香港中文大學
The Chinese University of Hong Kong

GEOGRAPHY & RESOURCE MANAGEMENT
地理與資源管理學系

MPUP 5422 – Week 3
Environmental justice and politics

XU Yuan

January 22, 2020

Outline

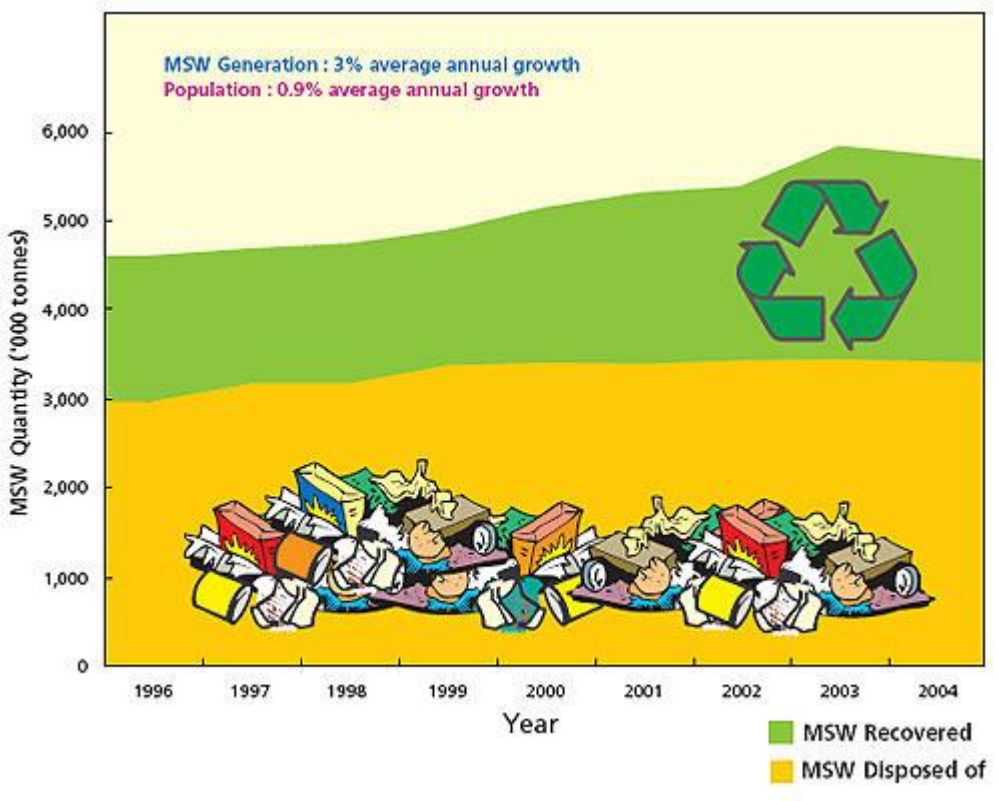
- Local NIMBY
- SO_2 mitigation in the United States
- Montreal Protocol vs. Kyoto Protocol
- Solar lobby in Japan

DISTRIBUTION OF COSTS/BENEFITS -- NOT IN MY BACKYARD

Any difference?

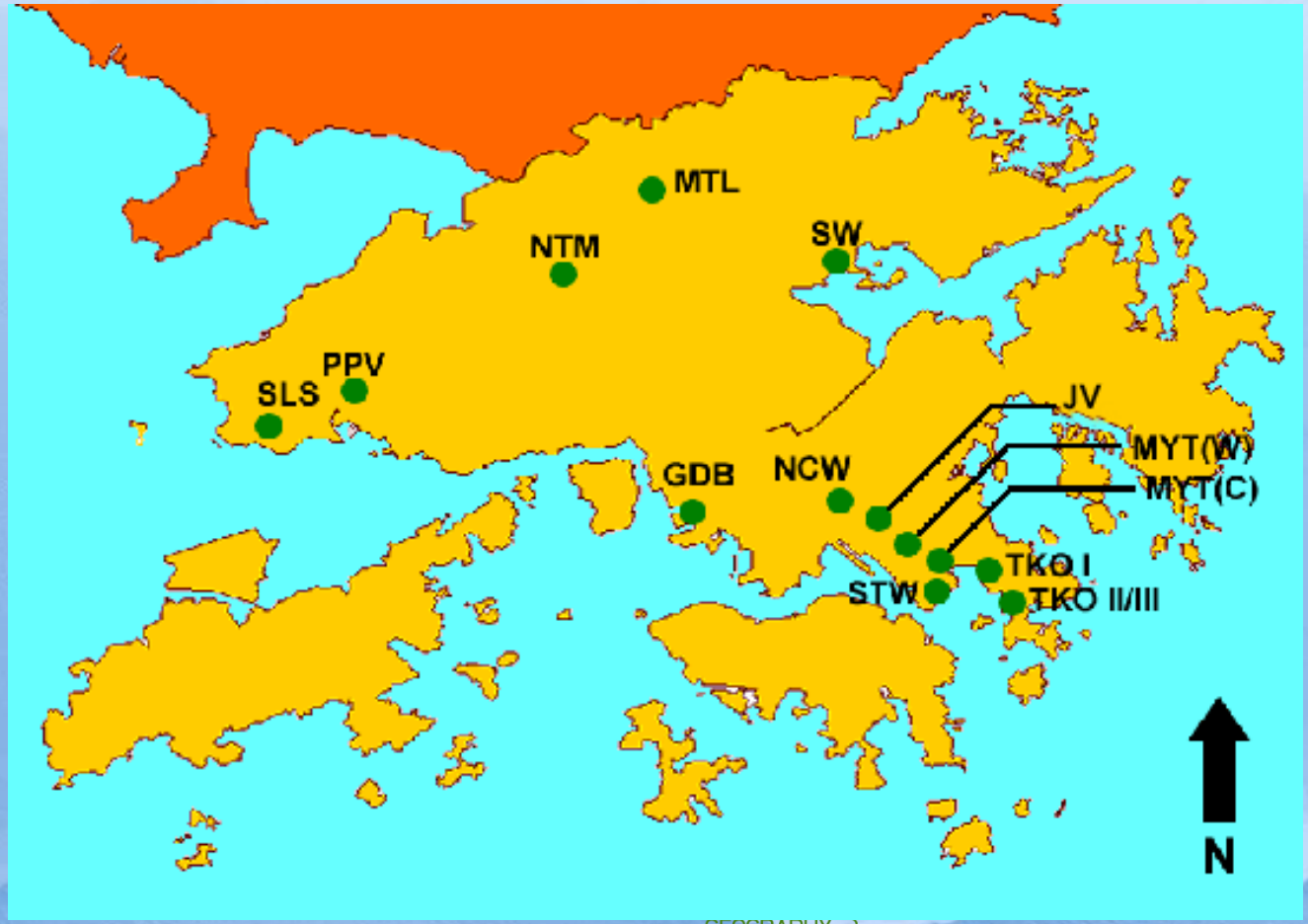
We need power plants and waste management facilities.

Hong Kong's municipal solid waste generation



Source: HK EPD, 2010

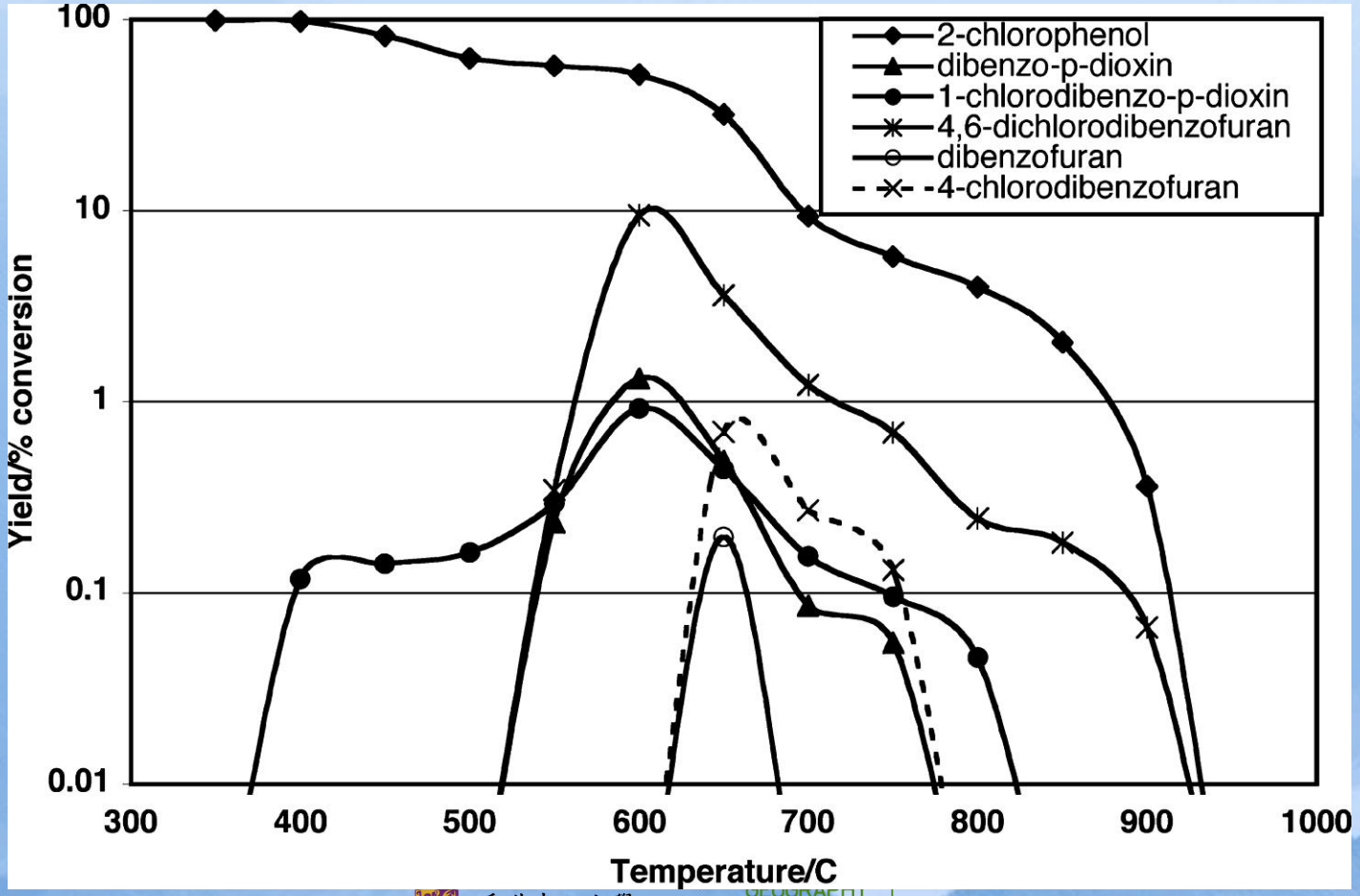
Location of Closed Landfills in Hong Kong



Source: HK EPD, 2010

Not In My BackYard (NIMBY)

Dioxin products and temperature



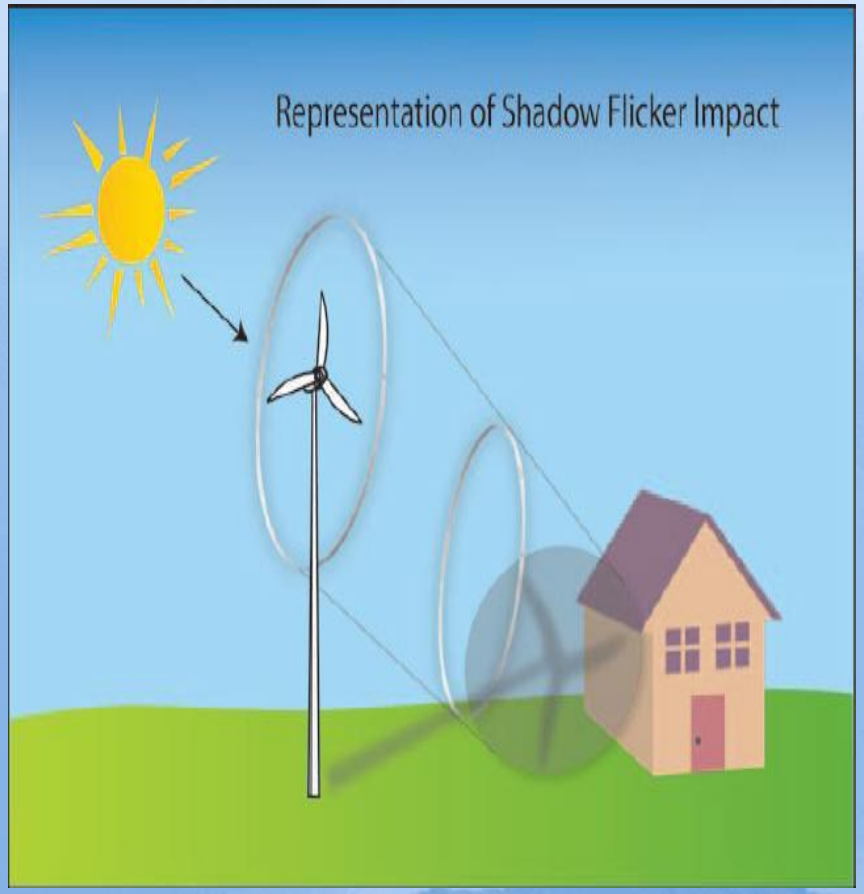
Source: Evans and Dellinger, 2005

Not In My BackYard (NIMBY)

