
DEVELOPING NATIONS

Moira Tagle, Physics 80, April 5, 2010



Electricity Usage

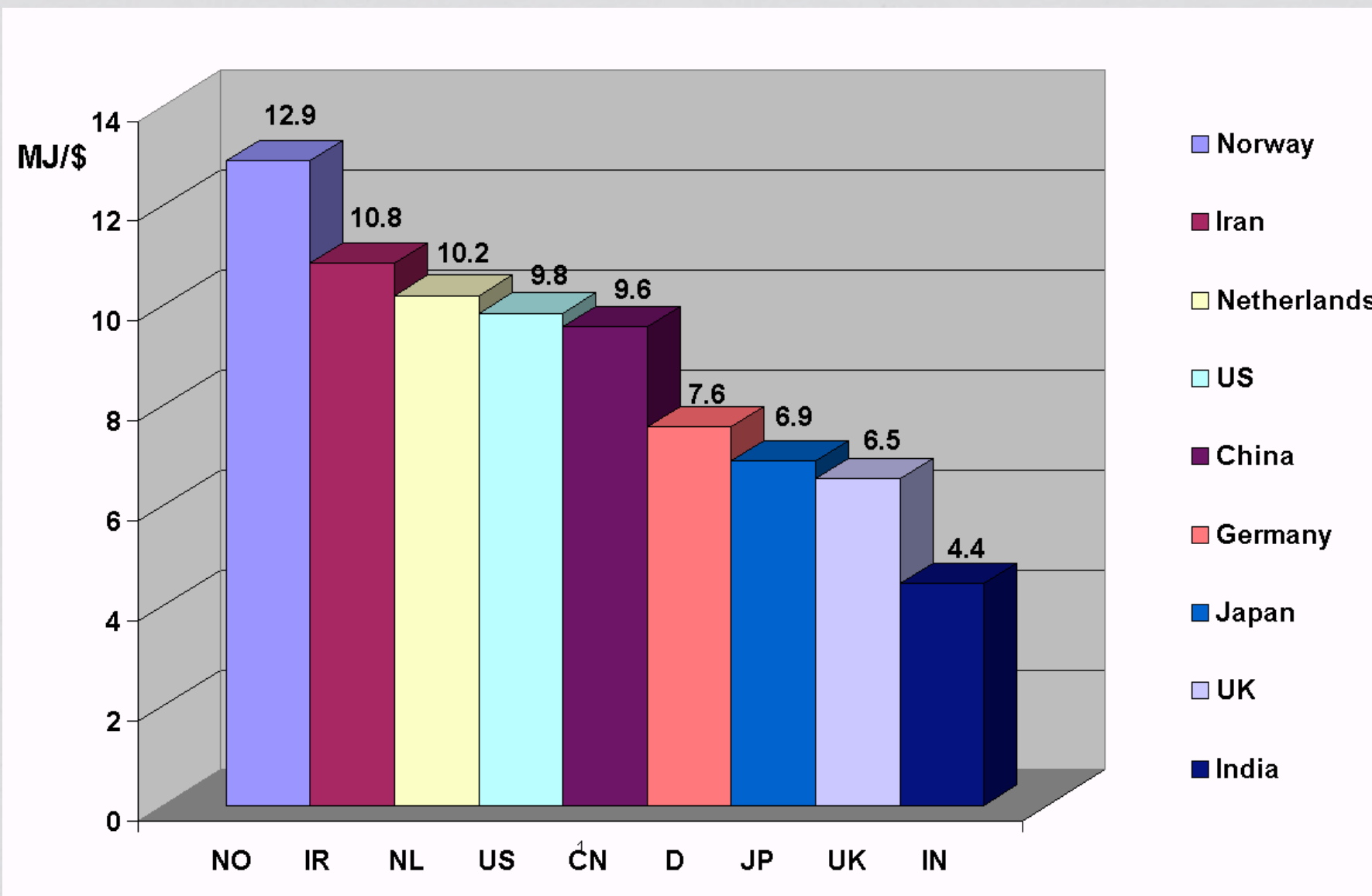
rank	country	total (MWh/yr)
1	USA	$38.1 * 10^8$
2	China	$36.4 * 10^8$
3	Russia	$9.9 * 10^8$
4	Japan	$9.7 * 10^8$
5	Germany	$5.9 * 10^8$
6	Canada	$5.4 * 10^8$
7	India	$4.9 * 10^8$
8	France	$4.5 * 10^8$
10	Brazil	$3.7 * 10^8$

rank	country	W per capita
1	Iceland	3152
2	Norway	2812
3	Finland	1918
4	Canada	1910
9	USA	1460
26	Russia	785
69	China	277
88	Brazil	226
133	India	50.5

