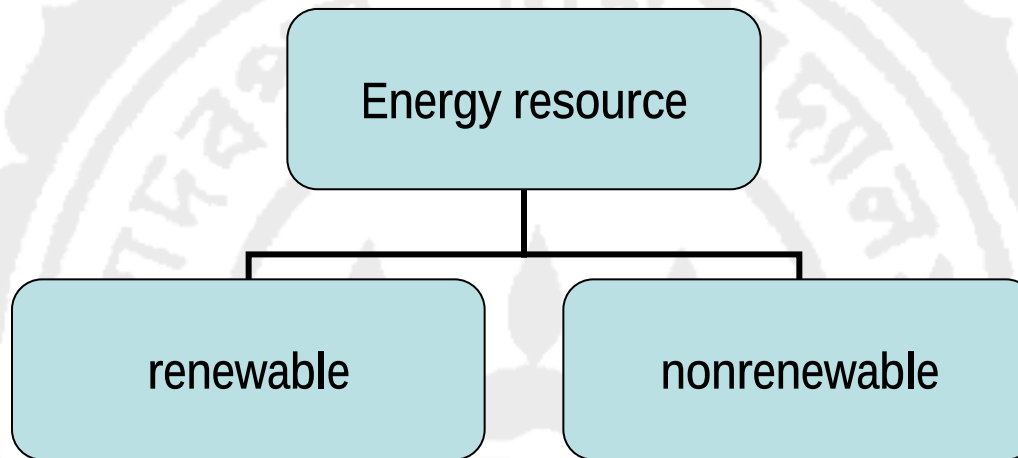




Energy Resource

Types of Energy Resource



Positive natural rate of growth

flow of energy

eg: hydro power, solar, wind,
geothermal

No positive natural growth within finite
time period

stock of energy

eg: coal, oil, natural gas

Increasing Energy Demand

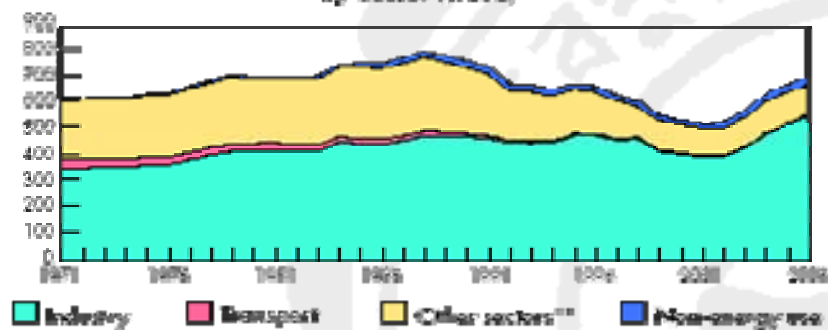
- ❑ global demand for primary fuels such as oil, natural gas, and coal will expand by 45% between 2006 and 2030
- ❑ average rate of growth of 1.6% per year
- ❑ vast majority of this growth will occur in developing countries, notably China
- ❑ global demand for oil will rise an average of 1% per year from 85 million barrels per day (mb/d) in 2007 to 106 mb/d in 2030

source: IEA's 2008 World Energy Outlook

Total Final Consumption by Sector

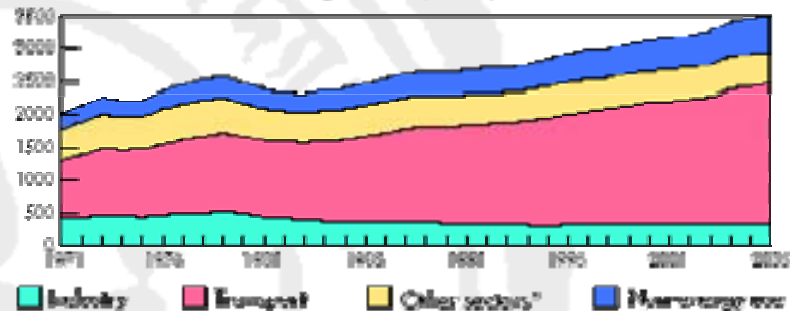
Coal*

Evolution from 1971 to 2006 of total final consumption by sector (Mtoe)