Panyu, Guangdong province

Hong Kong

Environmental impacts of wind turbines



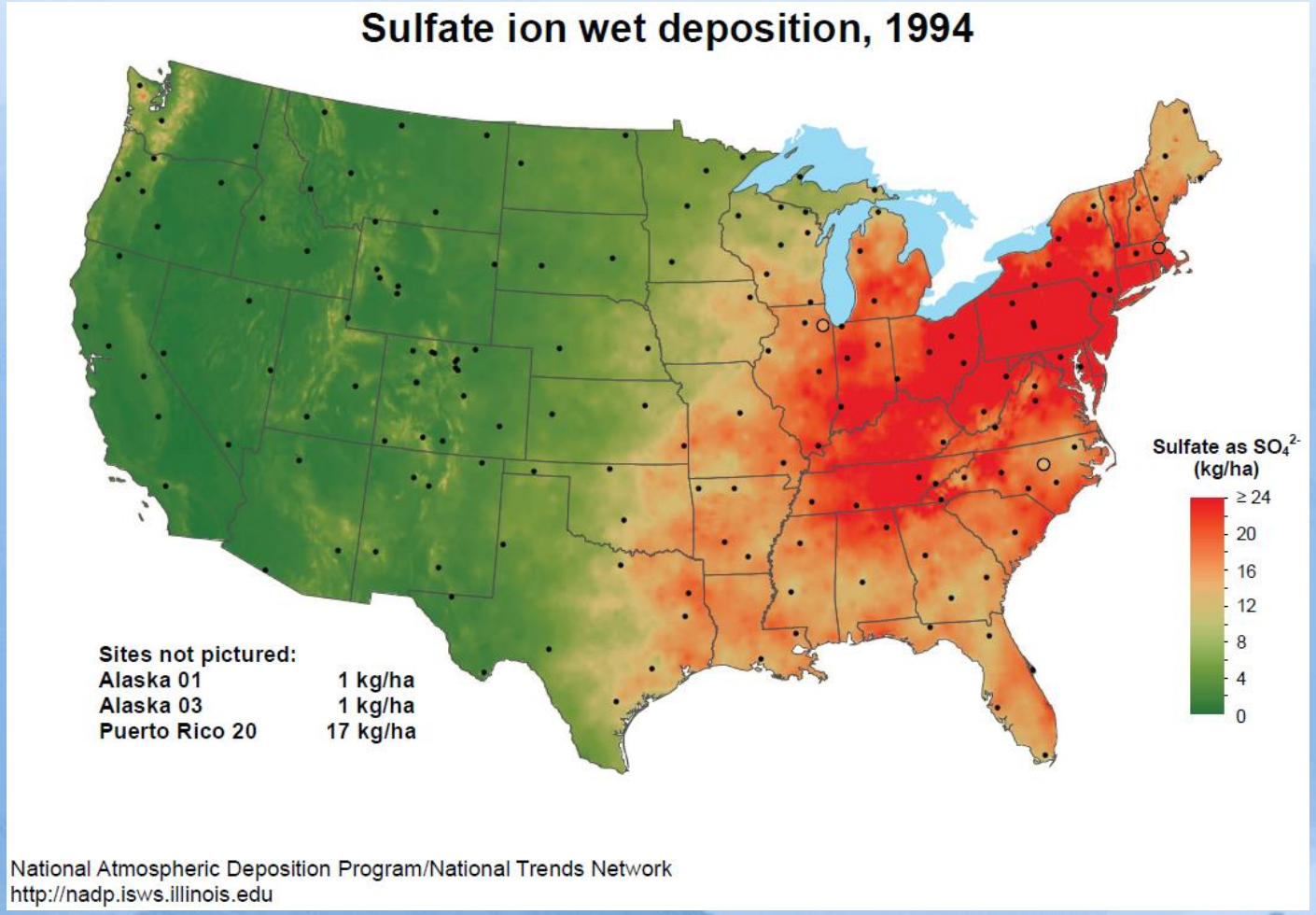
http://www.controlaltenergy.com/Wind_Myths.htm

http://www.mlive.com/news/bay-city/index.ssf/2009/06/wind_turbines_create_bad_buzz.html

Shale gas wells in the United States
-- In my backyard (IMBY)?

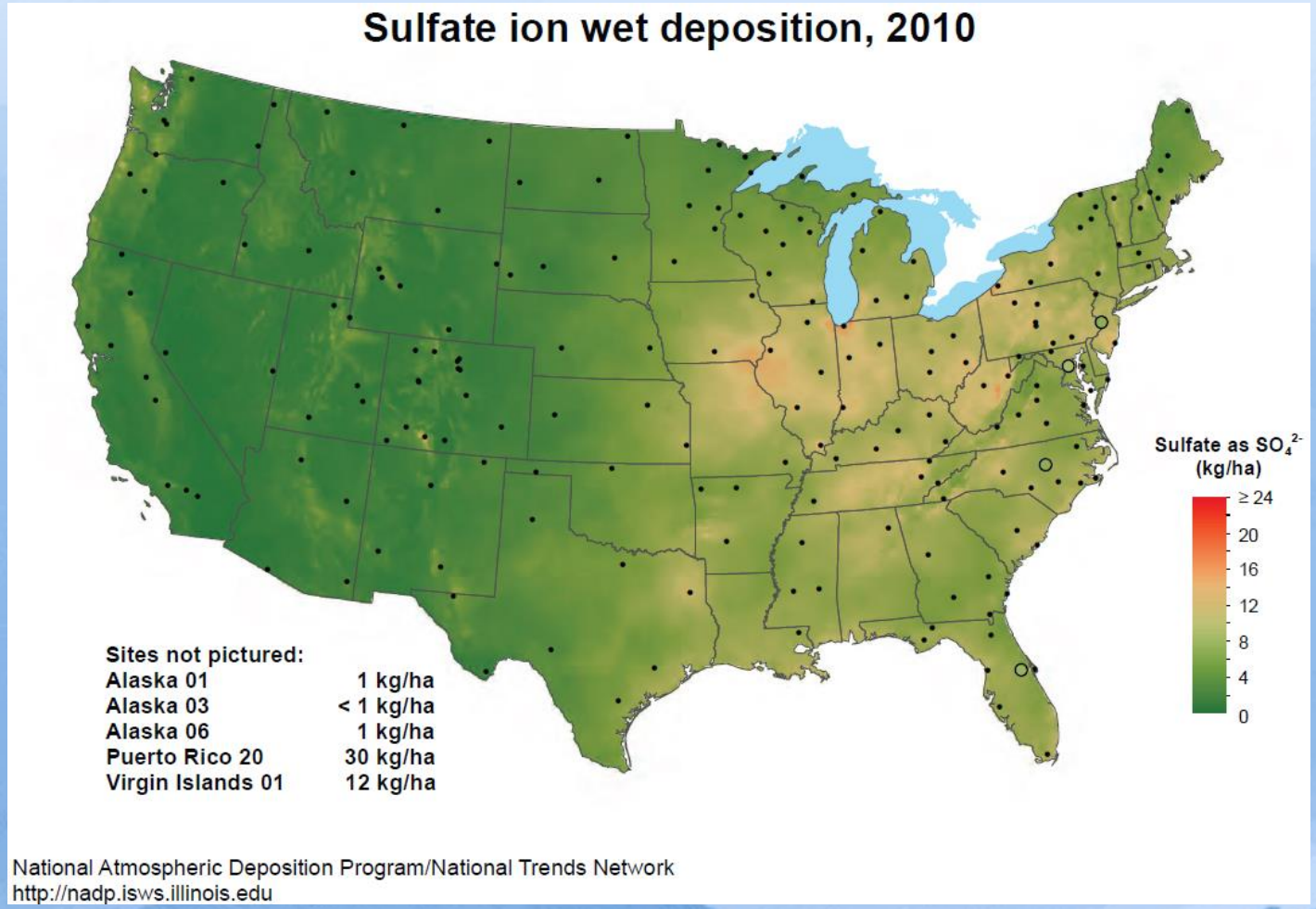
http://www.wsj.com/articles/SB10001424052748703712504576232582990089002

SO_2 MITIGATION IN THE UNITED STATES



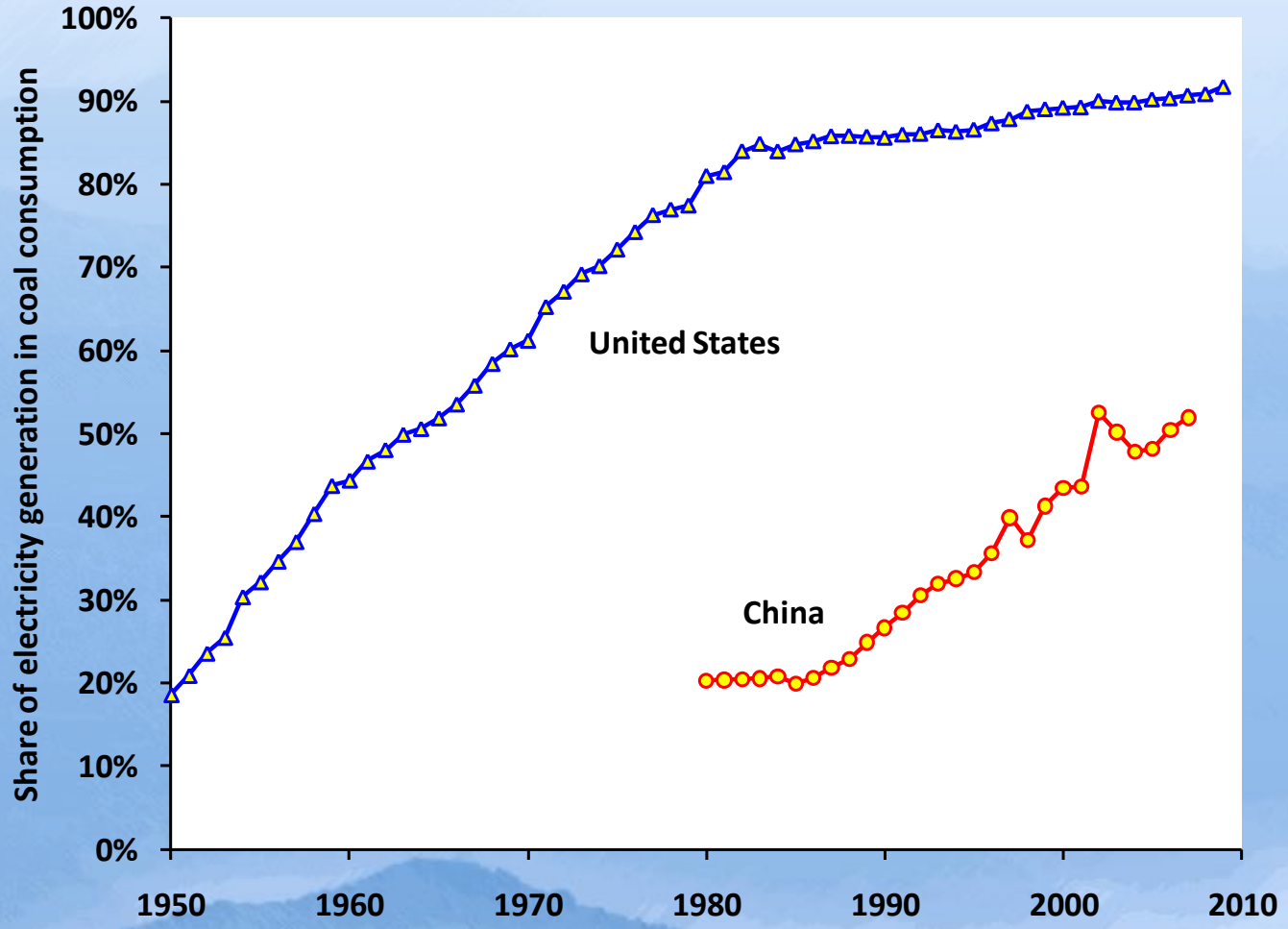
A video clip

http://nadp.sws.uiuc.edu/data/annualmaps.aspx



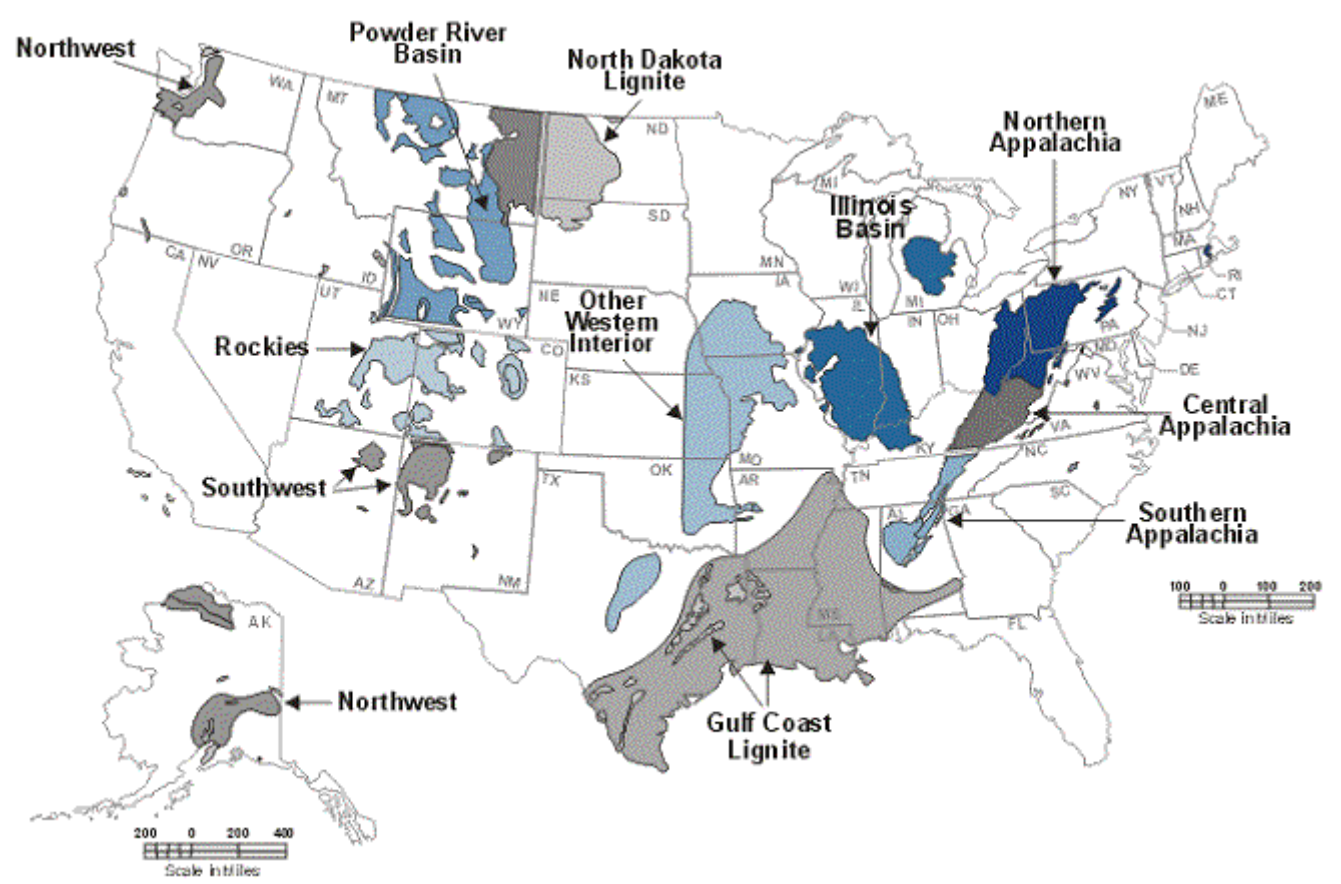
http://nadp.sws.uiuc.edu/data/annualmaps.aspx

