



Transport, Environment and Institutions: Why Good Science and Engineering Fail

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Economic Issue: Transport is a Derived, Not A Primary, Demand

- Transport serves more basic needs
- Each mode has specific time, cost, frequency, reliability, access/egress
- Urban passenger partly cost, but also time, frequency and access
- Tradeoffs determine outcome: energy (CO₂) can be minor factor. "Benefits" market determined
- Market forces do matter, but may not yield the desired outcome for CO₂ or other social benefits

Energy Costs As Percent of Operating Costs

Freight

Truck	13
Rail	20

Passenger

Auto*	11-20
Rail (Amtrak)	19
Bus	9
Commuter Rail	9
Heavy rail	7
Air (SWA)	30

*Ownership costs only

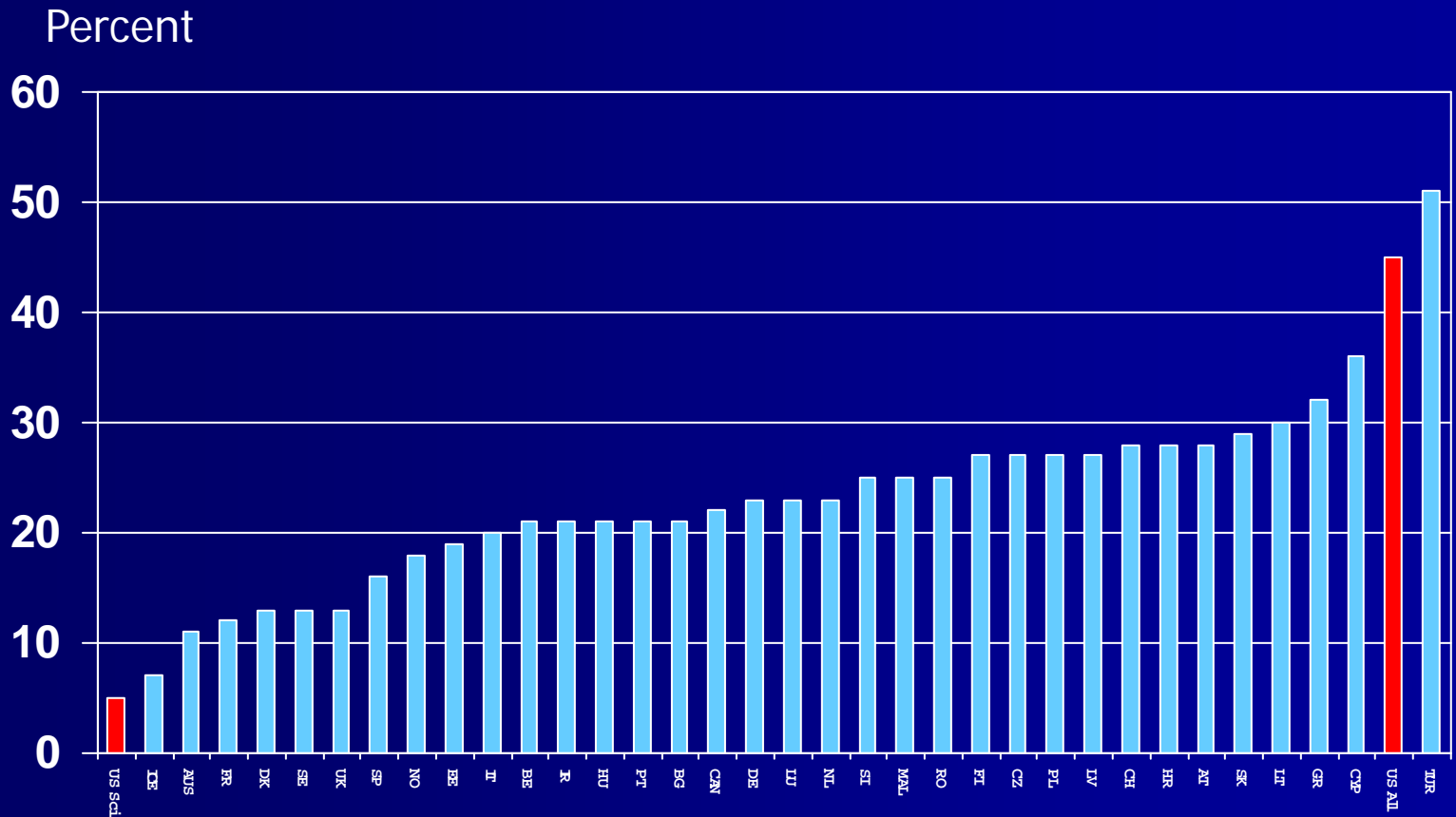
Non-Market Aspects of Transport Are Complex

