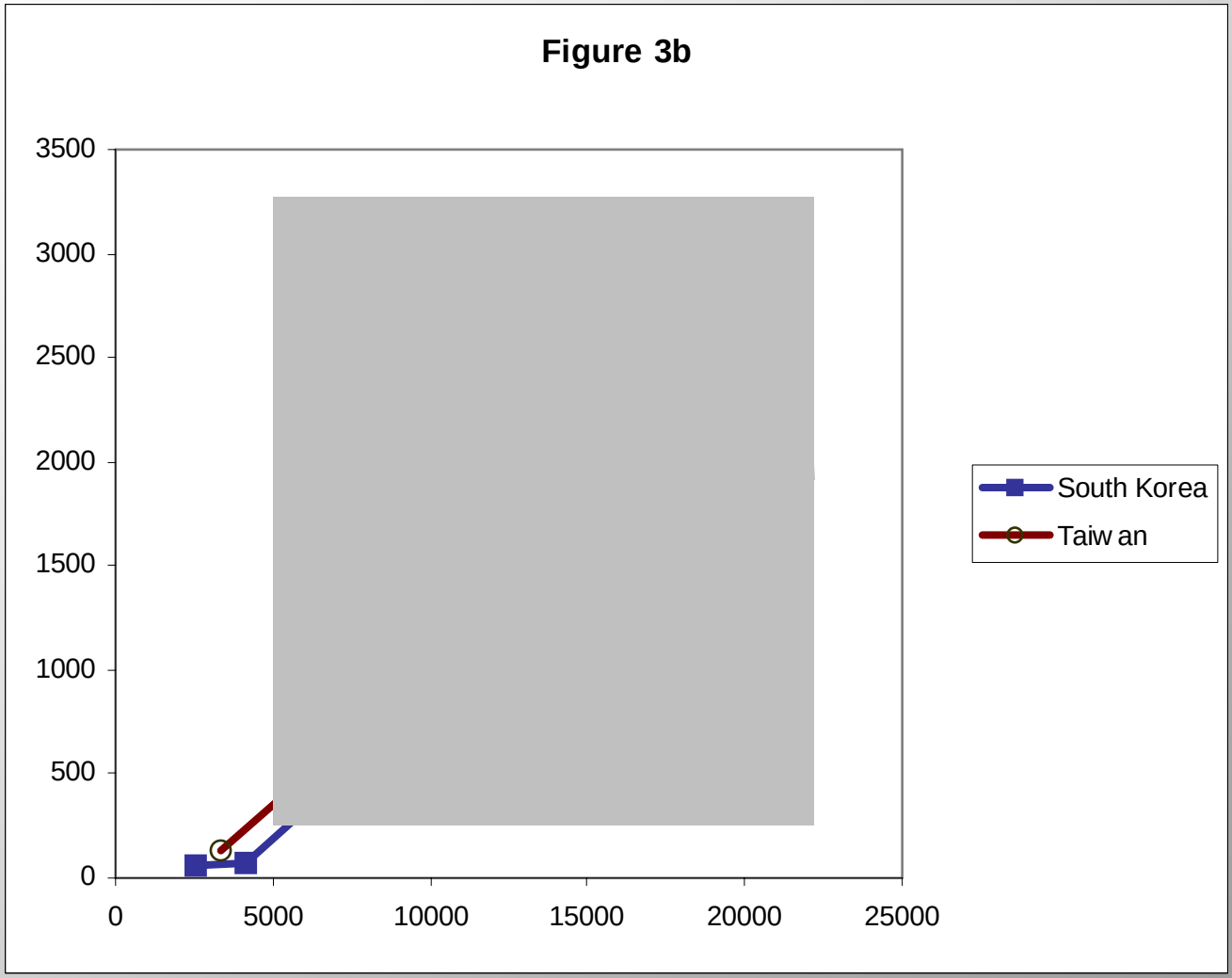
Source: Marcotullio and Marshall 2007

Group A – low emitters



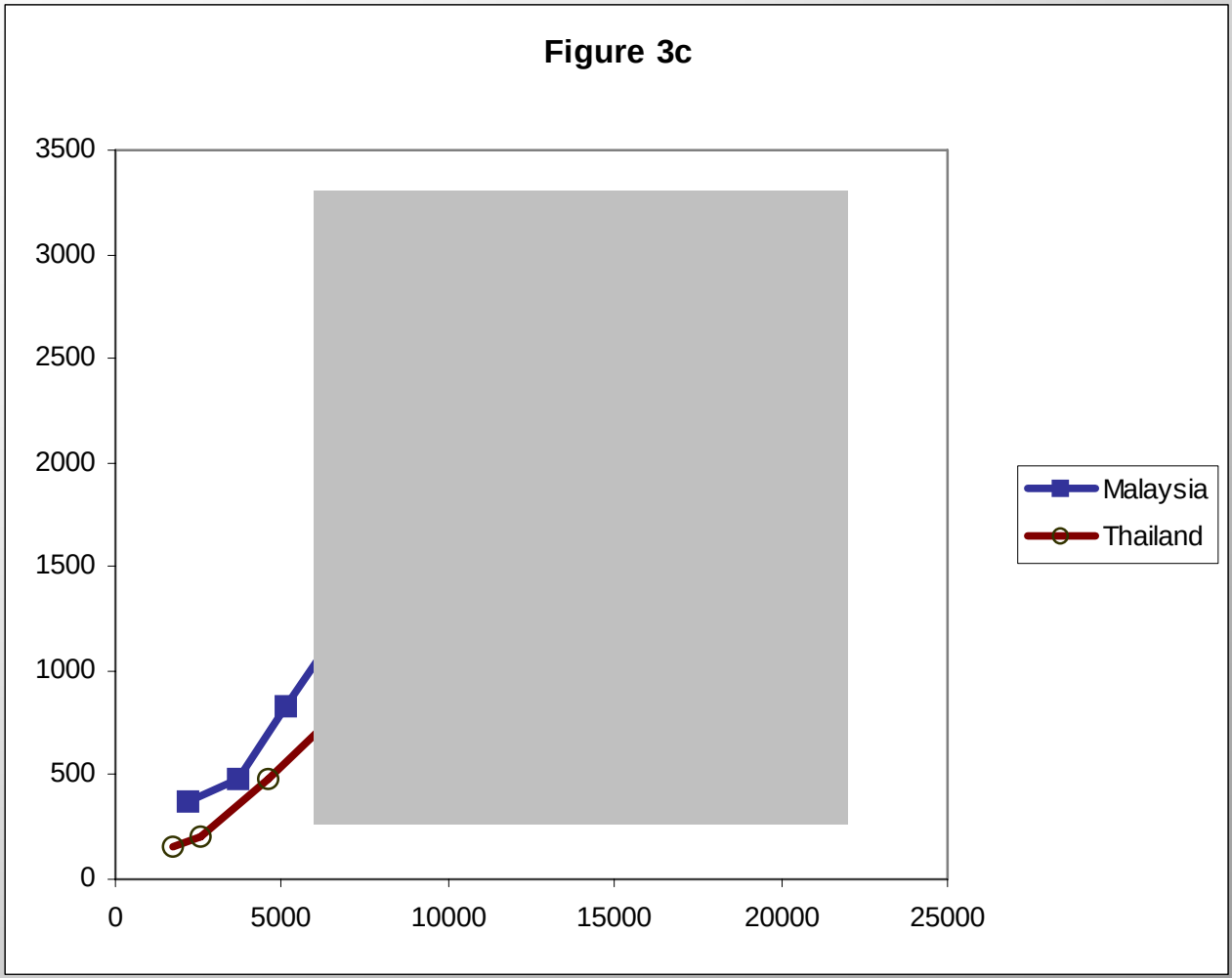
Source: Marcotullio and Marshall 2007

Group B – medium emitters



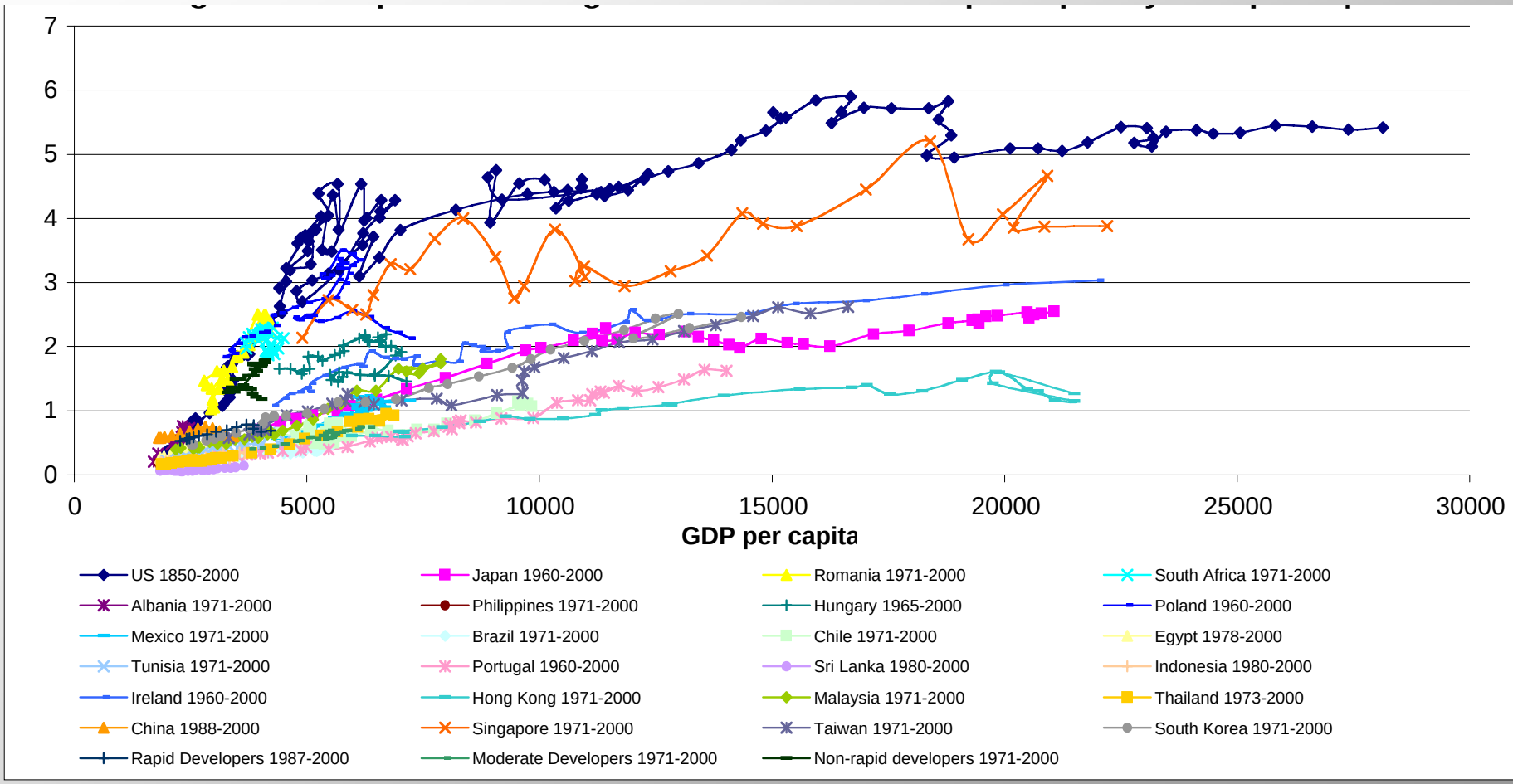
Source: Marcotullio and Marshall 2007

Group C – high emitters



Source: Marcotullio and Marshall 2007

Comparative changes in CO2 emissions per capita by GDP