Electrification of coal consumption



Source: EIA, 2010; Fridley, *et al., 2008*

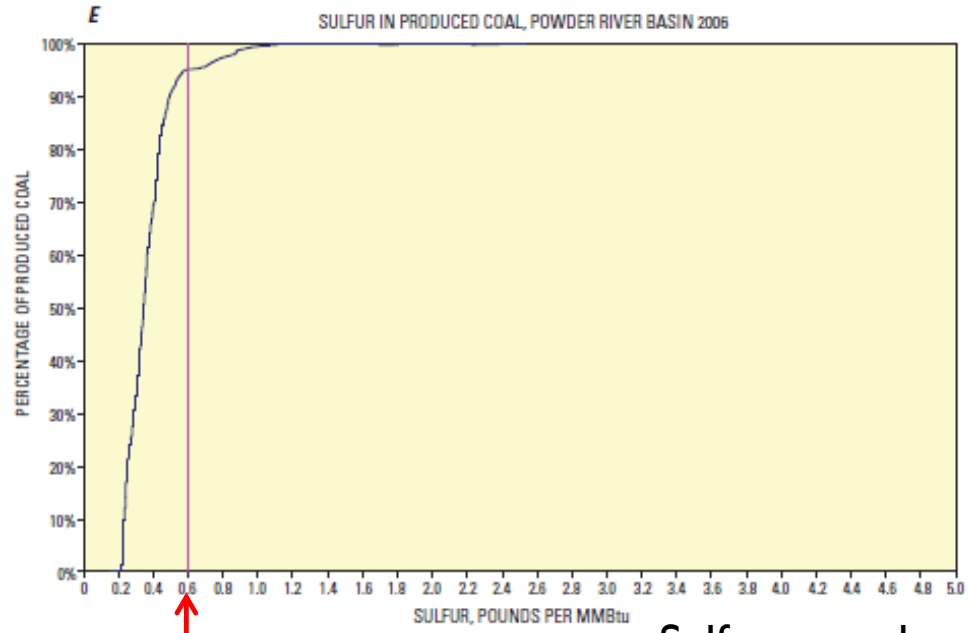
Coal beds in the U.S.



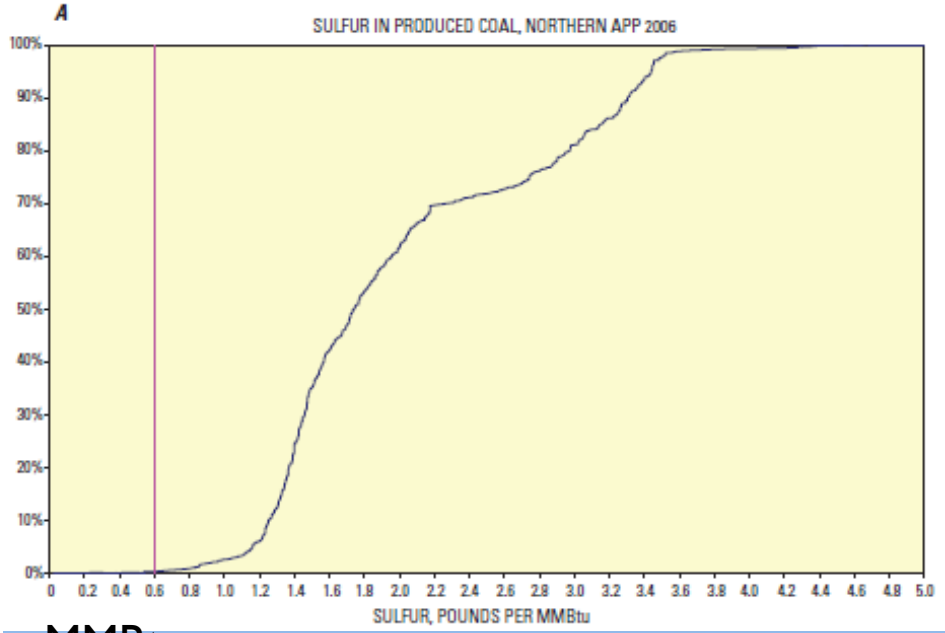
http://www.eia.doe.gov/cneaf/coal/page/trans/ratesntrends.html

Sulfur contents in the U.S.

Powder River Basin



Northern Appalachian



Sulfur, pounds per MMBtu

Implied Phase II standard

Source: Attanasi and Freeman, 2009

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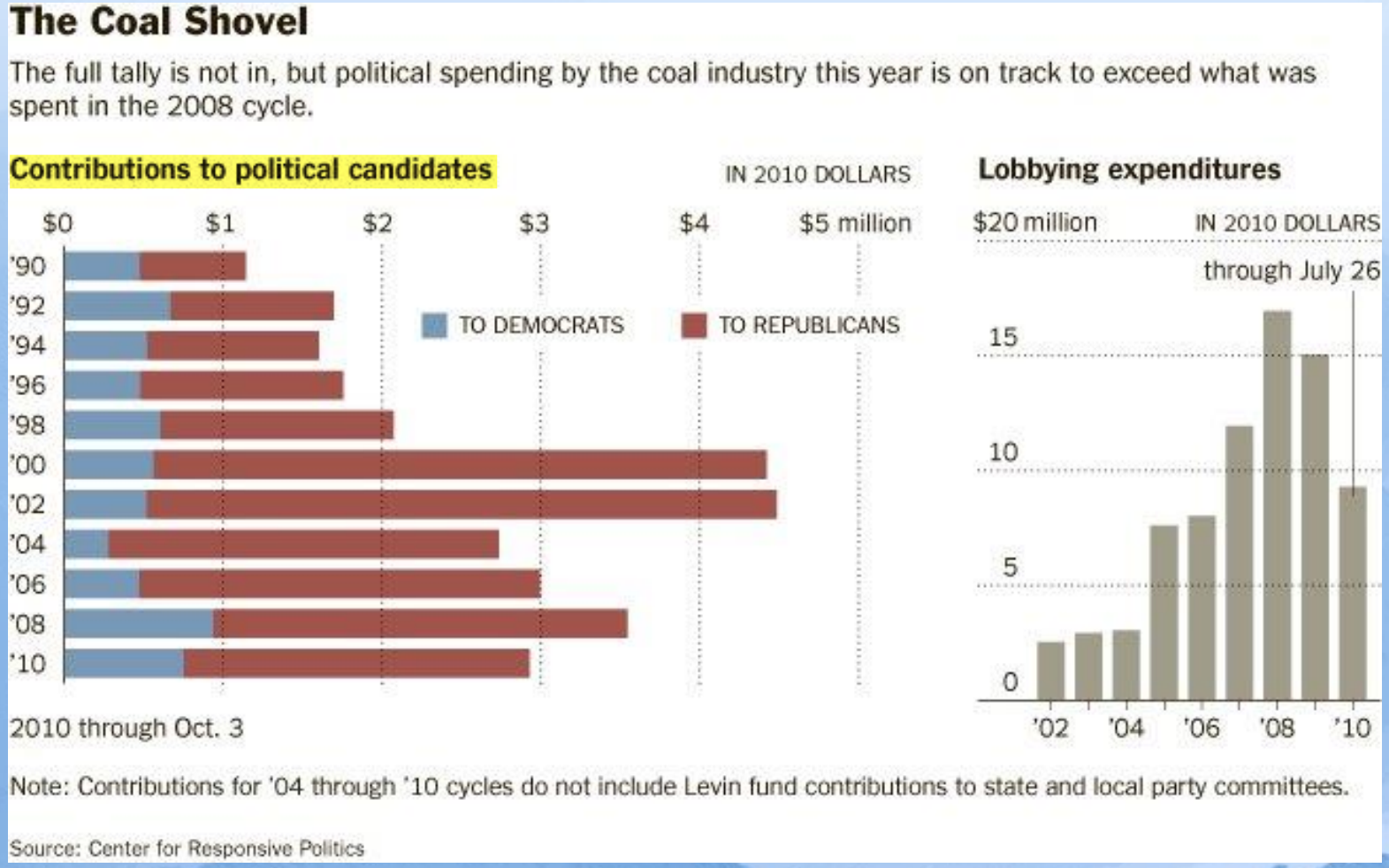
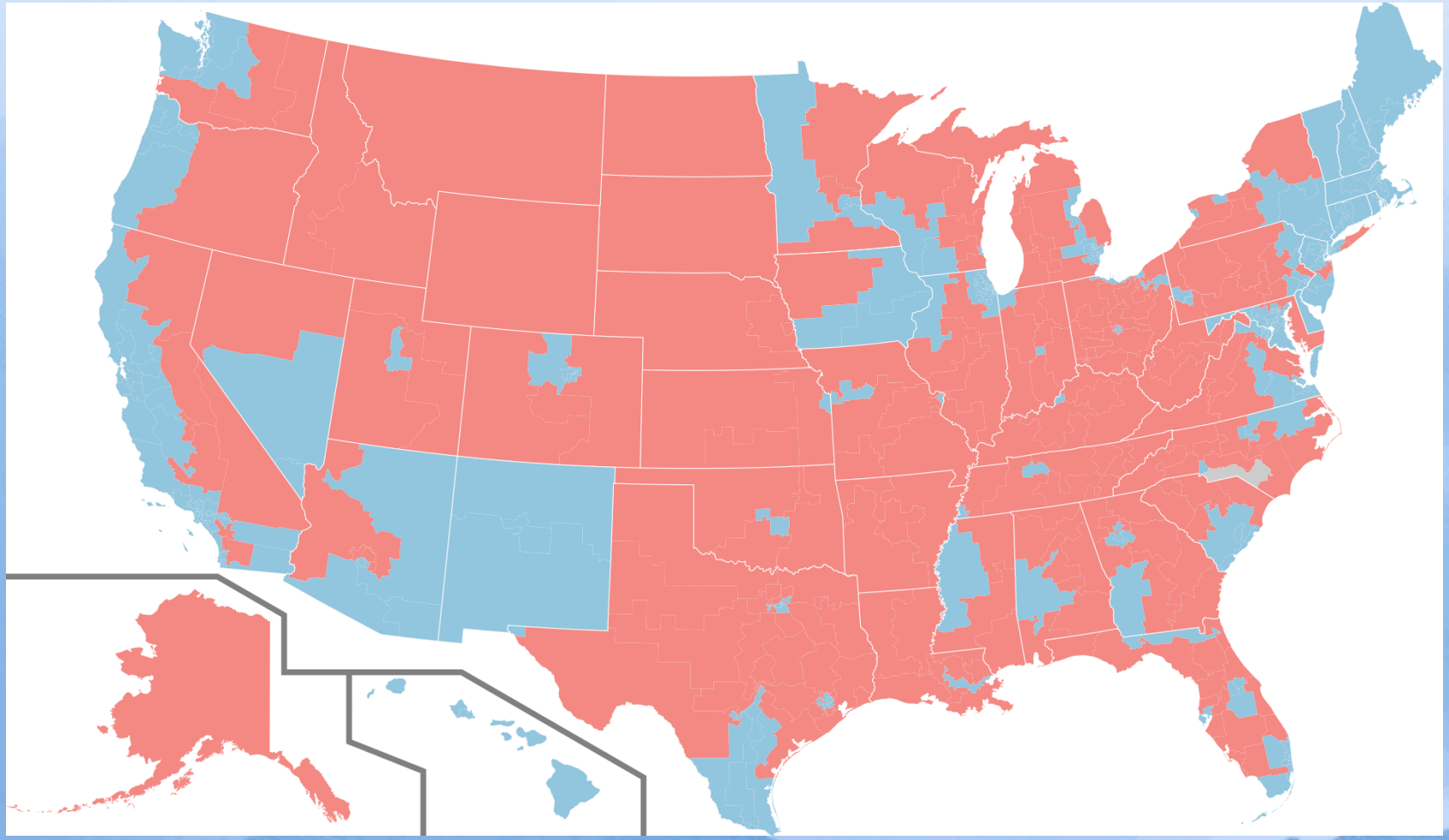
Political spending by the U.S. coal industry