- "Benefits" hard to quantify:
 - CO₂ (in addition to energy value)
 - "Pollutants" (CO, SO_x, HC, PM_{10,2.5})
 - "Congestion" and Noise
 - Urban form/density/productivity
 - Safety
- Must be incorporated through the policy/political process

Complex Benefits: Experts May Understand, Politicians And Public Can't or Won't

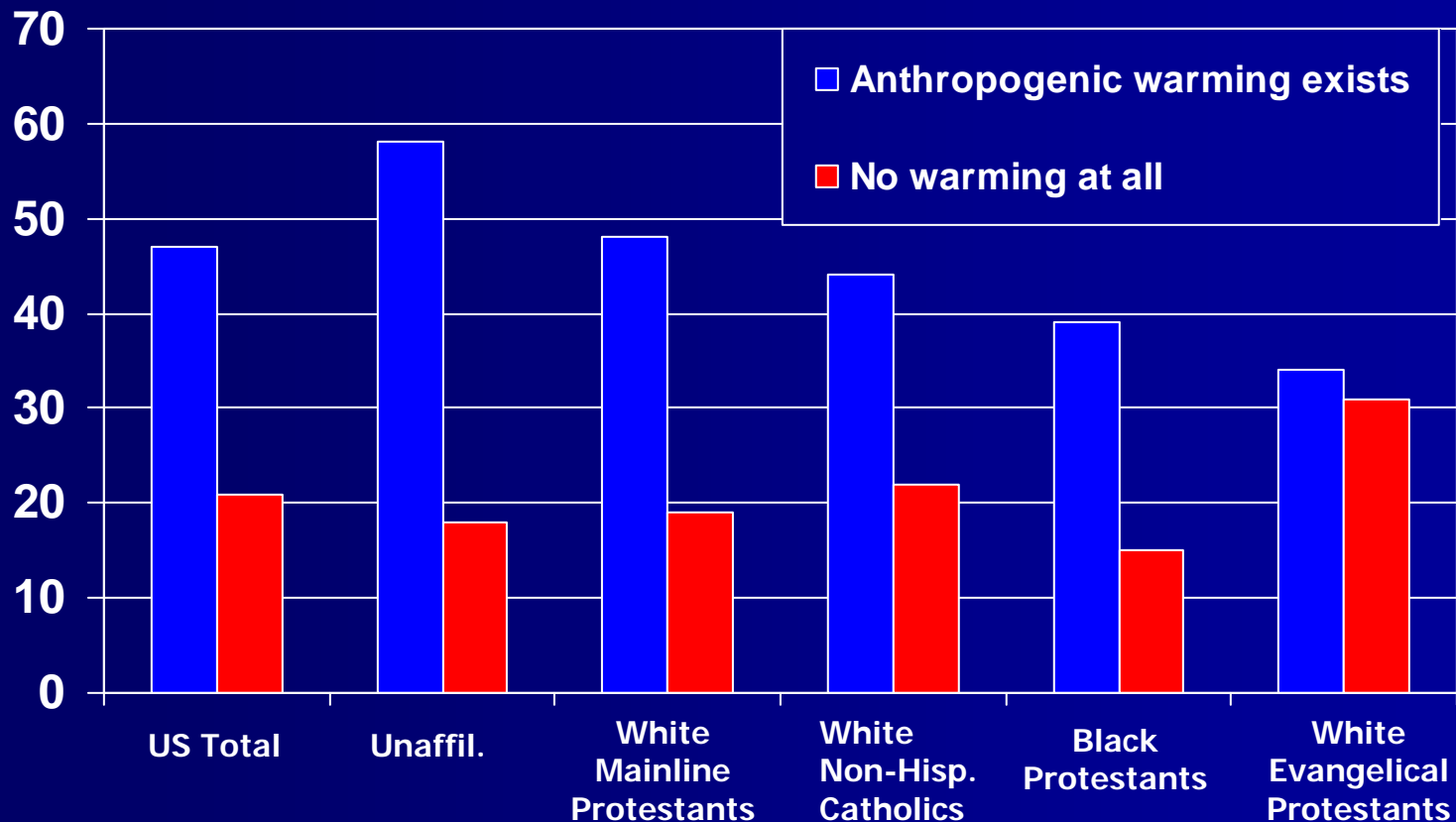
- Information availability (web helping)
- Level of education and expertise
- Cultural/religious values. "The public perception of scientific ideas depends largely on two factors: people's ability to grasp factual information and the cultural lens through which that information is filtered." Nature, 29/10/2009, pg 1173.
- Winners vs losers (losers usually win)
- Politically determined "price signals" distort understanding as well as markets ("affordable" fuel, peak pricing versus "Lexus Lanes")