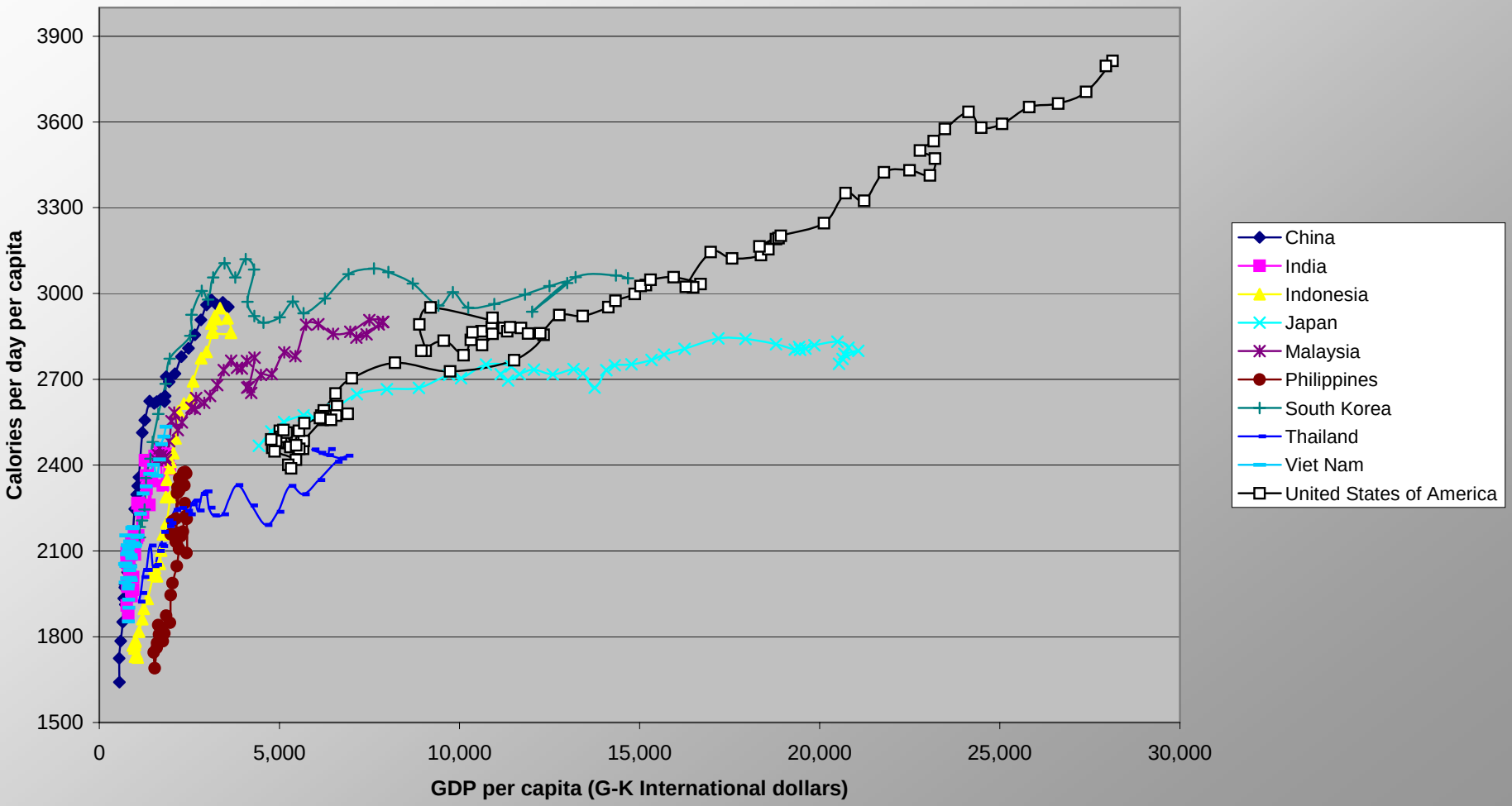
Source: Marcotullio and Schulz 2007

Cumulative impact may be larger

Between now and 2030, a predicted additional 600 million people in developing countries will become middle class bringing the total population in these regions to 1 billion;

By 2040, consumption of motor vehicles in China and India alone is predicted to match total global figures of today (800 million vehicles in use) (Goldman Saks, 2005, *The Economist*, 2006);

Average Daily Consumption per Capita by GDP



Comparative speeding up

- Changes are more rapid than previously experienced;
  - Speed of urbanization is faster in many Asia Pacific nations when compared to the developed world
  - Growth in energy supply is faster

Comparative speed of urbanization: USA and selected Asian economies

Comparative change in urbanization level at similar income ranges (percent/year)

		USA
South Korea	1.46	0.49
China	0.51	0.47
Thailand	0.24	0.51
Malaysia	0.79	0.50
Indonesia	0.94	0.47
Philippines	0.92	0.49
Japan*	0.87	0.47

*For this analysis, Japanese data includes the range 1920-2000
In 1960, the year that the energy data begin, Japan was approximately 63 percent urbanized.