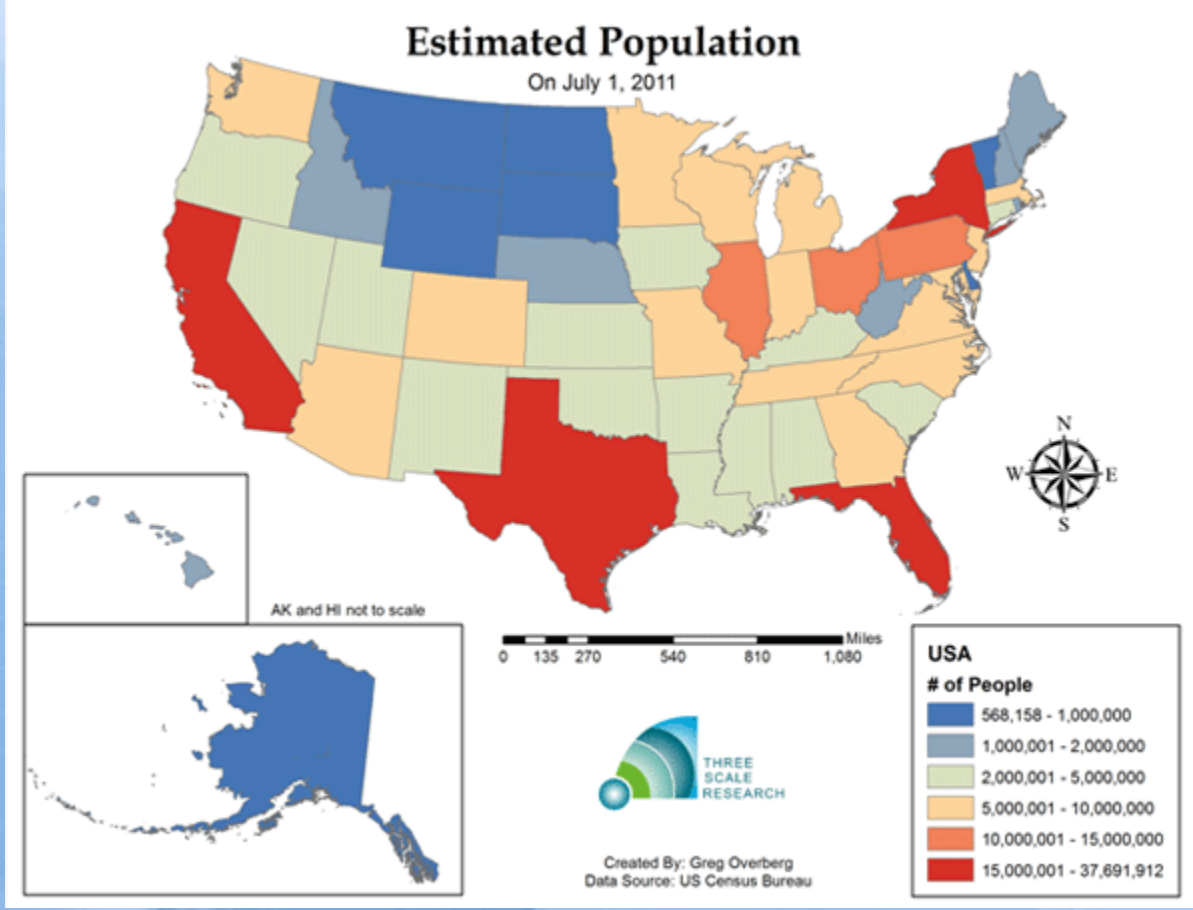


http://www.nytimes.com/2010/10/30/us/politics/30coal.html

U.S. House of Representatives in 2019



U.S. population and Senate

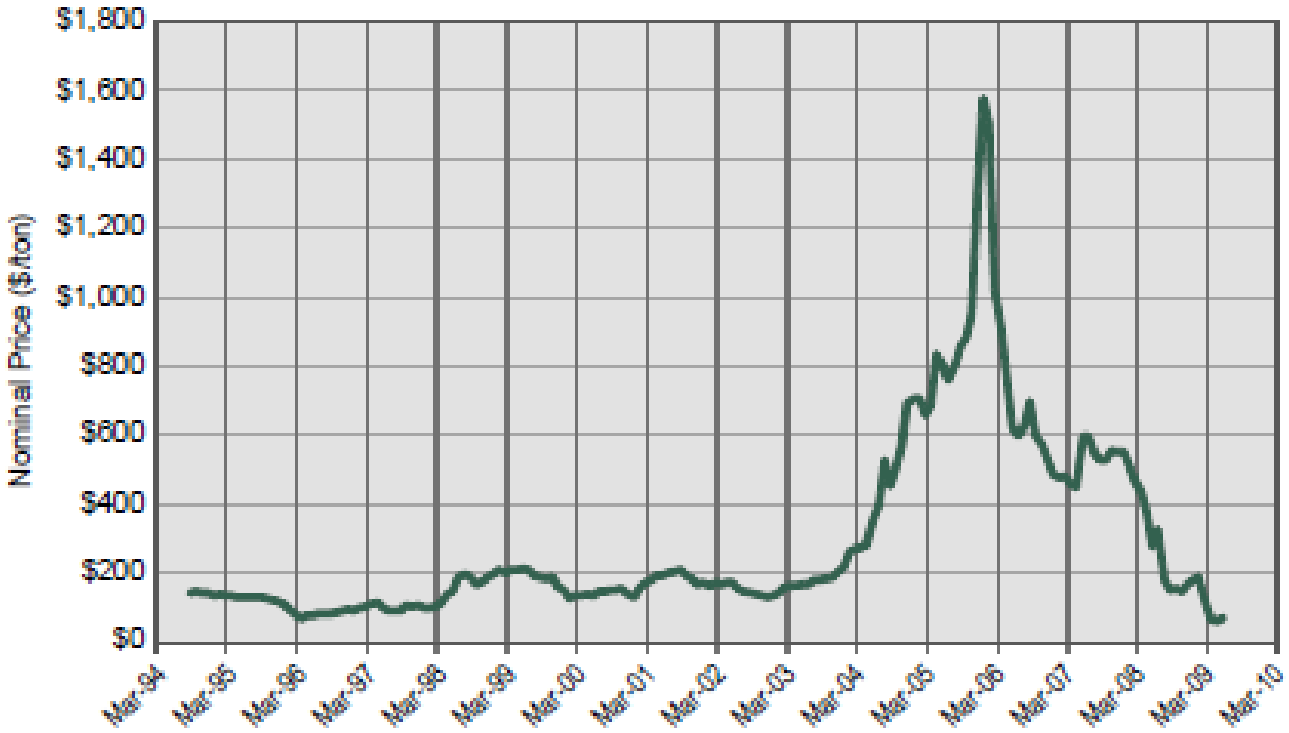


Clean Air Act Amendments of 1990

- The Clean Air Act Amendments of 1990 set a goal of reducing annual SO_2 emissions by 10 million tons below 1980 levels. To achieve these reductions, the law required a two-phase tightening of the restrictions placed on fossil fuel-fired power plants:
- Phase I (began in 1995)
  Affected 263 units at 110 mostly coal-burning electric utility plants located in 21 eastern and midwestern states. An additional 182 units joined Phase I of the program as substitution or compensating units, bringing the total of Phase I affected units to 445.
- Phase II (began in 2000)
  Tightened the annual emissions limits imposed on large, higher emitting plants and also set restrictions on smaller, cleaner plants fired by coal, oil, and gas, encompassing over 2,000 units in all. The program affects existing utility units serving generators with an output capacity of greater than 25 megawatts and all new utility units.

http://www.epa.gov/airmarkets/progsregs/arp/s02.html

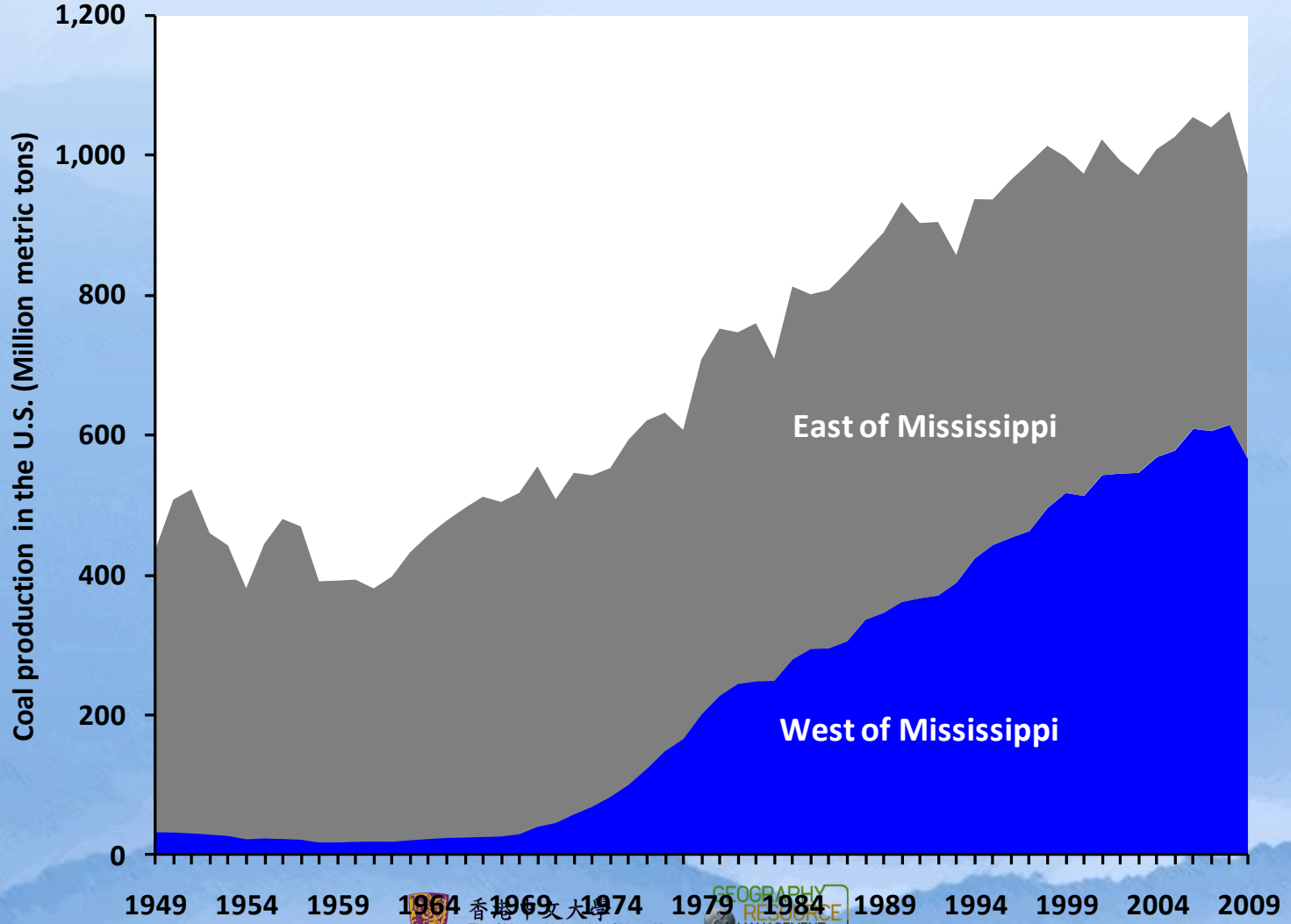
Figure 4: Average Monthly SO_2 Allowance Price, August 1994 - May 2009