Percent Who Reject Evolution



Faith in Global Warming

Percent

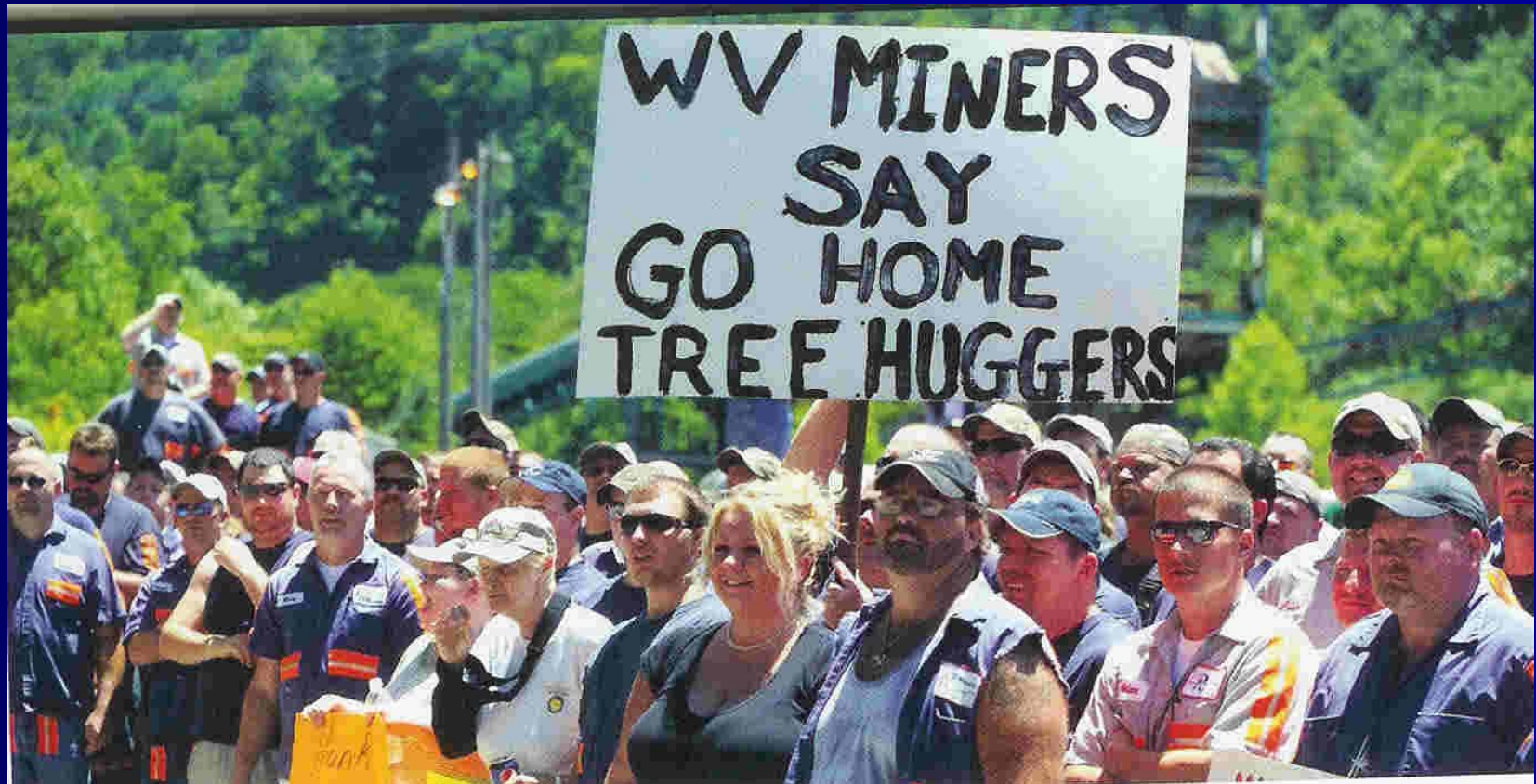


Source: Pew research, April 16, 2009

Bizarre Behavior

- A reasonable statement: "There is solid evidence the earth is warming."
- In April 2008, 71% of US agreed
- In October 2009, 57% of US agreed