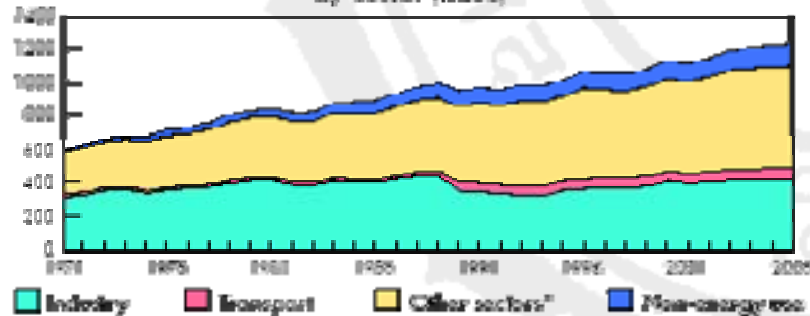
Oil

Evolution from 1971 to 2006 of total final consumption by sector (Mtoe)



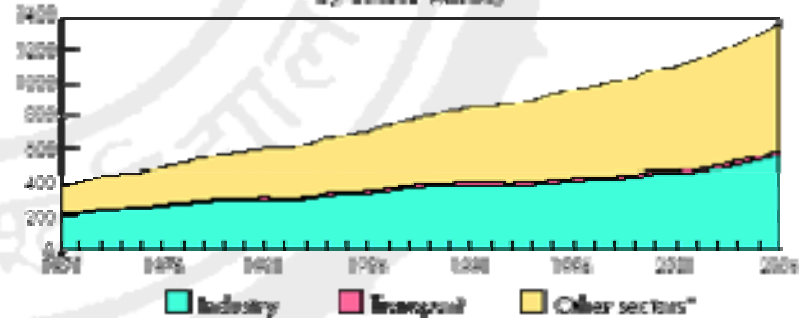
Gas

Evolution from 1971 to 2006 of total final consumption by sector (Mtoe)



Electricity

Evolution from 1971 to 2006 of total final consumption by sector (Mtoe)