Source: CantorCO2e Market Price Index, 2009

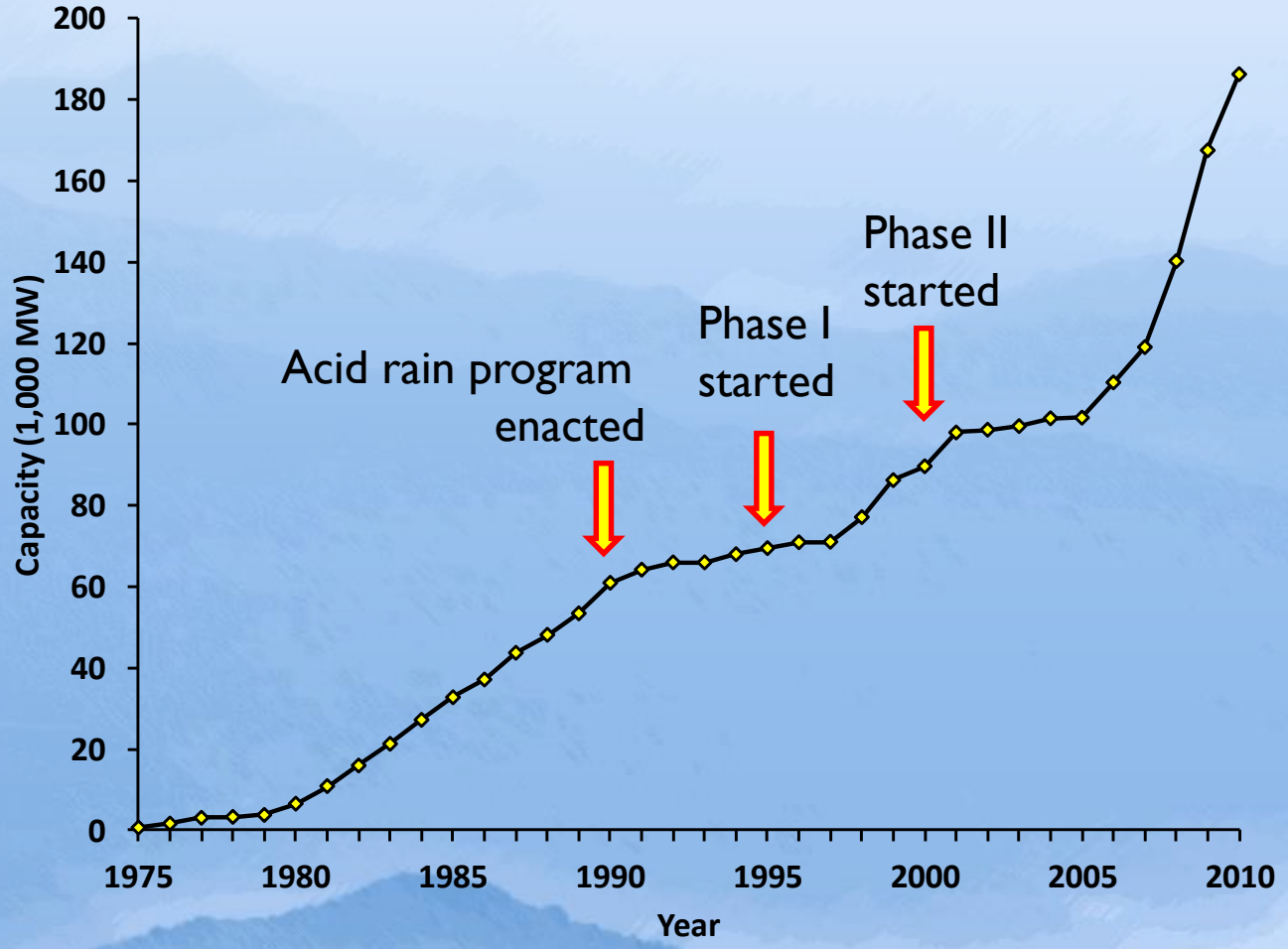
Source: EPA, 2009

Coal mining in the U.S.



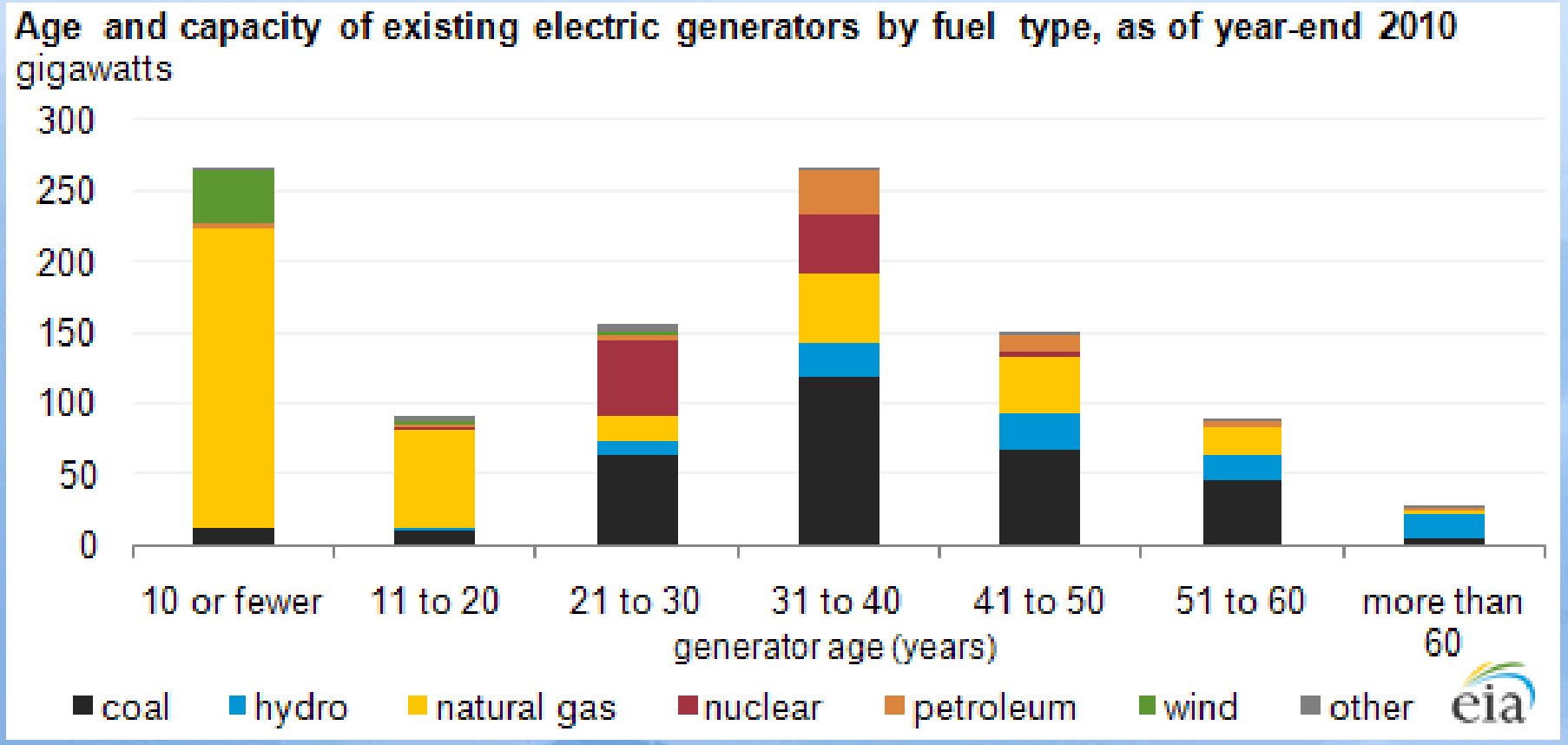
Source: EIA, 2010

The deployment of SO_2 scrubbers



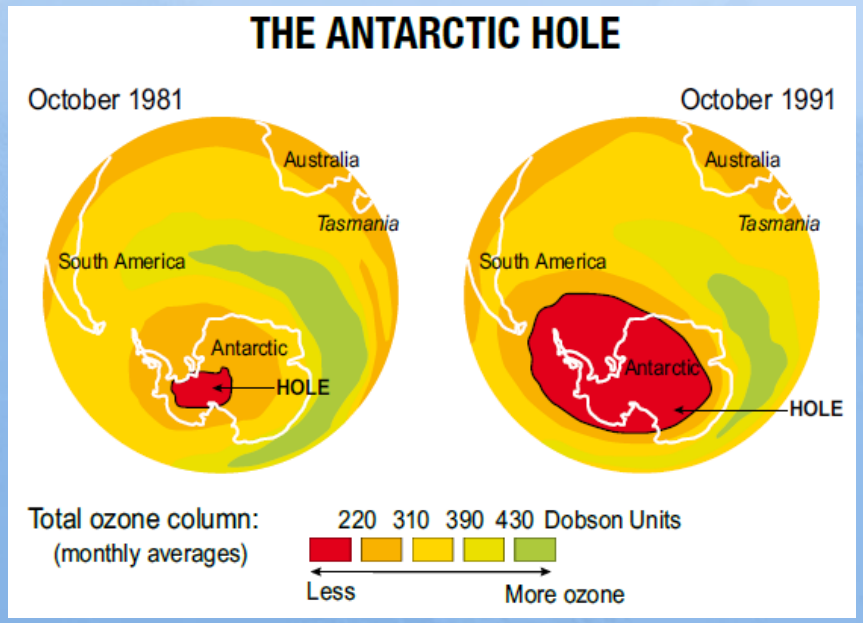
Source: NETL, 2007; EIA, 2012

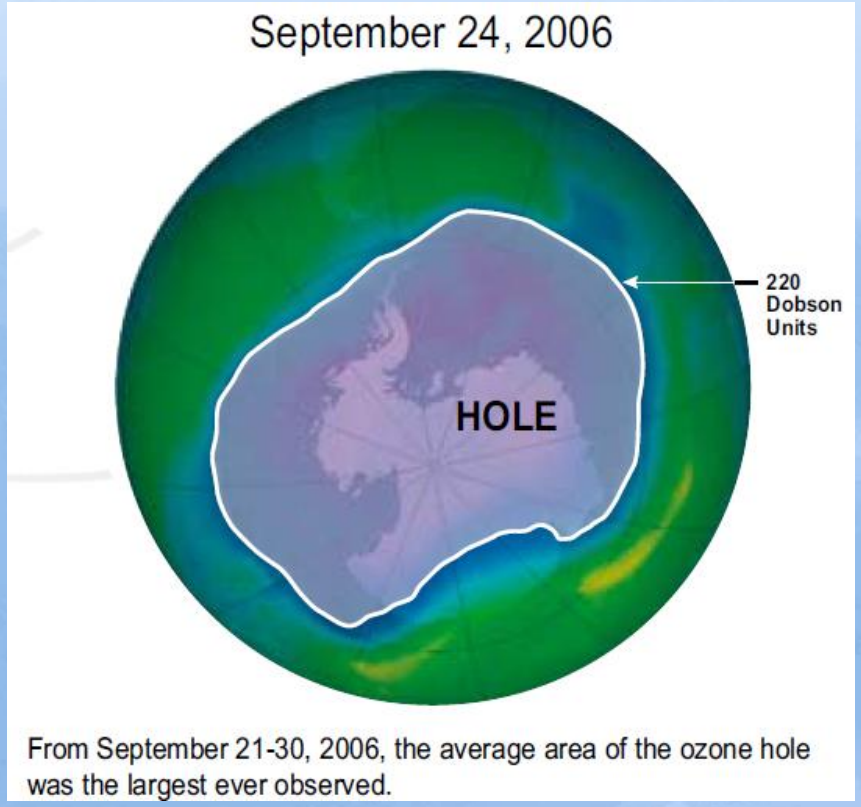
The stagnation of the U.S. coal power sector