Source: Marcotullio and Schulz 2008

Comparison in speed of increases in energy supply: USA and selected Asian economies

Changes in supply over similar income ranges (koe/capita/year)

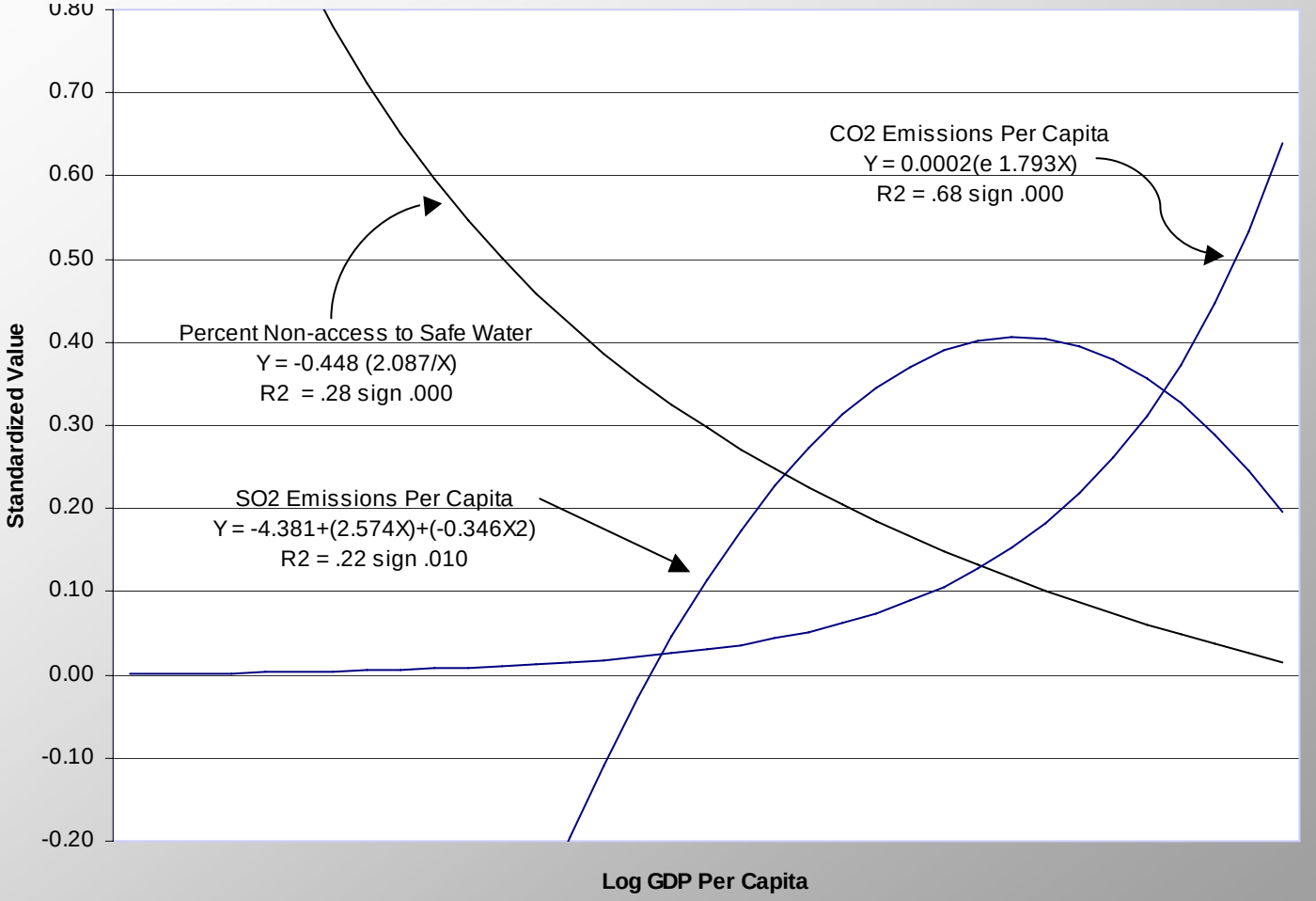
	Change in TPES	USA Change in TPES
South Korea	124.27	43.59
Singapore	187.21	58.55
China	17.12	11.08
Thailand	32.07	33.18
Malaysia	61.24	36.90
Hong Kong	59.45	75.94
Indonesia	15.53	11.28
Philippines	5.10	-5.49
Japan	76.29	57.67