Source: key world energy statistics 2008, IEA

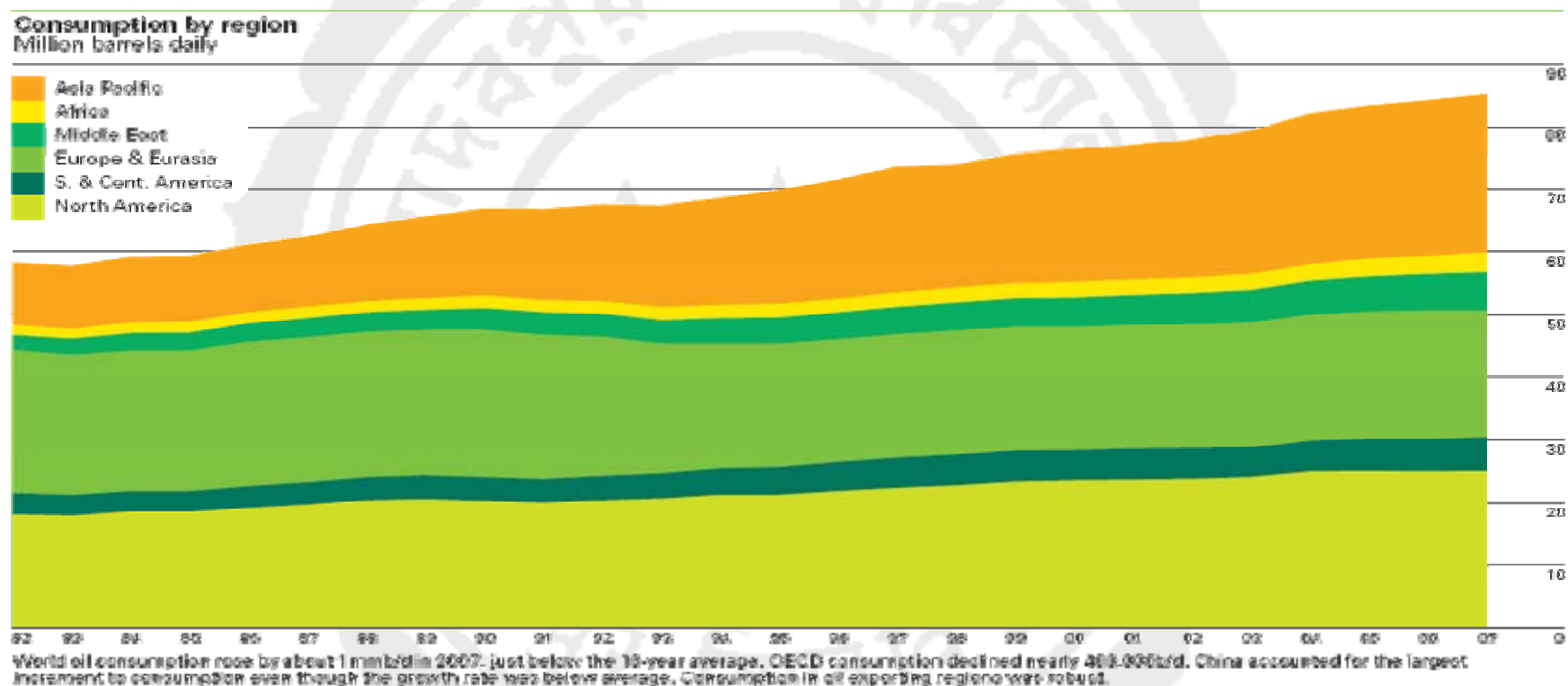
Selected Indicators for 2006

Region/ Country/ Economy	Popu- lation (million)	GDP (billion 2000\$)	GDP (PPP) (billion 2000\$)	Energy prod. (Mtoe)	Net imports (Mtoe)	TPES (Mtoe)	Elec. cons. ^(a) (TWh)	CO ₂ emissions ^(b) (Mt of CO ₂)
World	6536	37759	57564	11796	-	11740 ^(d)	17377	28003 ^(d)
OECD	1178	29169	31158	3842	1845	5537	9872	12874
Middle East	189	838	1456	1529	-990	523	599	1291
Former USSR	284	568	2266	1610	-577	1017	1274	2395
Non-OECD Europe	54	162	477	64	45	108	171	271
China	1319	2315	8916	1749	161	1897	2716	5648
Asia	2120	2139	7661	1187	176	1330	1414	2718
Latin America	455	1796	3425	704	-169	531	808	972
Africa	937	773	2207	1110	-489	614	522	854

Developed & Developing Countries

- ❑ Developing countries' share of fossil fuel consumption is currently small
- ❑ But given rapid population and economic growth it is expected to become 40% by 2020 (IEA, 1994)
- ❑ Average American uses 23 times the energy used by an average Indian (WRI, 2005)

Energy Consumption by Region



Source: key energy statistics, IEA

Energy Resources-Prof.J Roy

Indian Scenario: Key Indicators*

Population (million)	1,109.81
GDP (billion 2000 US\$)	703.33
GDP (PPP) (billion 2000 US\$)	3,671.20
Energy Production (Mtoe)	435.64
Net Imports (Mtoe)	134.83
TPES (Mtoe)	565.82
Electricity Consumption* (TWh)	557.97
CO2 Emissions ** (Mt of CO2)	1,249.74