MONTREAL PROTOCOL VS. KYOTO PROTOCOL

Antarctic Ozone Hole

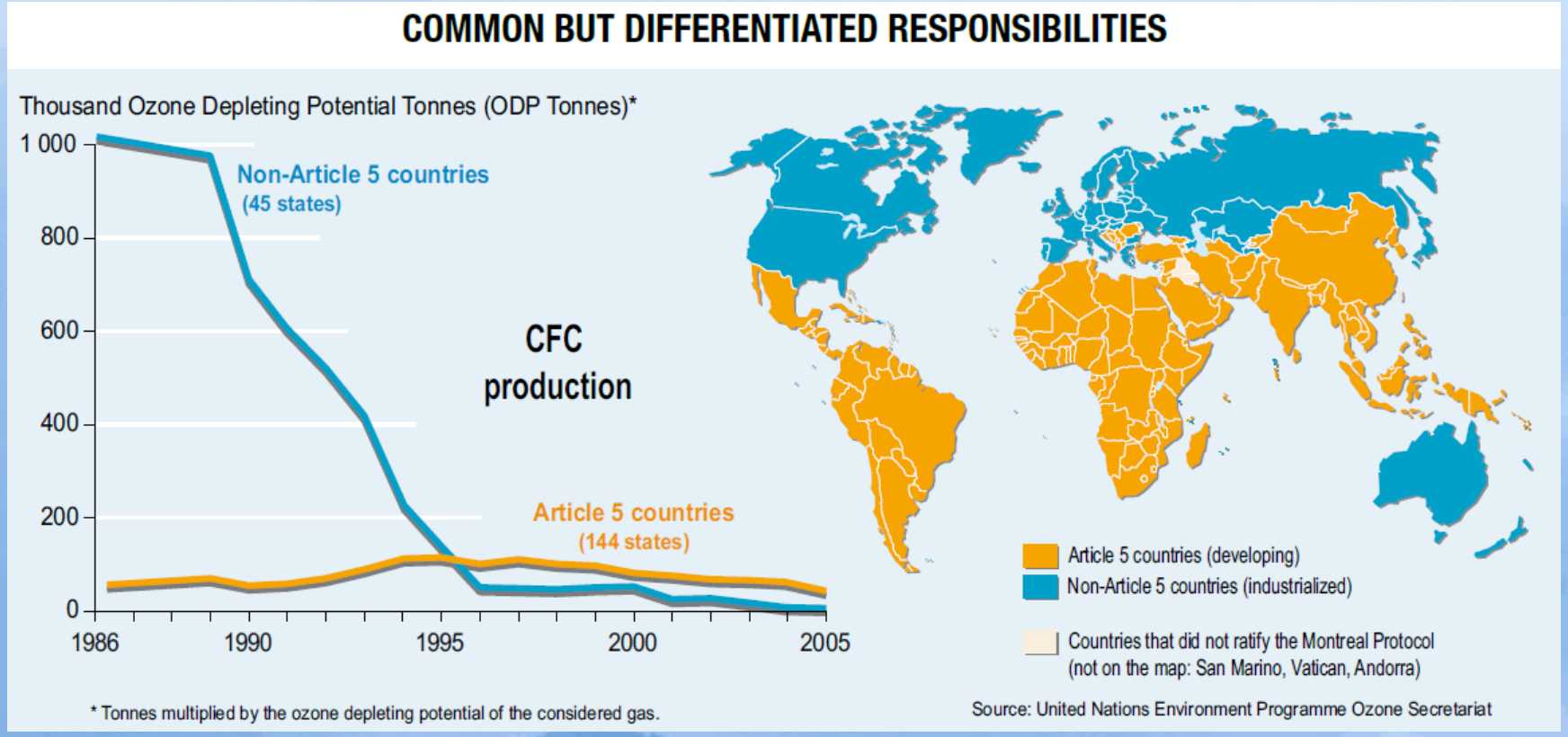




Source: UNEP, 2007

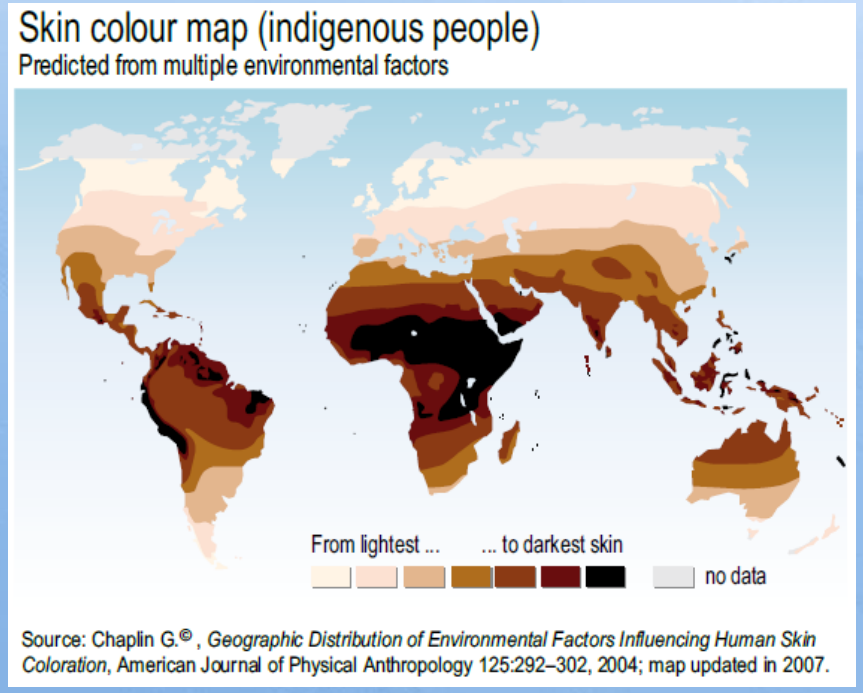
Freon (CFCs)

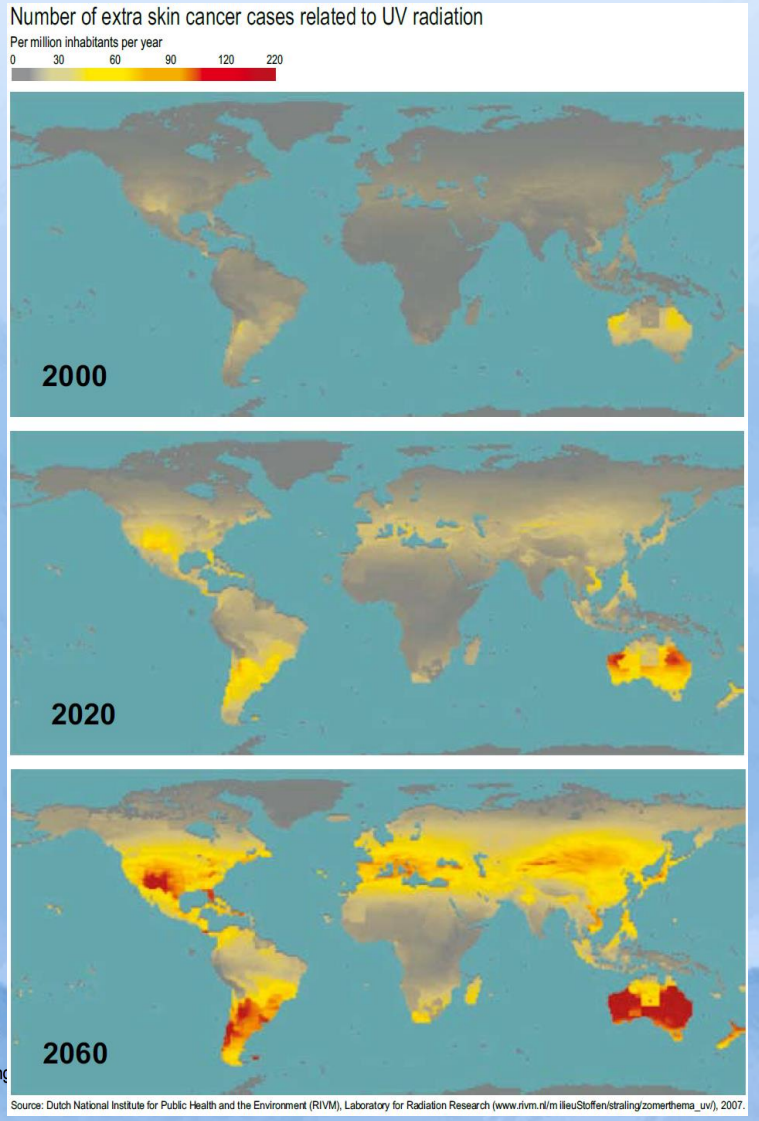
Production of Ozone Depleting Substances



Source: UNEP, 2007

Skin cancer: UV protection vs. Vitamin D





Source: UNEP, 2007

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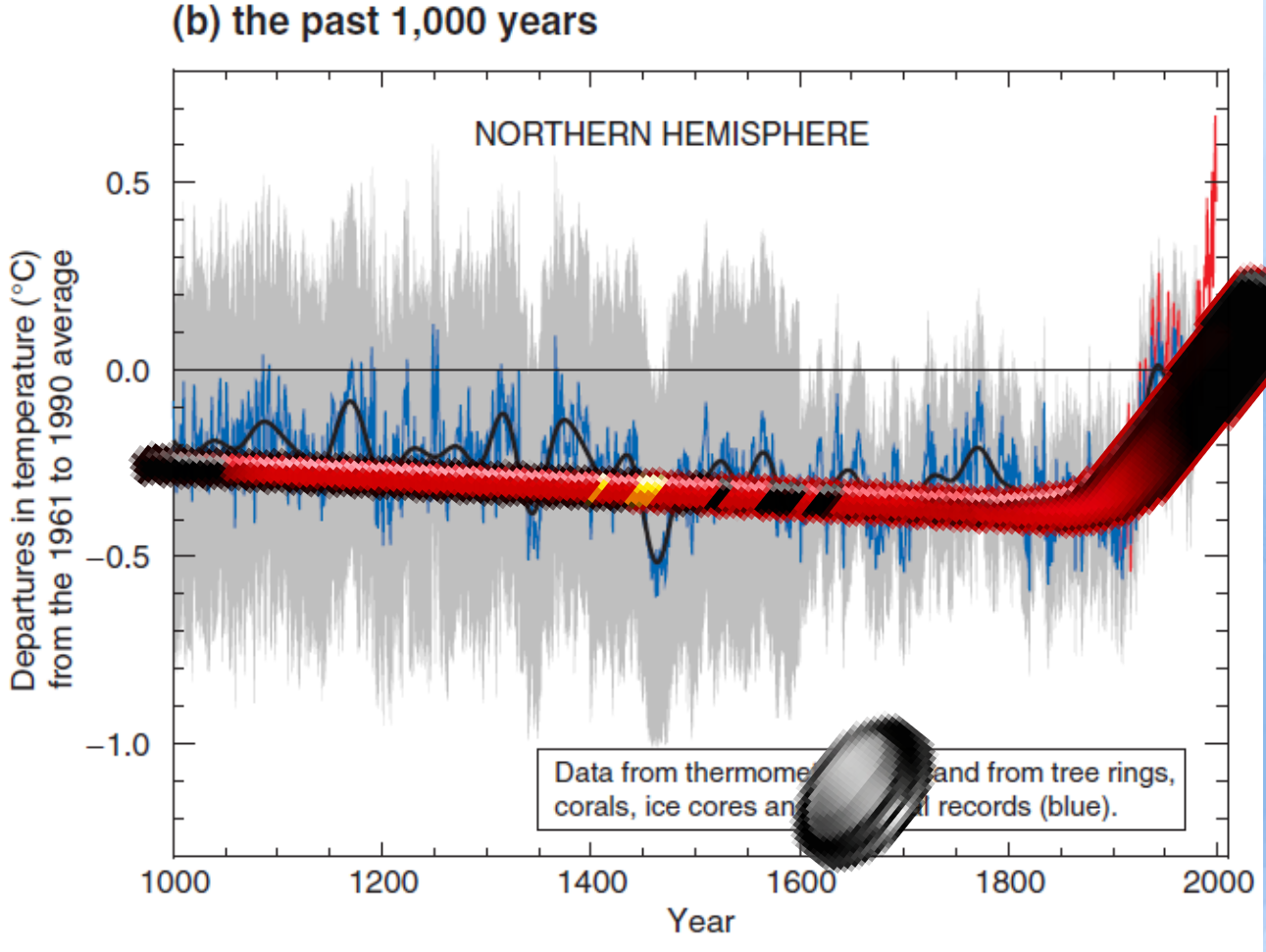
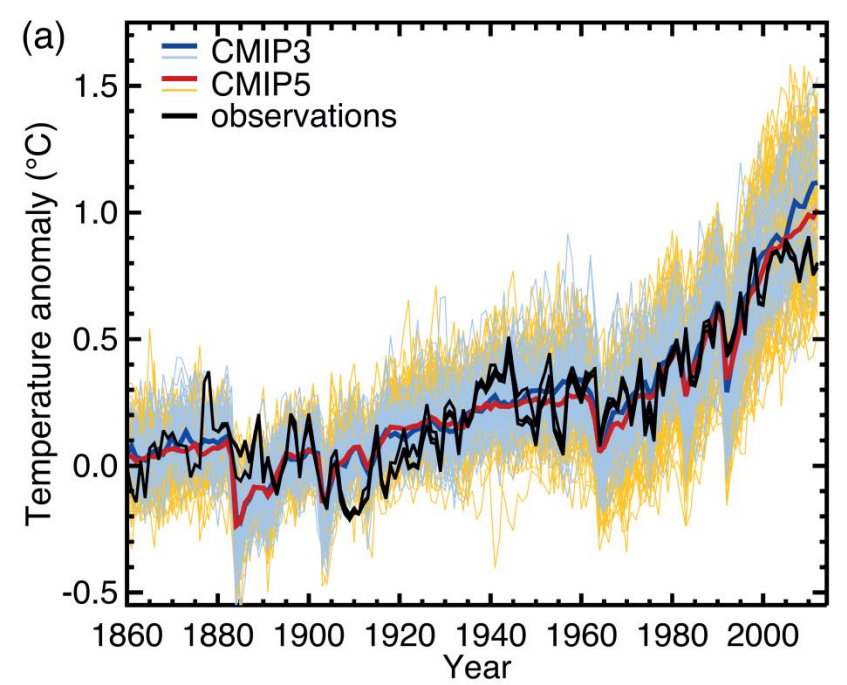
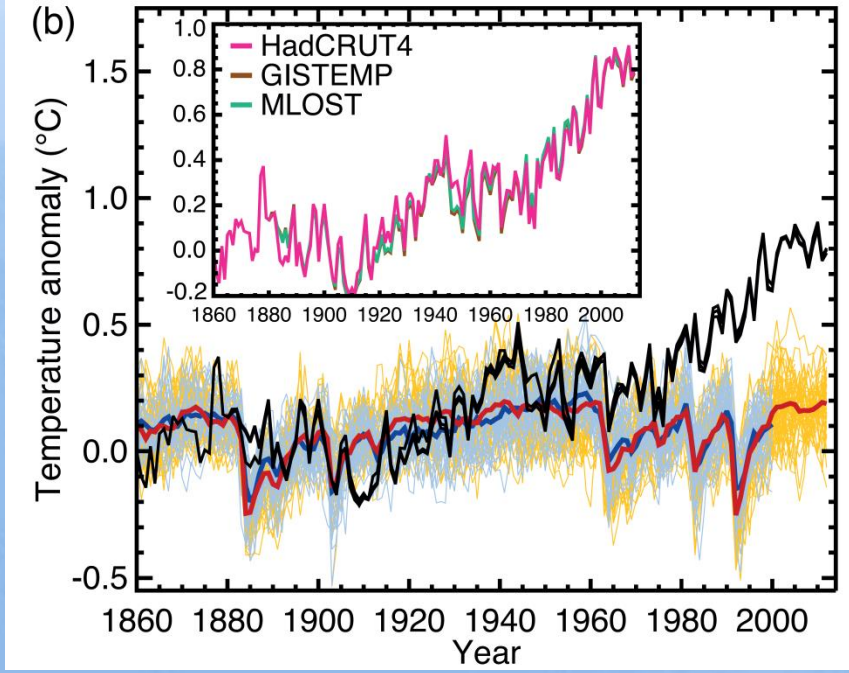
The hockey stick graph



