

Fred R. Conrad/The New York Times

Plan

- Context
- Two scenarios – to consider scale of emission cuts required
- Some brief policy implications

Context: two key trends driving our world

Climate change

Energy transformation

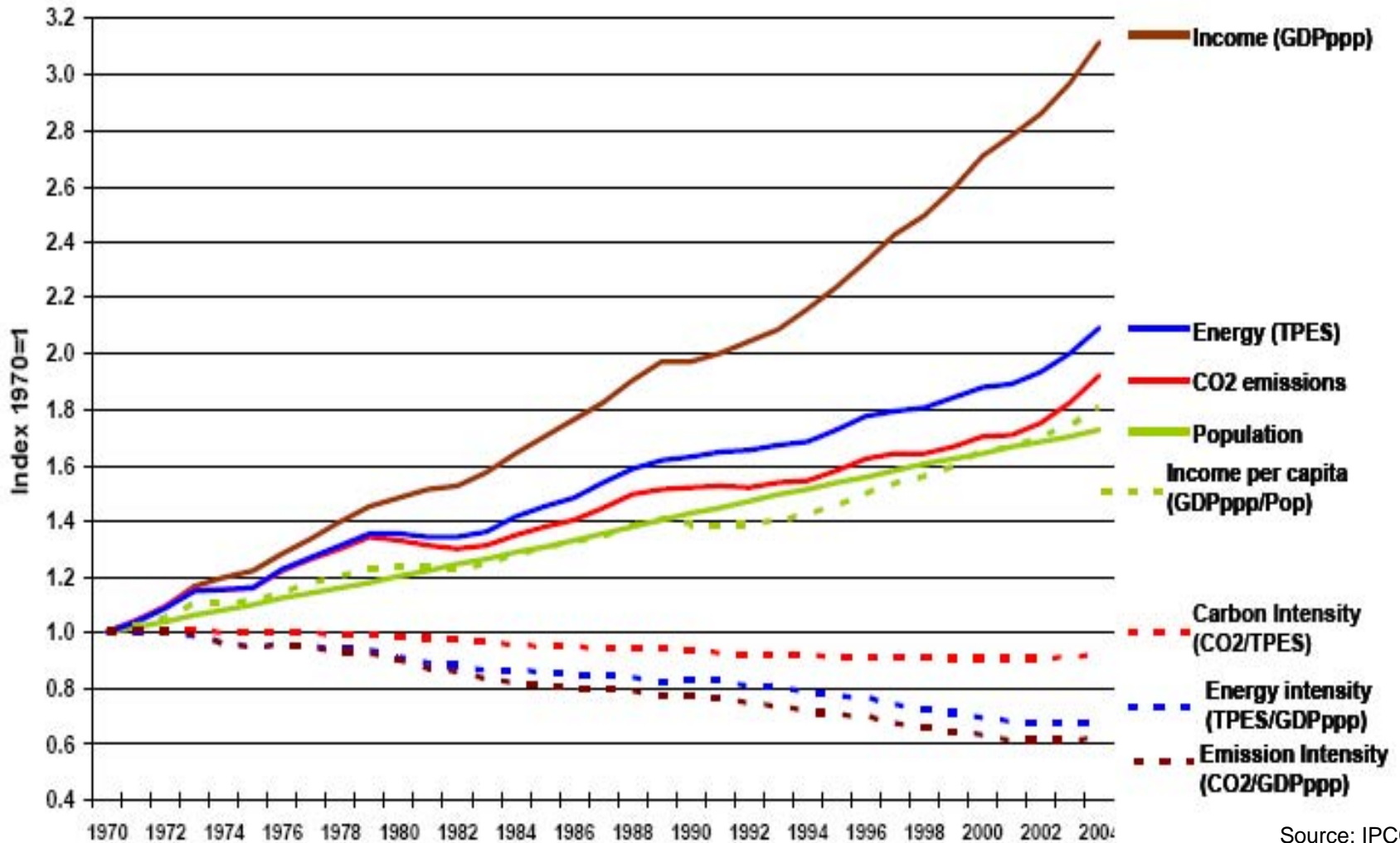


Source: [NASA-GSFC](#)