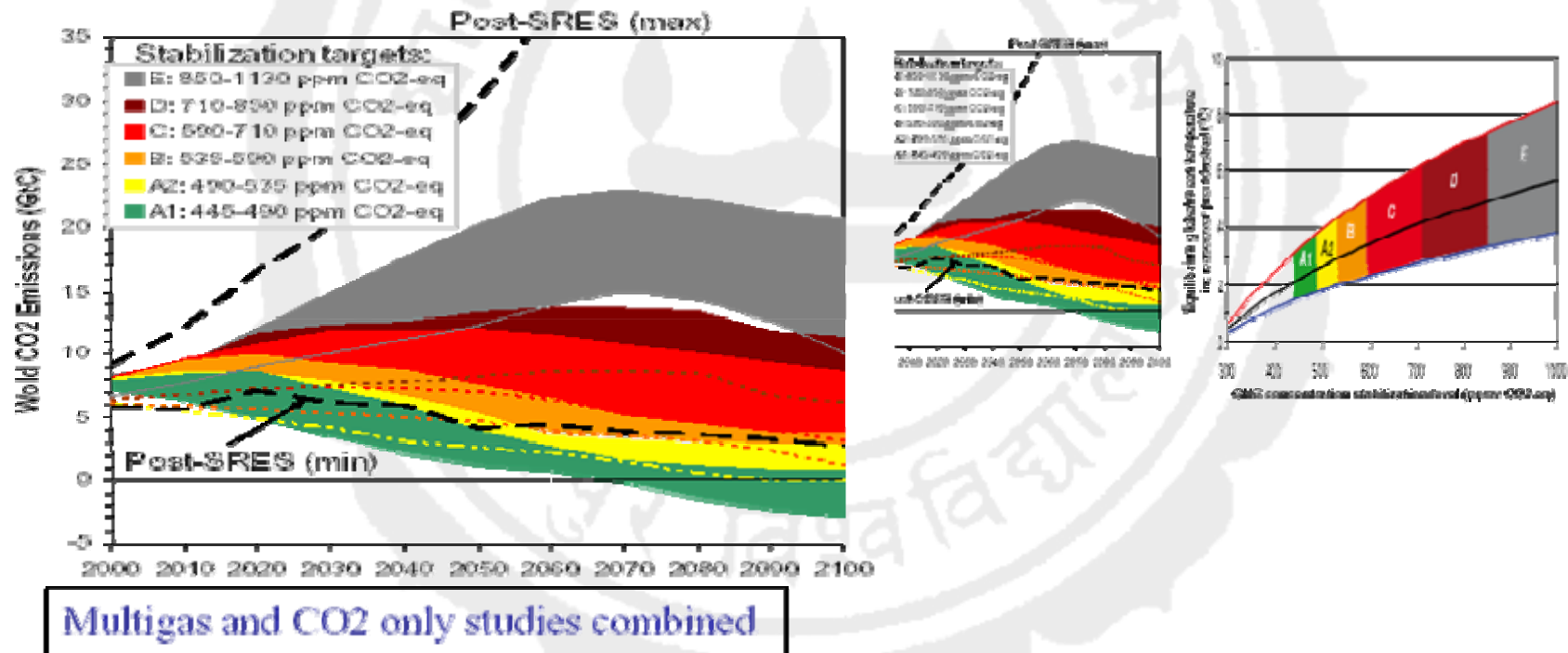
Source: key energy statistics, IEA (*Data for 2006)

Energy & Climate Change



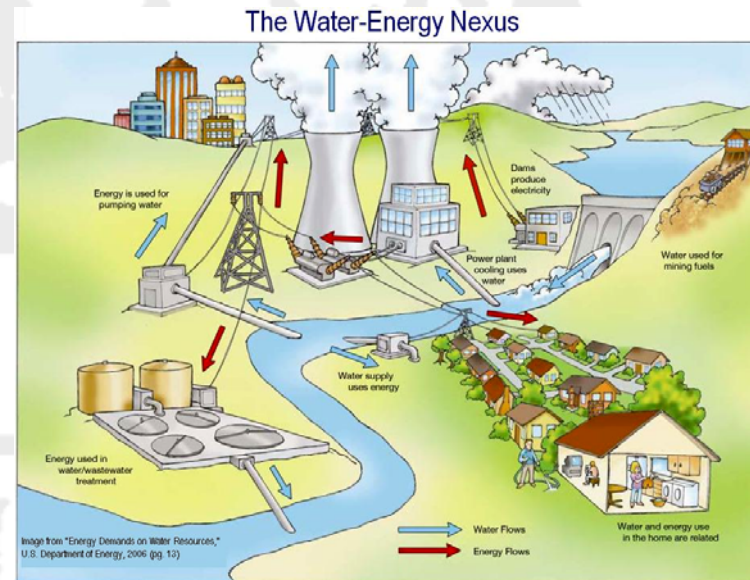
- ❑ Significant growth in fossil fuel consumption resulted in CO₂ concentration of 430ppm
- ❑ Increasing stock of GHGs leading to an increase in world mean temperature
- ❑ Urgent need to device policies in order to restrict the use of fossil fuel and hence to stabilize the concentration of GHGs.

The lower the stabilisation level the earlier global emissions have to go down



Renewable Resource

- ❑ Hydroelectric power: china having the largest number of such dams – over 60,000 generating 30% of china's electricity demand
- ❑ Solar energy: India having largest solar cooker programme
- ❑ Biomass energy: in USA 31% of organic waste is recovered from the municipal solid waste via recycling



Case Studies

- ❑ During Gulf war oil installation burned for weeks polluting the air with poisonous gases. The fires wasted 5 million barrels of oil and produced over one million ton of air borne pollutants, including SO₂, a major cause of acid rain



- ❑ In 1882, the first hydroelectric power dam was built in Appelon, Wisconsin. In India the first such dam was built in late 1980s in Western Ghats with an eye to reduce respiratory infections from coal driven cotton and textile mills in Bombay.