

BRAZIL



*Itaipu Dam, currently, the largest operational hydroelectric power plant in the world.
Foz do Iguaçu, Brazil*

Photo credit: Marcus Almeida for O Ministério de Minas e Energia do Brasil

ENERGY INTENSITY

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Relationship to Environment

Key concept

Importance of understanding

Literacy: Tools

Literacy: economic and environmental impacts

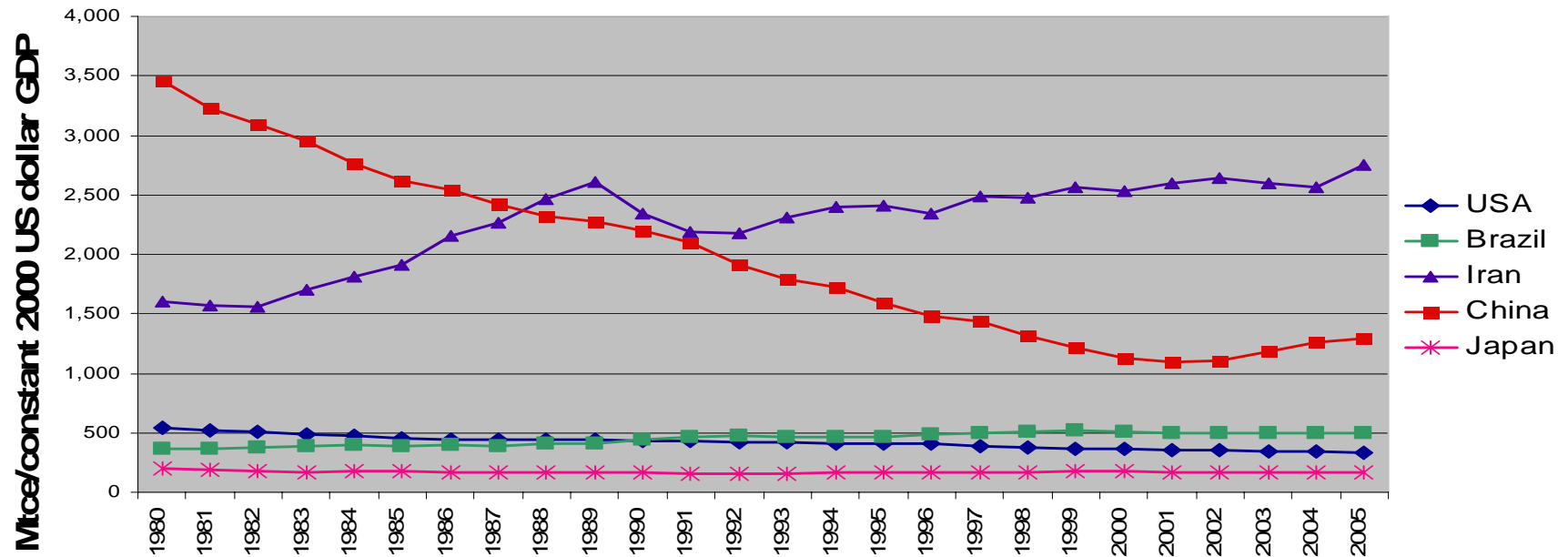
ENERGY INTENSITY

KEY CONCEPT

Energy Intensity = Energy Consumption per Unit of Output

ENERGY-INTENSITY CHALLENGES

SELECTED COUNTRIES, 1980-2006



Notes: (1) GDP = gross domestic product, measured in 2000 US dollars using market exchange rates

(2) Mtce = Million (metric) tons of coal equivalent.

(3) Units of energy consumption were converted from British thermal units to Mtce (1 Btu = .036 Mtce)

Source: Compiled by the Multiregional Planning Research Team from Energy Information Administration (2007) data.

REGIONAL ENERGY INTENSITY

DIFFERENCES ACROSS COUNTRIES

BRAZIL (NATIONAL AND REGIONAL)

CHINA (NATIONAL AND REGIONAL)

INDIA (NATIONAL)

IRAN (NATIONAL)

UNITED STATES (NATIONAL AND REGIONAL)