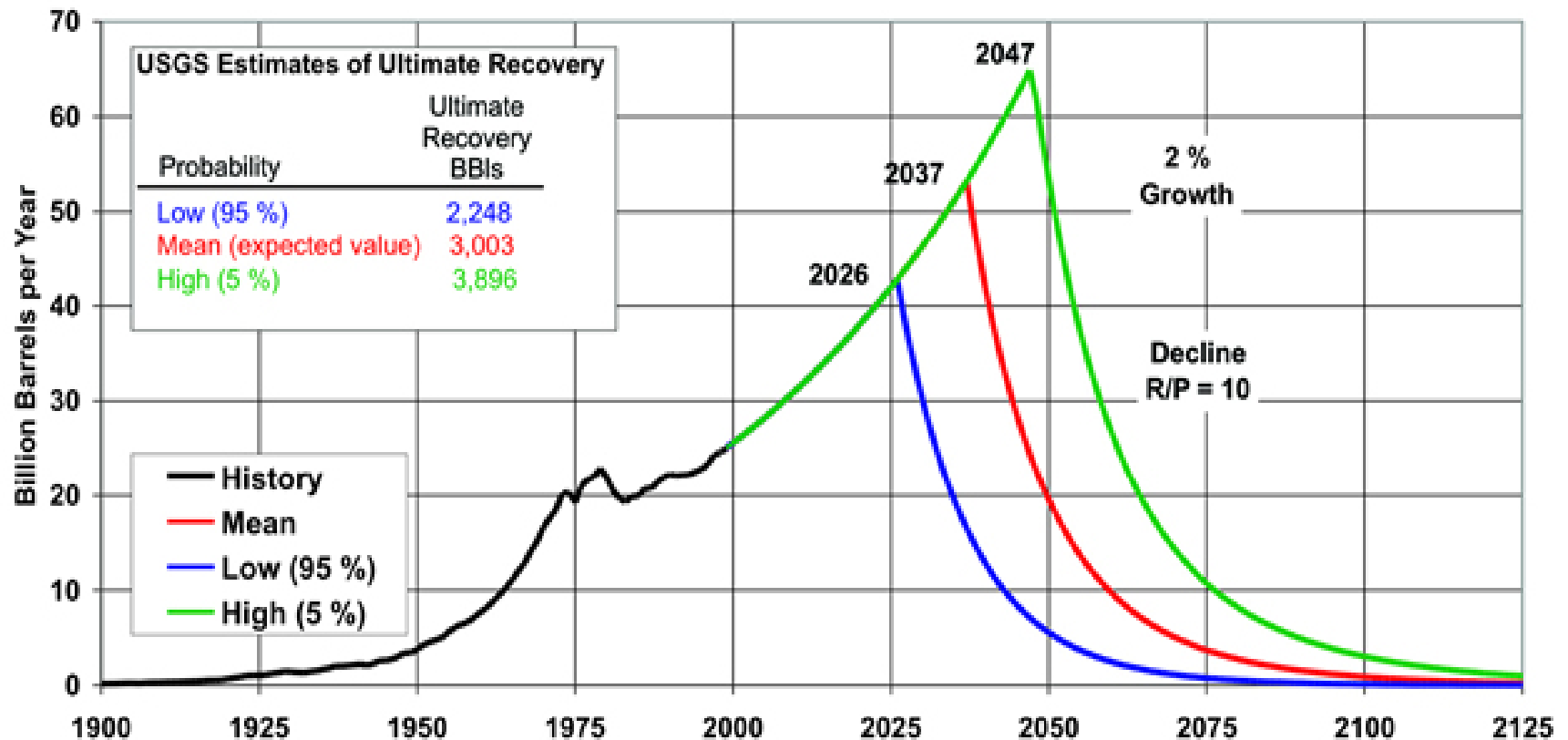
Maple Ridge Wind Farm: Tug Hill, New York
Copyright © 2006 PPM Energy and Horizon Wind Energy

The long addiction we have to break



Peak oil? Even US EIA projections see precipitous drops before long

Figure 2. Annual Production Scenarios with 2 Percent Growth Rates and Different Resource Levels (Decline R/P=10)



Source: Energy Information Administration

Note: U.S. volumes were added to the USGS foreign volumes to obtain world totals.

An IEA view: the need to rethink energy supply and demand

“China and India are transforming our energy markets. We have a window of opportunity of 5 to 10 years before it becomes unsustainable and irreversible.”

- IEA chief economist Fatih Birol (Nov 07)

Nature of the energy transition

- Previous energy transitions (wood to coal, coal to oil, etc.) were gradual and evolutionary; oil peaking will be **abrupt and revolutionary**
- Without massive mitigation at least a decade **before** the fact, the problem will be pervasive and long lasting
- Countries that dawdle will suffer from lost opportunities... in every crisis, there are always **opportunities** for those that act decisively