Source: IPCC, 2001

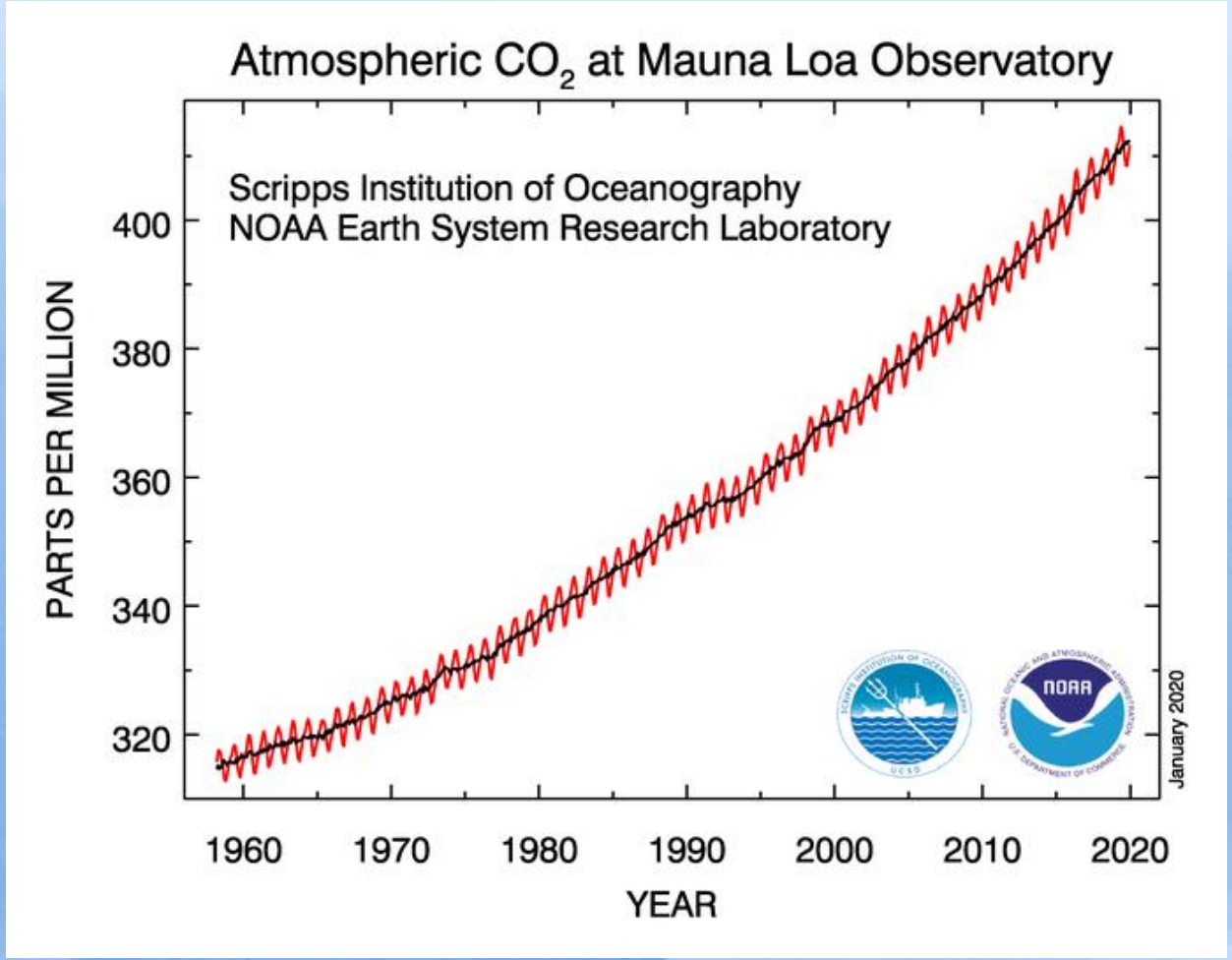
The point of debate
- Are we causing global warming?





Source: IPCC, 2013

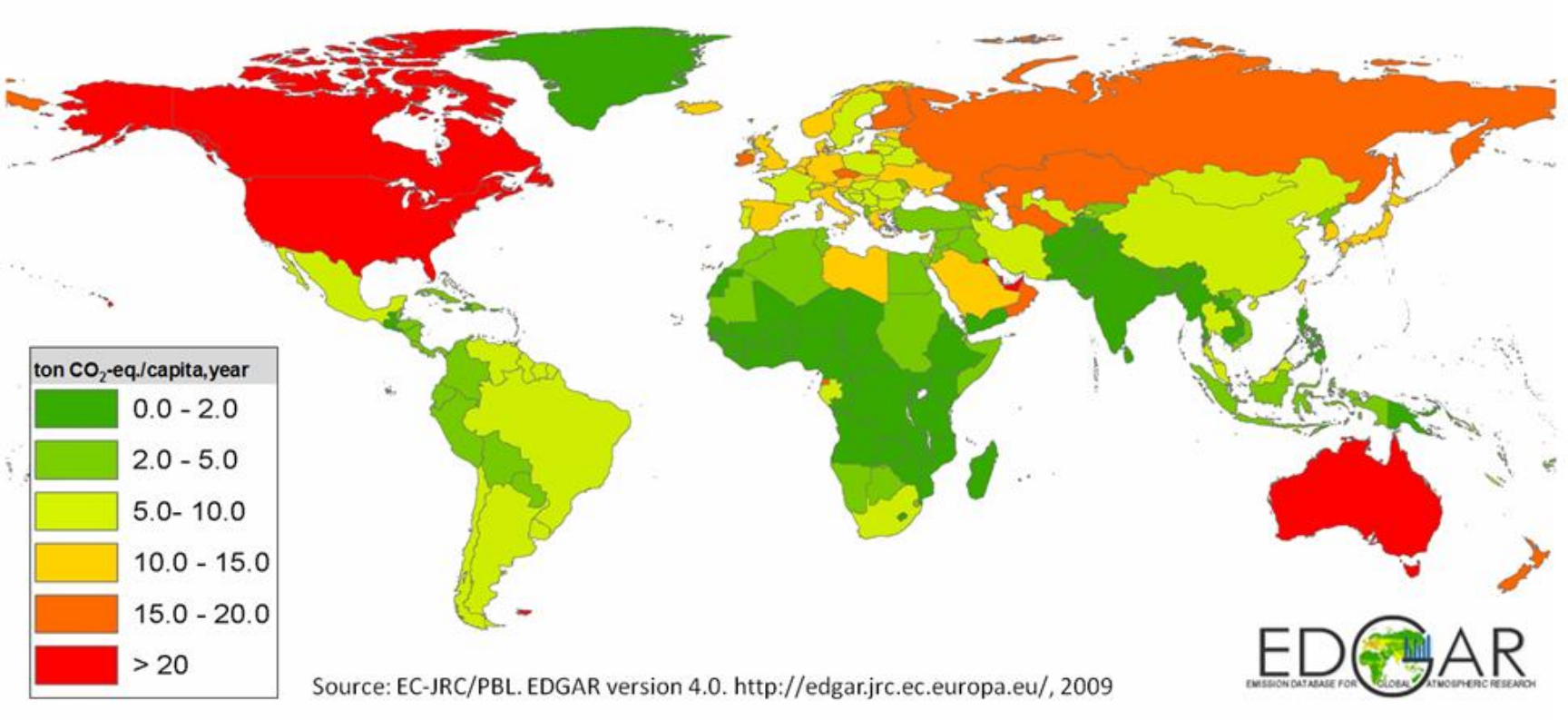
Atmospheric CO_2 concentration at Mauna Loa



http://www.esrl.noaa.gov/gmd/ccgg/trends/#mlo_full

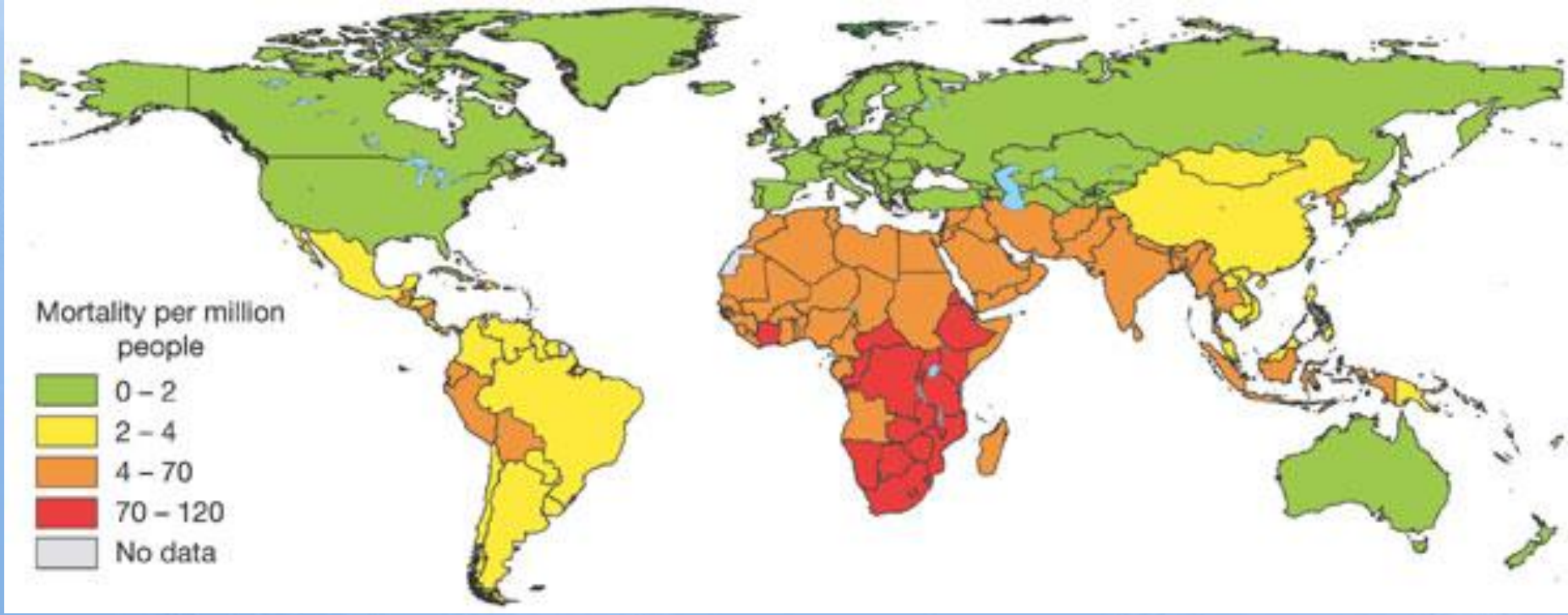
World's CO_2 emissions are mainly emitted by developed and rapidly developing countries

CO_2 emissions per capita



However, developing countries suffer the most from climate disasters

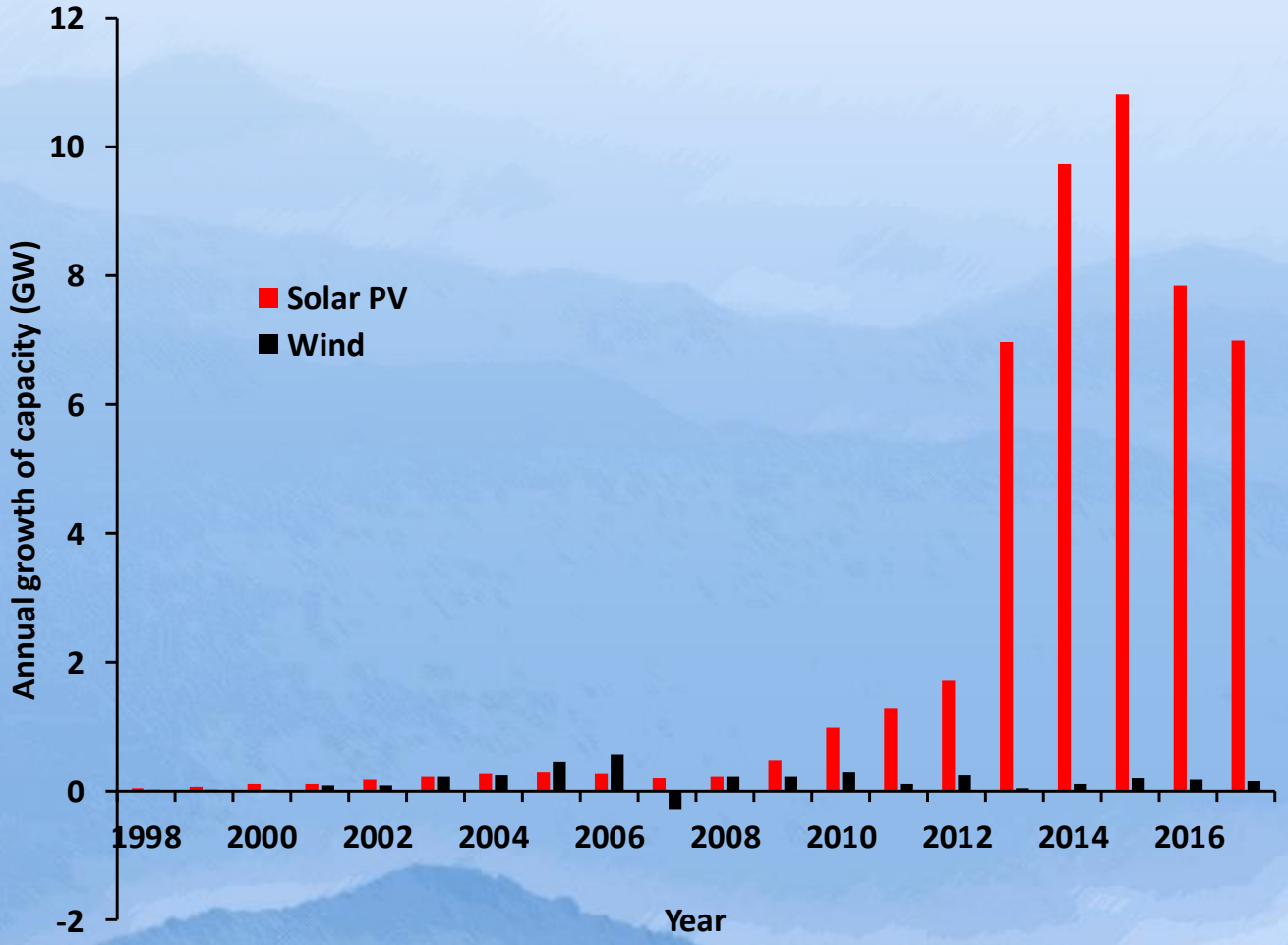
Mortality (per million people) attributable to climate change by the year 2000



Patz, J. A., et al., 2005. "Impact of regional climate change on human health." Nature 438(7066): 310-317.