IMPORTANCE OF UNDERSTANDING REGIONAL ENERGY INTENSITY

- **HUGE DISCREPANCIES AMONG COUNTRIES**

Brazil is large user of renewables and petroleum

China is large user of coal

France is large user of nuclear

Iran is large user of petroleum

United States is large user of coal and petroleum

- **HOW TO DETERMINE ENERGY POLICIES
RELATED TO CLIMATE CHANGE,
TRANSPORTATION, AND EMPLOYMENT**

ENERGY CONSUMPTION BY TYPE, BRAZIL, 1971-2004

		Percentage of Total Energy Consumption					
Year	National Energy Consumption (1,000 toe)	Coal	Petroleum	Renewables and waste	Natural Gas	Hydro	Total
1971	62,919	1.2	39.2	53.6	0.2	5.8	100.0
1975	80,235	1.3	48.8	42.2	0.5	7.2	100.0
1980	96,660	2.3	51.0	35.2	0.9	10.5	100.0
1985	103,200	4.0	43.6	36.9	1.6	13.9	100.0
1990	113,235	3.3	47.3	31.3	2.1	16.0	100.0
1995	131,507	3.7	50.0	27.3	2.3	16.8	100.0
2000	157,050	3.7	51.8	24.0	3.1	17.5	100.0
2004	172,195	4.1	46.2	27.3	5.1	17.3	100.0

TOE = tonnes of oil equivalent.

Source: International Energy Agency. Energy Balances of Non-OECD Member Countries.

ENERGY CONSUMPTION BY TYPE IN CHINA, 1978-2005

Year	Energy Consumption (million tonnes SCE)	Percentage of Total Energy Consumption				
		Coal	Crude Oil	Natural Gas	Hydro	Total
1978	571	70.7	22.7	3.2	3.4	100.0
1980	603	72.2	20.7	3.1	4.0	100.0
1985	767	75.8	17.1	2.2	4.9	100.0
1990	987	76.2	16.6	2.1	5.1	100.0
1995	1,312	74.6	17.5	1.8	6.1	100.0
2000	1,386	67.8	23.2	2.4	6.7	100.0
2005	2,233	68.9	21.0	2.9	7.2	100.0

SCE: Standard Coal Equivalent. Source: *China Statistical Yearbook, 2006*.

IMPORTANCE OF UNDERSTANDING REGIONAL ENERGY INTENSITY

HUGE DISCREPANCIES AMONG REGIONS

US West Coast large hydroelectric consumption

US Midwest mainly coal consumption

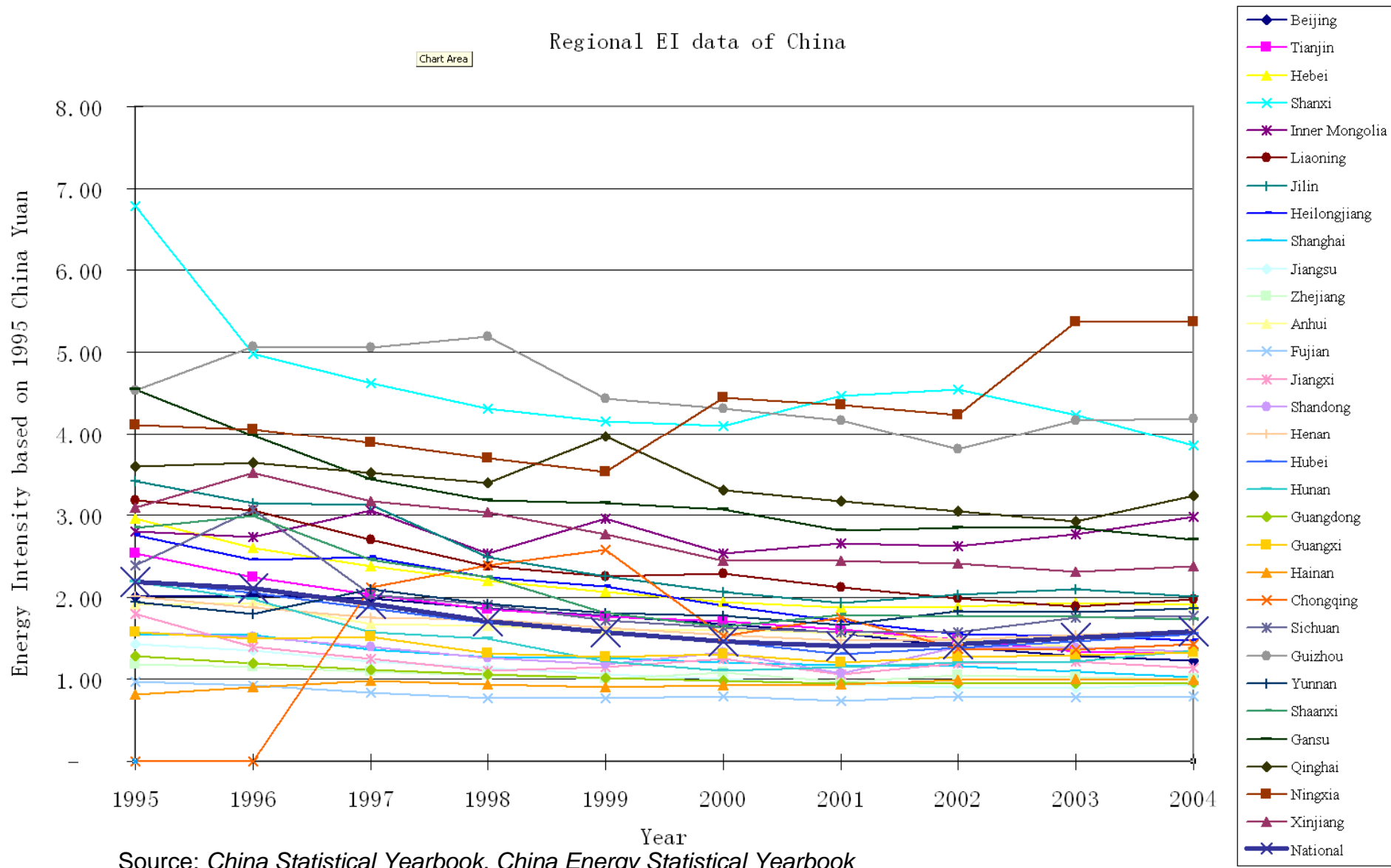
North Brazil—sugarcane for ethanol produced manually