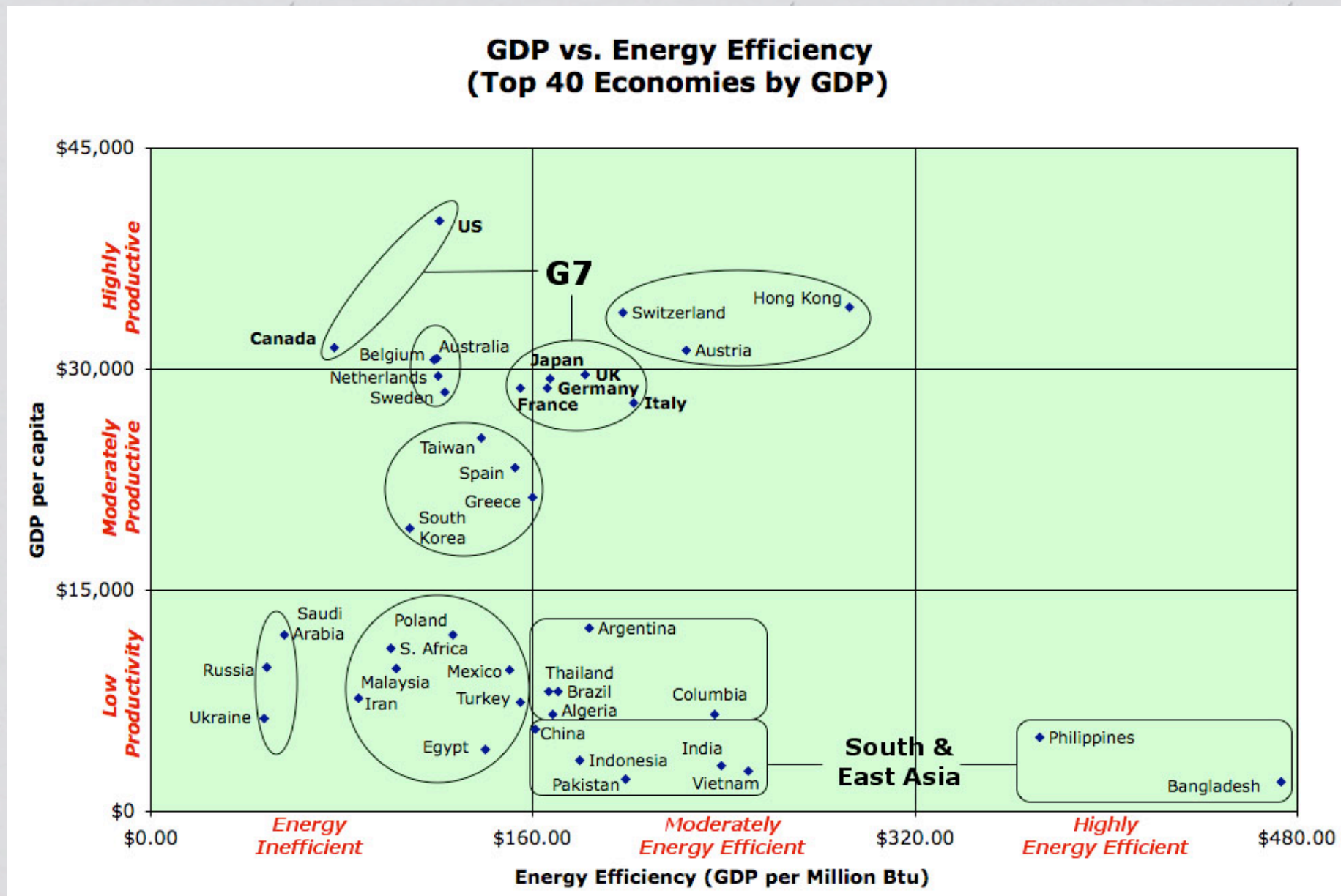
Total Energy Usage

rank	country	W per capita
1	Quatar	28495
2	Iceland	15606
3	UAE	14035
4	Bahrain	13651
9	Canada	11055
10	USA	10381
73	China	1516
76	Brazil	1421
109	India	682

Energy Intensity



More Energy Intensity



But is Energy Intensity fair?

- * Developing countries have low standards of living, so not as much energy of their total energy is used for personal/residential reasons.
- * What if we just look at the ratio of energy used for commercial ventures and leave out residential usage?