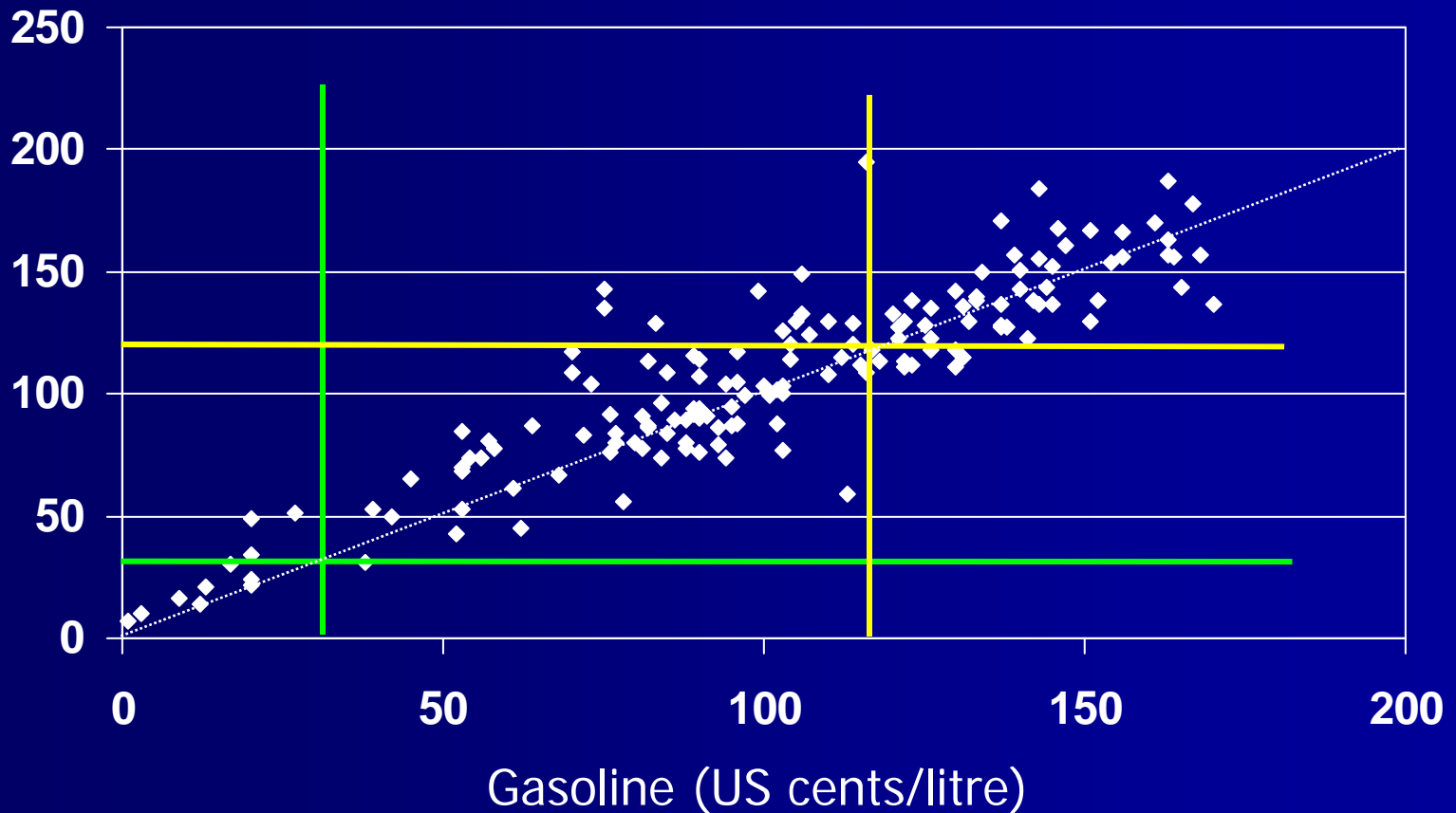
Losers Versus Winners



Fuel Price Variations: The Impact of Tax Policy

(Nov 2008)