South Brazil—sugarcane for ethanol produced mechanically

EFFECTS ON CLIMATE CHANGE

REGIONAL ENERGY INTENSITIES

Regional EI data of China



IMPORTANCE OF UNDERSTANDING REGIONAL ENERGY INTENSITY

HUGE DISCREPANCIES AMONG SECTORS

Transportation and construction are most energy intensive

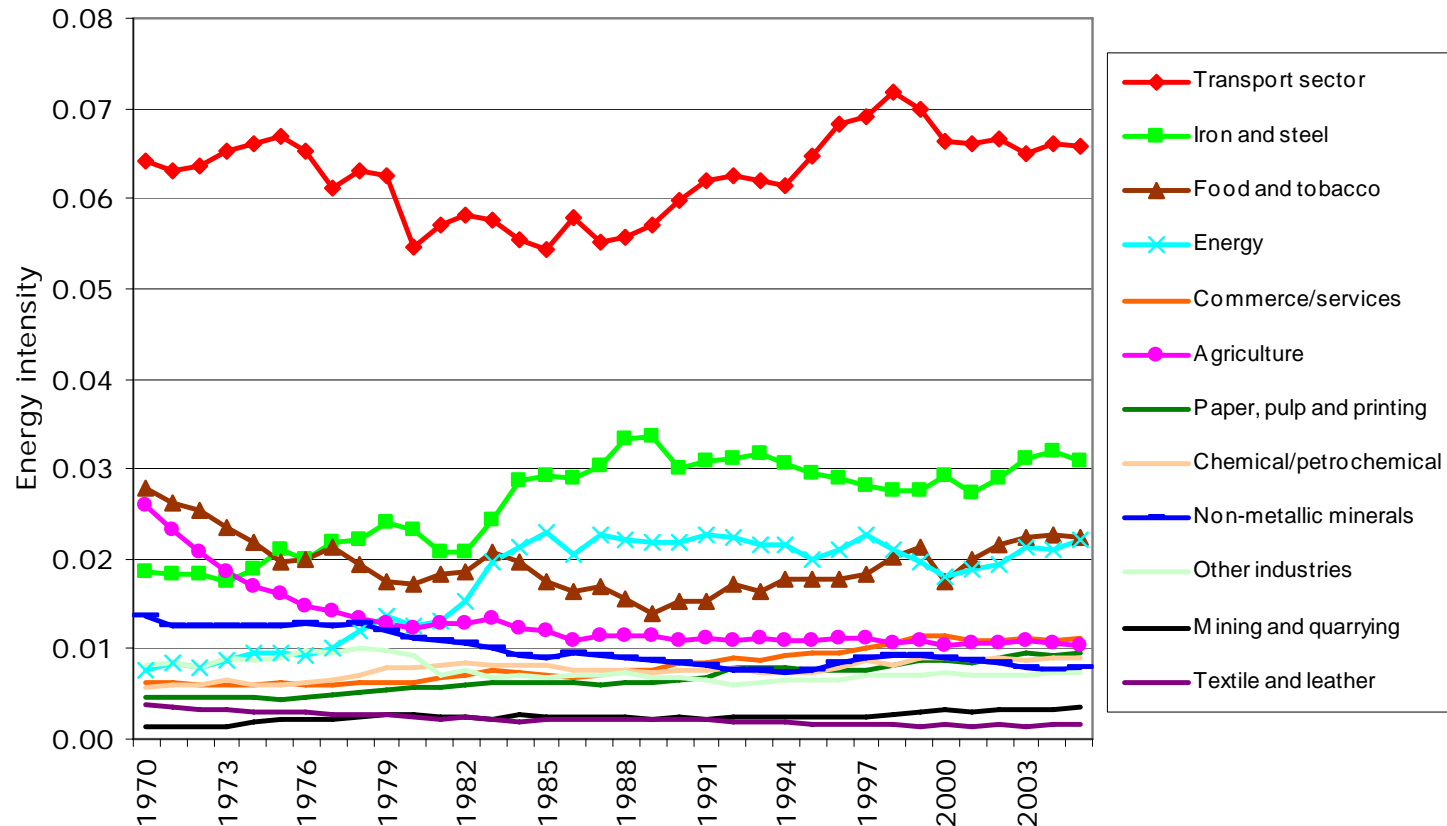
Direct energy consumption

Indirect energy consumption

Induced energy consumption

ENERGY INTENSITY BY SECTOR, BRAZIL, 1970-2005

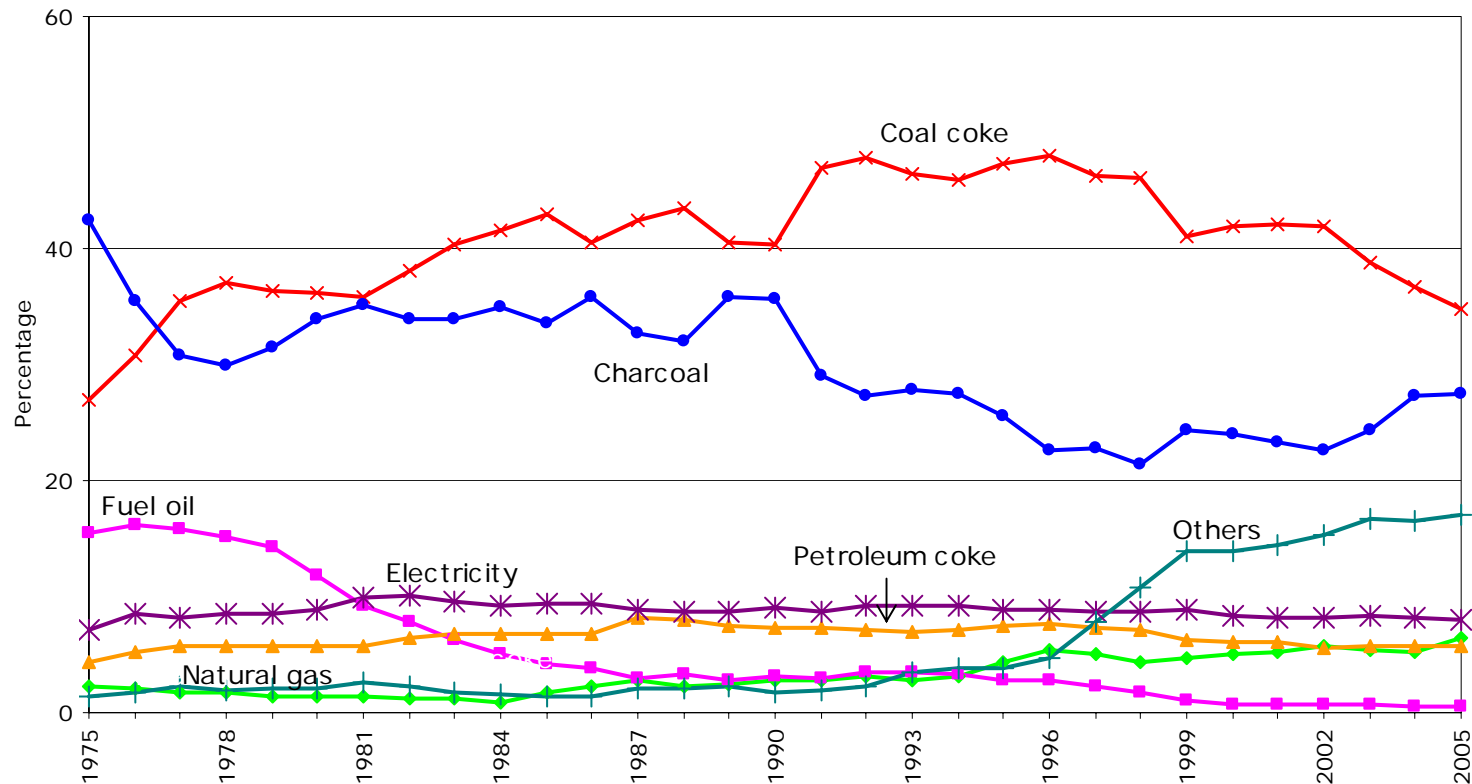
Energy intensity (toe/GDP—thousands of 2005 US dollars)