Math!

	total energy usage (MT OE)	“industrial” %	GDP	population	“industrial” energy per GDP per cap.
USA	2269985	79%	14270000	308,996,000	$3.95 * 10^{-8}$
China	1088349	58%	4758000	1,336,750,000	$9.92 * 10^{-11}$
India	480418	43%	1243000	1,179,111,000	$1.41 * 10^{-10}$
Brazil	179701	84%	1482000	192,728,000	$5.28 * 10^{-10}$

GDP, Population: CIA Factbook

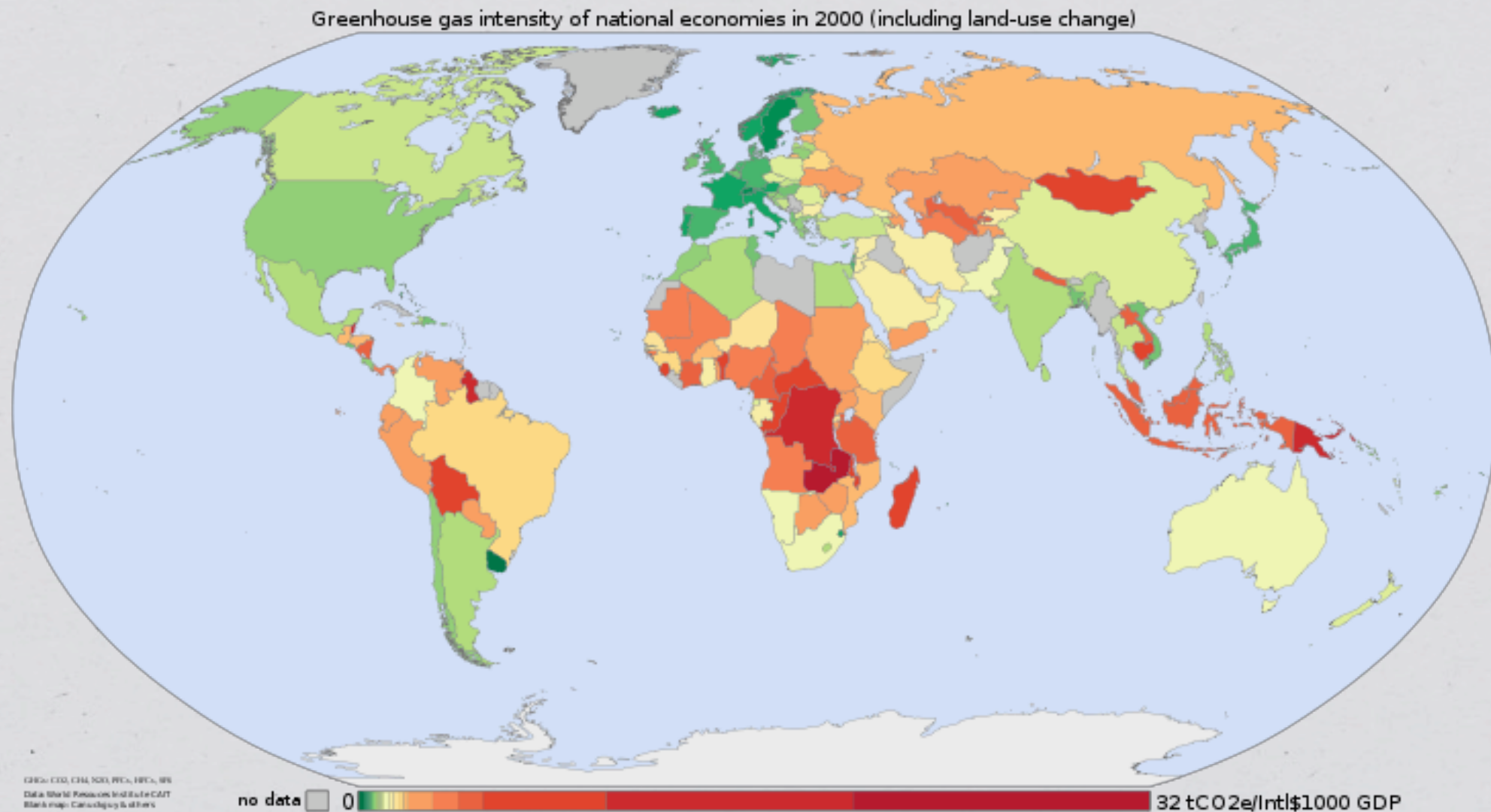
Energy Data: World Resources Institute: Earth Trends

Energy Use Changes

rank	country	pCap %d 1990
1	Qatar	101%
2	Iceland	4%
3	UAE	19%
4	Bahrain	29%
9	Canada	4%
10	USA	5%
73	China	19%
76	Brazil	14%
109	India	14%

country	E.Inten %d 1990
Norway	-9%
Iran	8%
Netherlands	-13%
USA	-10%
China	-46%
Germany	-17%
Japan	5%
UK	-10%
India	-18%