- Robert Hirsch, 2005

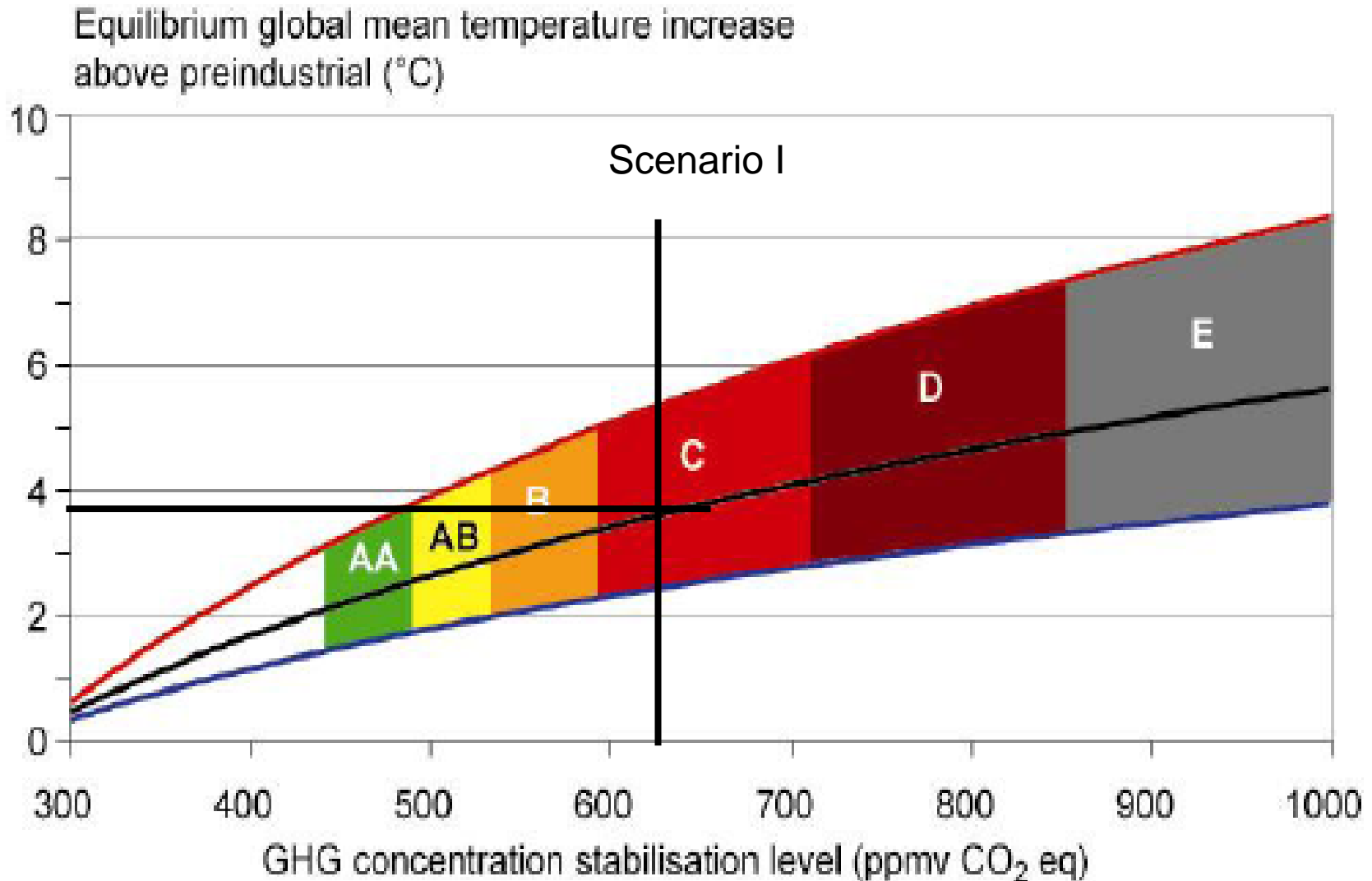
Two climate scenarios – to 2050 and beyond

- Not predictions
- Illustrative conjectures
- Tied to IPCC science

Scenario I

- **Developed** countries like NZ make GHG cuts of ~10% (v. 1990) by 2020, and **55%** cuts by 2050
- 'Peak oil' provides much of the impetus for cuts in oil and gas use, but **coal is used** as a buffer
- **Global** emissions fall more slowly:
~30% by 2050
- Concentrations projected to reach **600- 650 ppm** CO₂e