TOE = tonnes of oil equivalent; GDP = gross domestic product.
Source: Ministry of Mining and Energy (Brazil).

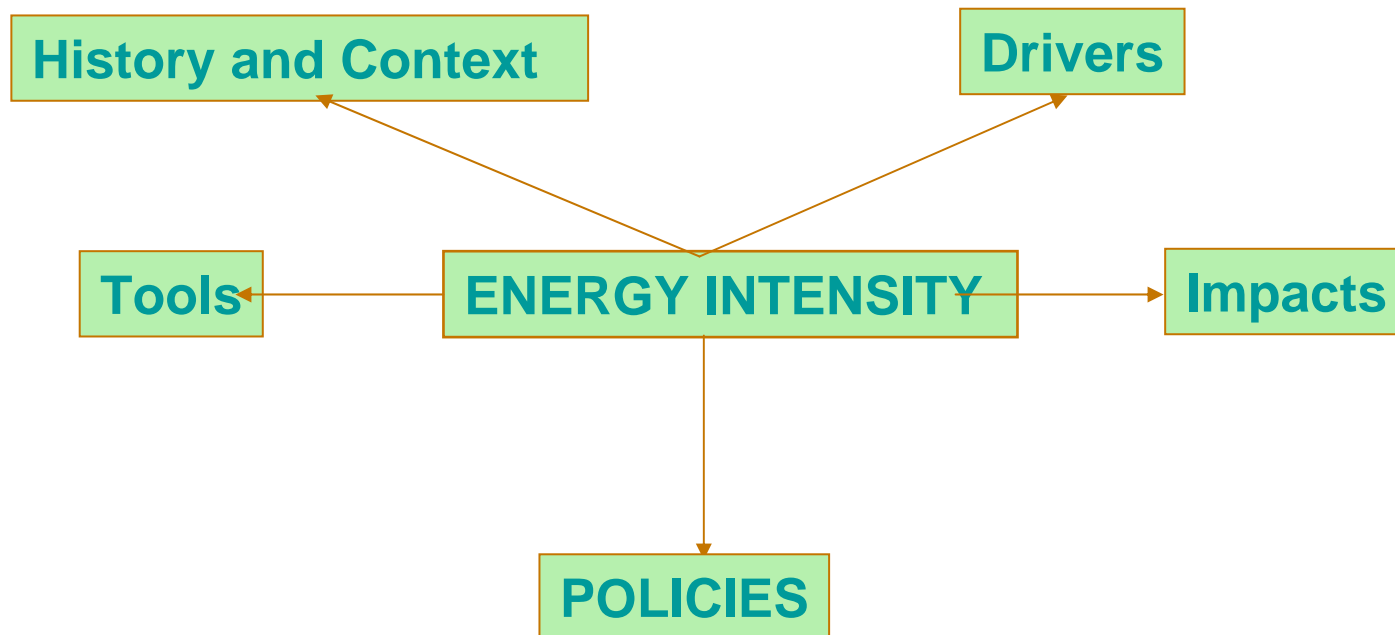
IRON AND STEEL SECTOR, BRAZIL, CONSUMPTION STRUCTURE, 1975-2005,

Percentage of energy consumption by fuel



Source: Ministry of Mining and Energy (Brazil).

LITERACY IN ENERGY INTENSITY



LITERACY--TOOLS

- CASE STUDIES
- COMPUTABLE GENERAL EQUILIBRIUM MODELS
- ECONOMETRIC METHODS
- INPUT-OUTPUT MODELS
- LIFE-CYCLE ANALYSES
- SIMULATION ANALYSES

LITERACY—IMPACTS

- JOBS
- INCOME
- ENVIRONMENTAL
- OTHER