GHG Intensity

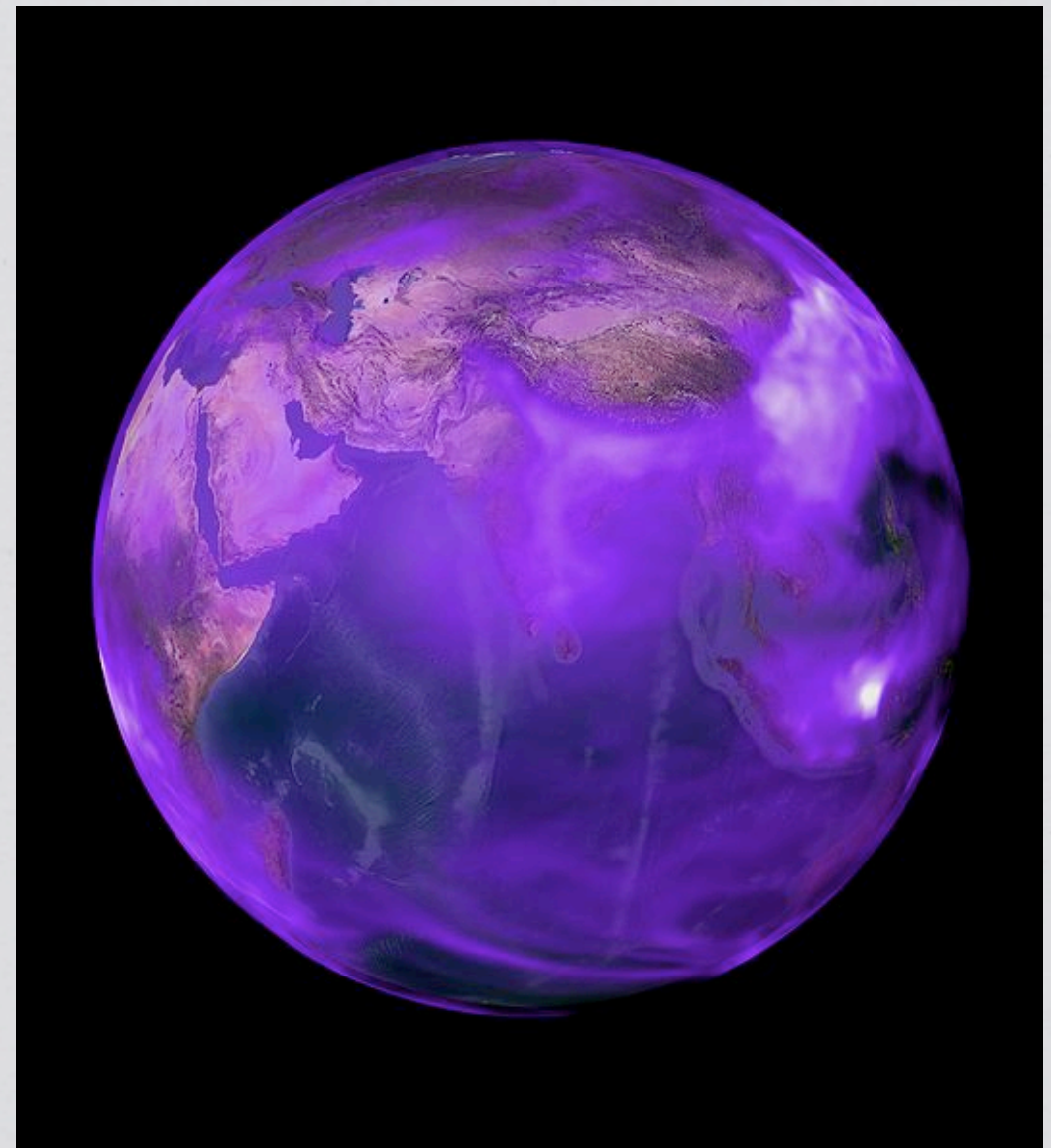


Some Criticisms of Emission Intensity

- * CO₂ emissions are fairly easy to calculate...
- * But other emissions are not! The better the technology, the more complete the combustions, the less pollutant is put into the atmosphere, but this is very difficult to calculate.
- * From 1990 to 2000 Emission Intensity in the USA declined by 17%, but emissions increased by 14%.
- * U.S. National Environmental trust, 2002: “[Emission Intensity is] a bookkeeping trick which allows the administration to do nothing about global warming while unsafe levels of emissions continue to rise.”