Diesel (US cents/litre)



Source: GTZ International Fuel Prices 2008

Implementation Is Always Lacking Everywhere

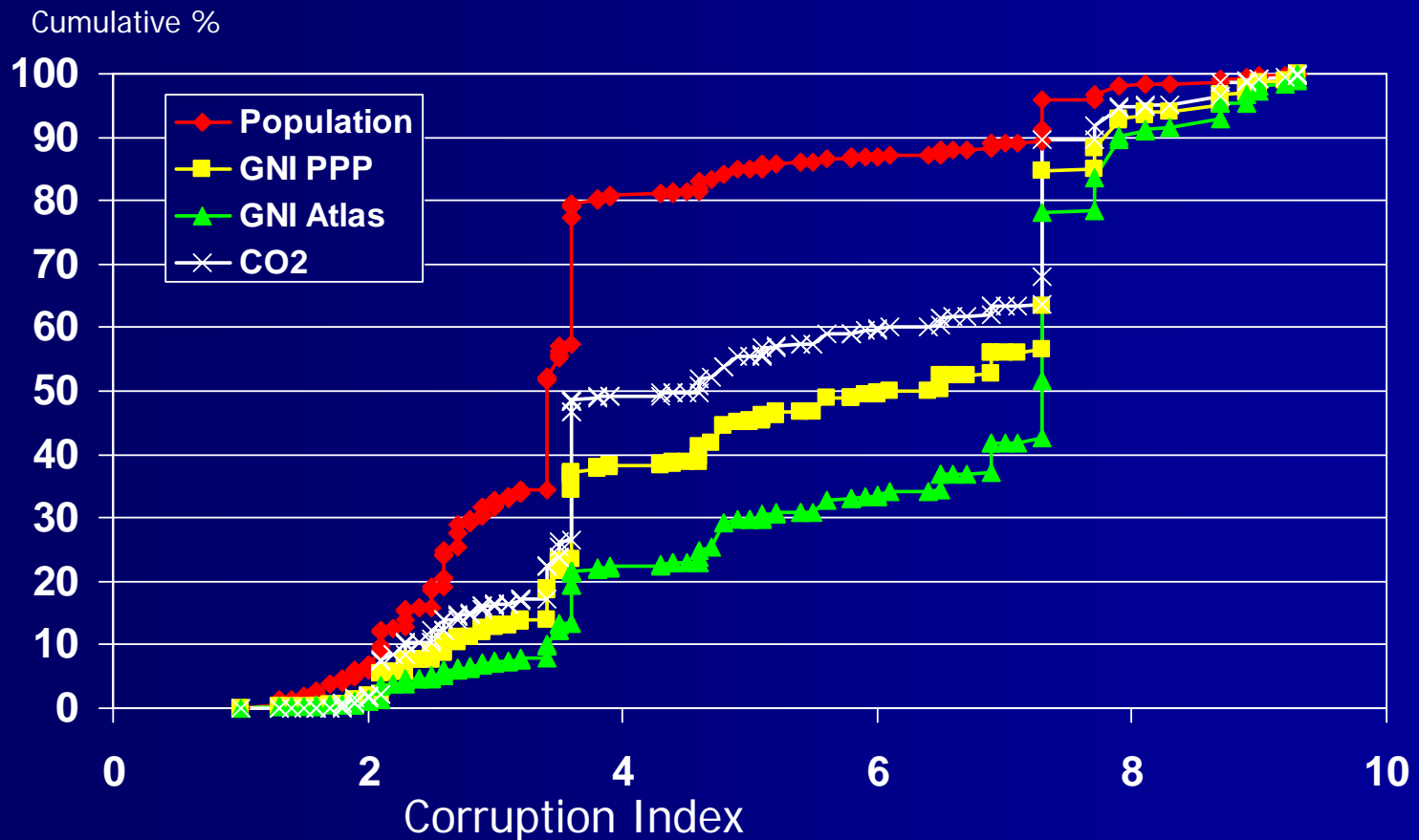
- Ambition first, reality later: promoters start what builders can't deliver
- "Megaprojects" with multiple and conflicting objectives
- Corruption a major factor

Ambition (or Worse): Cost and Demand Experience For Megaprojects

Project	Construction Cost Overrun (%)	Initial Traffic as % of Forecast
Humber Bridge UK	175	25
Channel Tunnel UK/FR	80	18
Baltimore Metro US	60	40
Tyne & Wear Metro UK	55	50
Portland Metro US	55	45
Buffalo Metro US	50	30
Miami Metro US	35	15
Paris Nord TGV FR	25	25