SOLAR LOBBY IN JAPAN

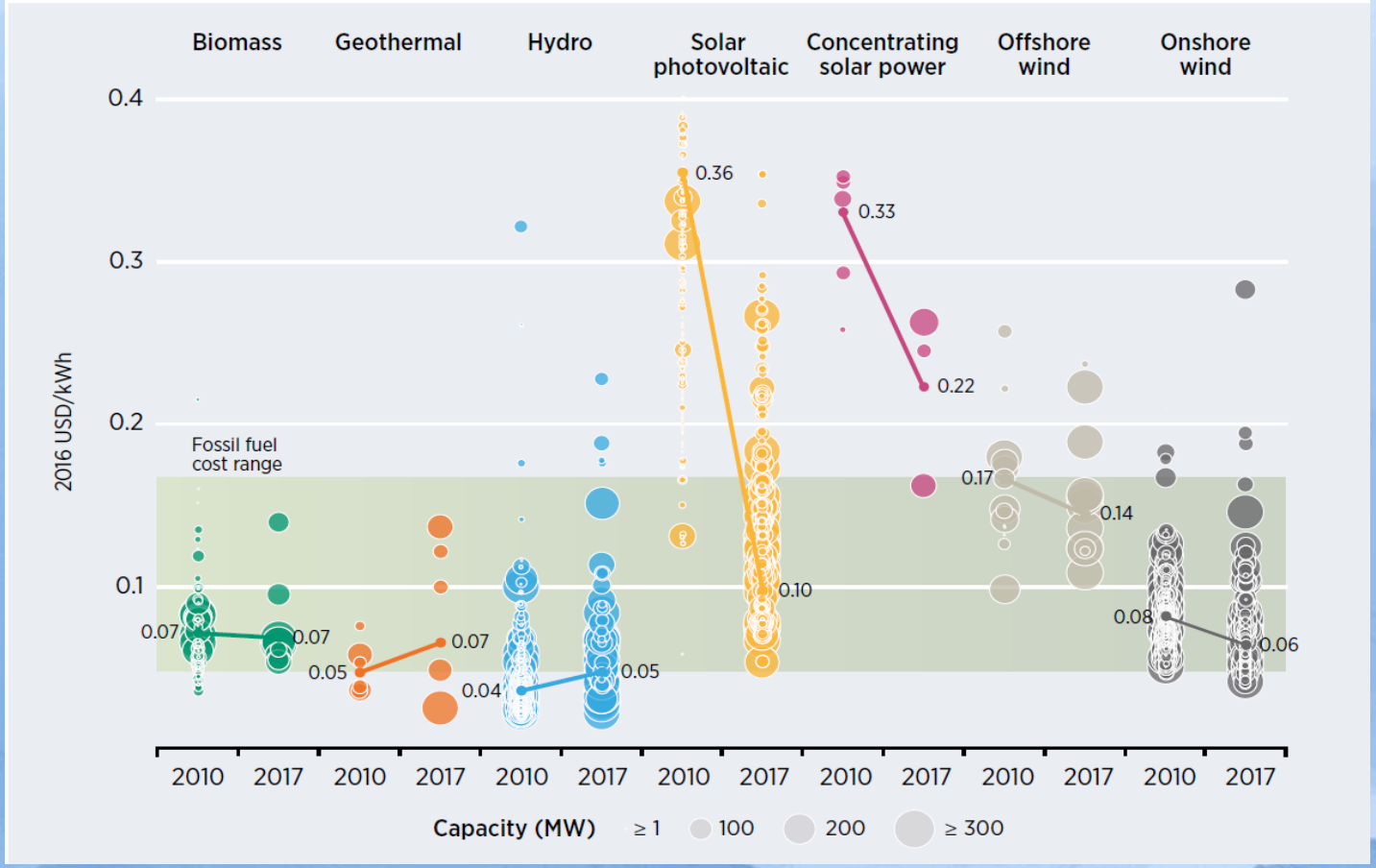
Renewable energy development in Japan



Source: BP, 2018

Japan's market economy?
-- Economic optimization

Figure 2.1 Global levelised cost of electricity from utility-scale renewable power generation technologies, 2010-2017



IRENA, 2018

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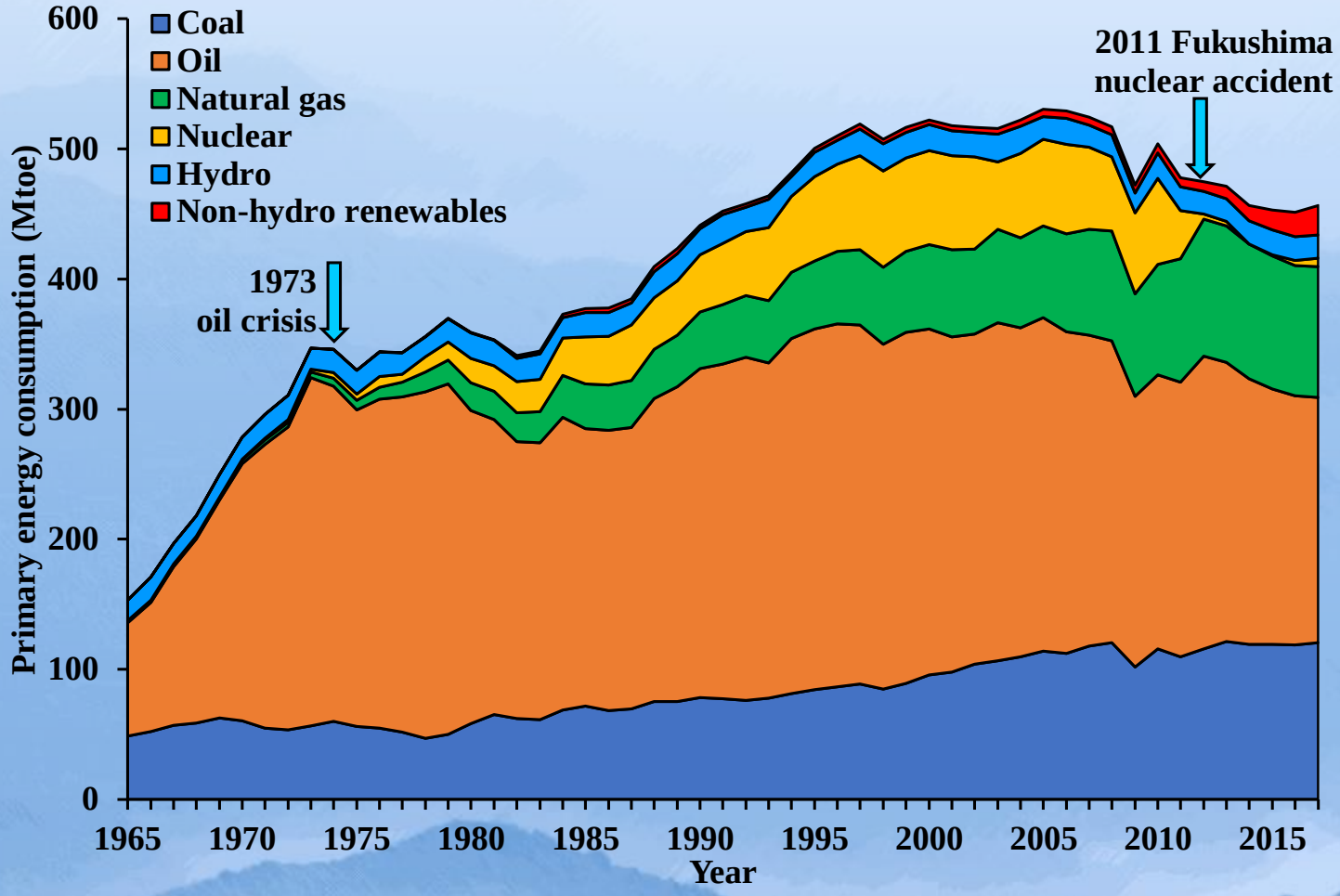
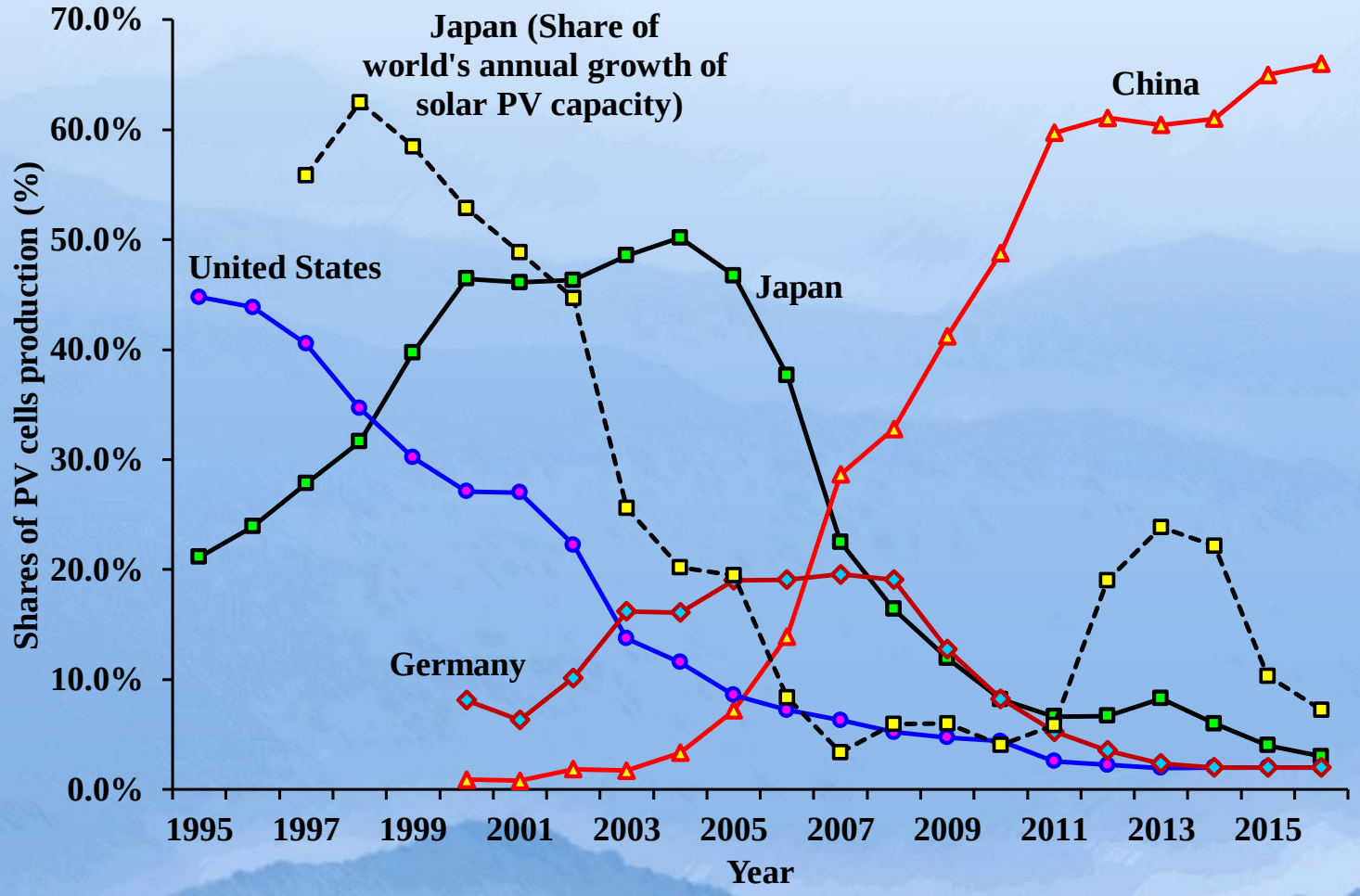
Bureaucracy and the first energy transition



The solar industry in rising global competition



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Independent power producers after Fukushima

Time constraints and energy crisis

Energy Type	Time needed from project preparation to FIT approval	Time needed from FIT approval to the start of operation
Biomass (5,000 kW)	1 year	2~3 year
Geothermal (30,000 kW)	3~4 year (environmental assessment)	3~4 year
Median- or small-scale Hydropower (1000 kW)	3 year (local agreement)	~5 year
Solar PV (10,000 kW)	1 year	1~1.5 year
Wind (20,000 kW)	3~4 year (environmental assessment)	1~3 year

Solar lobby and high feed-in-tariff

Feed-in Tariff

Energy type	2012	2013	2014	2015	2016
Solar PV (>10 kW)	40	36	32	29	24
Solar PV (<10 kW)	42	38	37	33	31
Onshore wind (> 20 kW)	22				
Onshore wind (<20 kW)	55				
Offshore wind	-	-	-	36	36
Geothermal (>15000 kW)	26				
Geothermal (<15000 kW)	40				
Hydro(1000kW~30000kW)	24				
Hydro (200kW~1000kW)	29				
Hydro (<200kW)	34				

Source: METI, 2017. Energy White Paper 2017. Tokyo, Japan

	Initial capital cost* ($/kW)	Capacity factor*	Electricity generation cost* ($/MWh)	FIT level** (¢/kWh)
Britain	1160	10%	130	16.5
China	1181	16%	102	14.3~15.8
France	1050	14%	93	10.6 (biding price)
Germany	1000	11%	103	8.9 (biding price)
India	898	19%	90	7.7~9.2
Japan	2205	14%	192	22.5
Turkey	1240	16%	122	13.3

Source: METI, 2016