Black Carbon

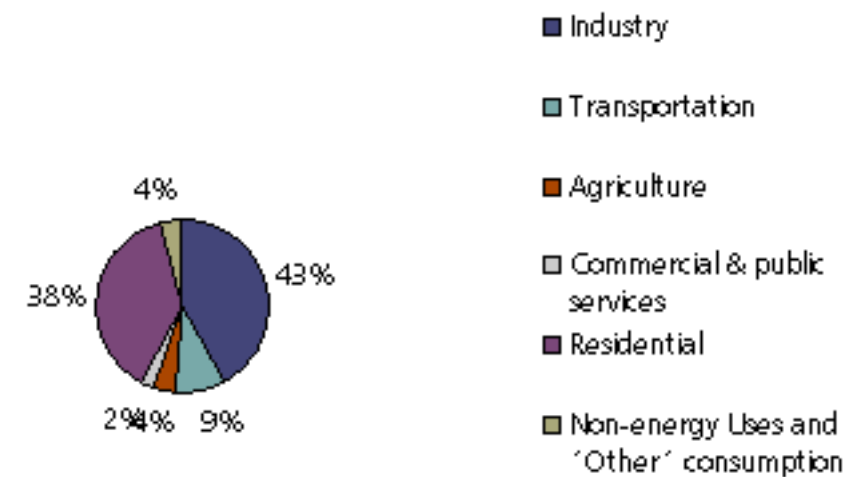
- * Black Carbon is atmospheric soot left from the incomplete combustion of fossil fuels, biofuel and biomass.
- * Very short atmospheric lifetime (a few weeks compared to over a century for CO₂).
- * high radioactive forcing (especially over ice)



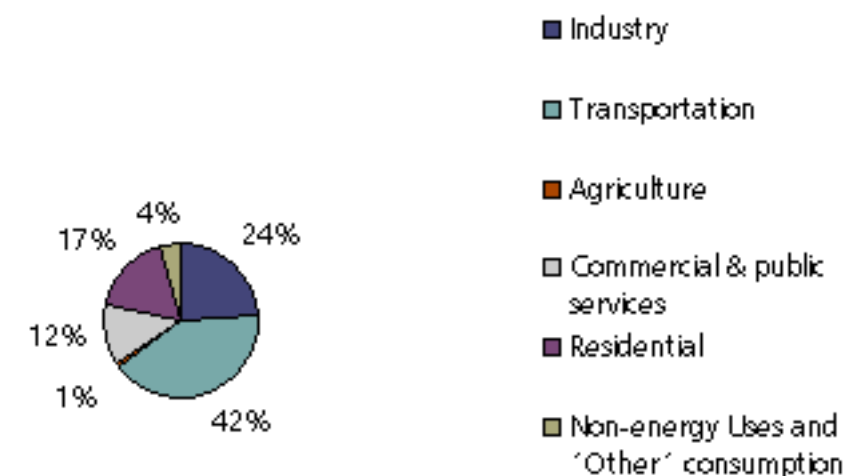
China vs US

* is China doing some things
RIGHT that the US is doing
WRONG?

Energy Consumption by Sector, China, 1999



Energy Consumption by Sector, United States, 1999



Vehicle Efficiency Standards!

- * In 2015 a car in China will need to reach 42.2 mpg to hit fuel economy standards.
- * In 2016 a car in the US will need to reach 35.5 mpg to hit fuel economy standards.
- * The US's actual average in 2004 was 24.6 mpg. If we adopted China's fuel efficiency standards, this would amount to over a 20% reduction in our TOTAL energy usage, across all sectors.

The Effect of Global Warming on Developing Nations

- * “Developing countries are the most vulnerable to climate change impacts because they have fewer resources to adapt. [...] Climate change is anticipated to have far reaching effects on the sustainable development of developing countries.”

The Effect of Global Warming on Developing Nations

- * South America:

- * Decreased freshwater availability (between 7 and 77 million affected by 2020s)
- * By 2050, 50% of crop lands are very likely to be subjected to desertification and salinization.
- * Strength of tropical storms are likely to increase, causing increased mortality and social instability.

The Effect of Global Warming on Developing Nations

* Asia:

- * Decreased freshwater availability (approximately 1 billion people could be affected by 2050)
- * Increased chance of flooding from glacial melts.
- * Decrease in crop yield in many parts of Asia (up to 30% in central and south Asia)
- * Increased mortality from diseases such as cholera and diarrheal disease.
- * Tens of millions could be displaced by rises in the sea level in south and southeast Asia.

Conclusions!