Source: Flyvbjerg (2002)

Cumulative Percent of Population, PPP GNI, Atlas Method GNI and CO2 Emissions versus Corruption Index

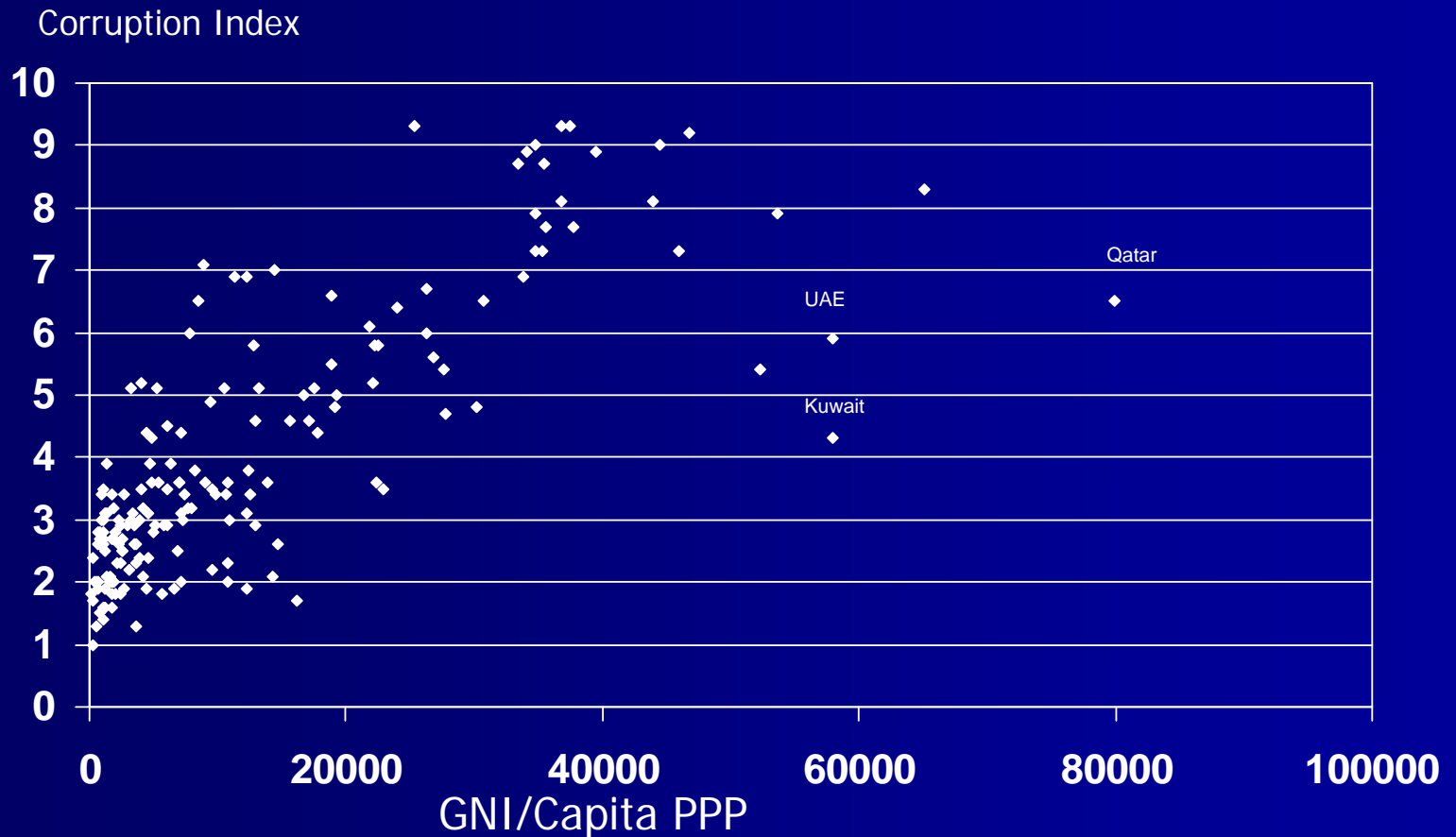


Note: 1 is totally corrupt, 10 would be completely non-corrupt

Corruption Index from Transparency International, economic data from World Bank

Discontinuities: Russia, India, China, US

Corruption Index versus PPP GNI/Capita



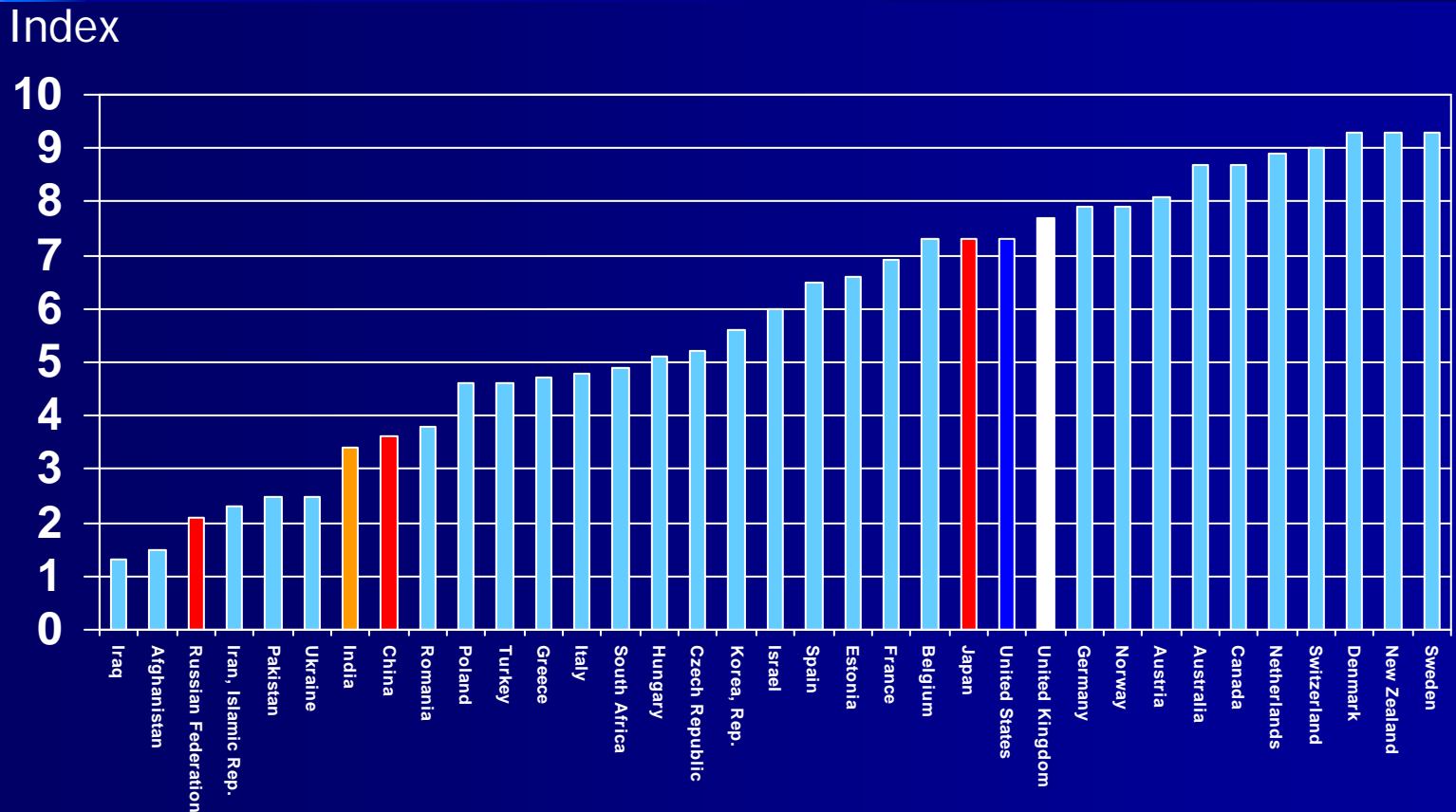
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Corruption Index from Transparency International economic data from World Bank

How To Respond?

- Shape the message to the REAL audience and repeat it (many times)
- Try to align science/engineering with economic principles. There are no purely scientific or engineering solutions!
- Only SIMPLE things can be implemented, and they will often be hijacked by promoters or opponents. Complexity is the enemy.
- Try to avoid despair (difficult)

Typical Corruption Indices



Note: 1 is totally corrupt, 10 would be completely non-corrupt