Source: Marcotullio and Schulz 2007

Comparative speeding up: timing of impacts

- Previously experienced sequential development patterns are now experienced simultaneously
    - Sets of multi-scale environmental conditions within urban populations of different income in the region
    - Multi-scale urban water related conditions in Southeast Asia

Current Situation
Urban Environmental Transitions



Source: Marcotullio and Lee, 2003

Estimated Urban Population Living Under Different Environmental Conditions

1995 GDP Category (US$)	Environmental Challenge	Total Urban Population (thousands) (N)	Share of Total (%)
< 467.74	Lack of Water and Sanitation ("brown" issues)	456,985	17.8
> 467.75 and < 1,071.52	Rising Industrial pollution ("gray" issues), and significant "brown" issues	518,812	20.3
> 1,071.53 and < 3,981.07	High "grey" issues, rising modern risks ("green" issues) and "brown" issues	526,315	20.6
> 3,981.08 and < 14,125.3	High but decreasing "gray" issues, rising "green" issues	296,993	11.6
> 14,125.3	Largely "green" issues	613,480	24.0
Missing		147,610	5.8
Total global urban population		2,560,195	

Source: Marcotullio and Lee, 2003

Sets of urban water related issues by scale within urban regions of ASEAN

City	Local	Metro-wide	Regional and global
Low-income cities			
	Low levels water supply coverage Low levels of sanitation coverage Poor drainage	River and coastal water pollution Overdrawn groundwater Subsistence Coastal area degradation Flooding	Economic water scarcity Vulnerability due to climate change
Middle-income cities			
	Low levels of water supply coverage Low levels of sanitation coverage Poor drainage	River and coastal water pollution Overdrawn groundwater Subsistence Coastal area degradation Flooding	Economic water scarcity Vulnerability due to climate change
Upper-middle income cities			
	Low levels to incomplete sanitation coverage Water supply coverage not complete poor to inadequate drainage	River and coastal water pollution Overdrawn groundwater Subsistence Coastal area degradation Flooding	Increasing water consumption per capita Vulnerability due to climate change
High income cities			
		River and coastal water pollution Coastal area degradation	Physical water scarcity Increasing water consumption per capita Vulnerability due to climate change

Notes:
Cities in low income category include Vientiane, Phnom Phen, Hanoi, Ho Chi Minh, among others
Cities in the middle income category include Manila, Jakarta, among others
Cities in the upper-middle income category include Bangkok, Kuala Lumpur, among others
Cities in the high income category include Singapore

Conclusions

- Globalization, at least at a theoretical level, is implicated in the structural differences between rapidly developing and developed world experiences with environmental conditions

- Widening, deepening and speeding up have underpinned increasingly diverse phenomena located in increasingly centralized nodes (cities) and altered time-space dynamics;

Conclusions

- While there is some evidence for the sooner (at lower levels of income and urbanization), faster (over time) and more simultaneous experiences of socio-ecological conditions, the impacts of these seemingly chaotic conditions have been both a lowering of levels of per capita impact in some areas (i.e., transportation CO2 emissions, energy consumption) and an increasing impact in other areas (i.e., ecosystem service consumption)

Conclusions

- The differences between these two results may be due to both the advantages of technology and public policy. In the rapidly developing world transportation emissions reductions have been due to a *combination* of motor vehicle reduction or control policies and the diffusion of low fuel consumption technologies;

- In the areas where there is higher impact, there is less or no policies;

Conclusions

- These broad observations demonstrate differences dependent upon the data sources (UN DESA, IEA, OECD, US Census, etc) and therefore require further exploration at both the global and regional scale and through local scale case study comparisons

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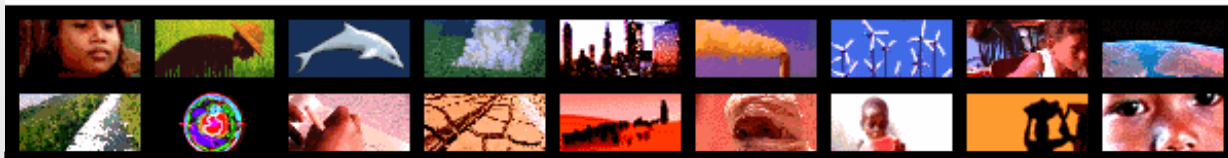

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The End