Temp. increases under scenario I... well over 3°C, perhaps 4°C

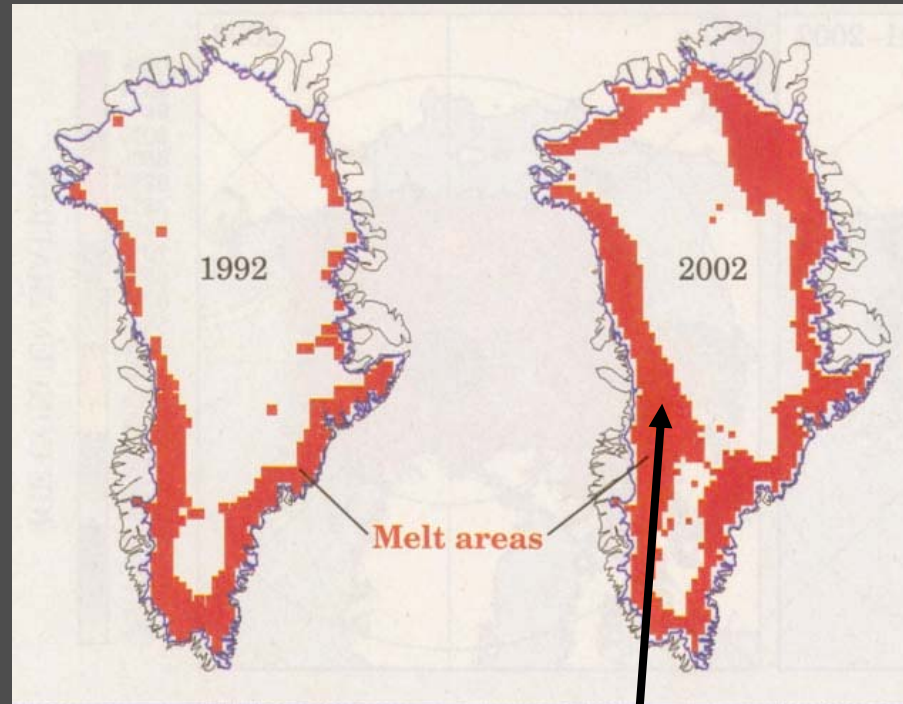




Scientists project Greenland ice sheet, WAIS and many Himalayan glaciers largely committed to melting

Melt area on Greenland goes on growing

(Source: Hansen, 2007)



70 meters thinning in 5 years

Satellite-era record melt of 2002 was exceeded in 2005

Source: Waleed Abdalati, Goddard Space Flight Center

Arctic sea ice – greater summer melting

Current Ice Extent
09/03/2007

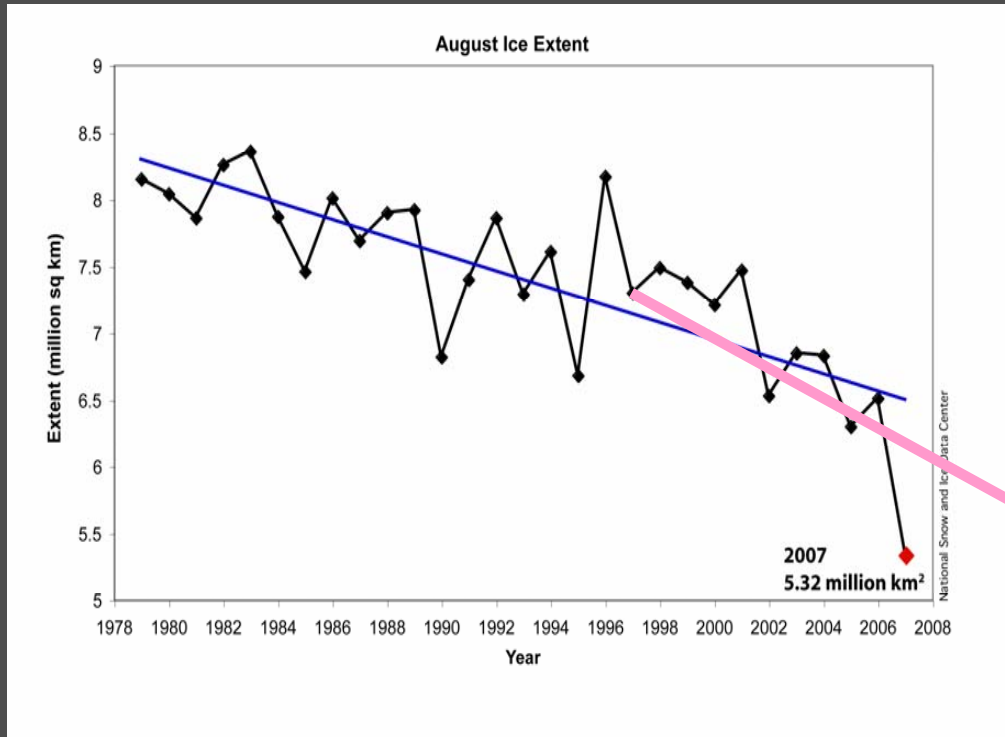


National Snow and Ice Data Center, Boulder, CO

 median
ice edge

Total extent = 4.4 million sq km

The last decade's accelerating sea ice melt continues to accelerate



“The shrinking of summertime ice is about thirty years ahead of the climate model projections,” - NSIDC scientist and co-author Ted Scambos, April 2007

Zero?

2030?

Scenario I implications

- A physical “commitment” to large global temperature increase: **~3.5 - 4°C**
- Greenland ice sheet and WAIS pass tipping points and scientists agree that we are **committed** to a **more than 12 metre** rise in sea levels (slow, but inexorable)

Civilisation says goodbye to many low-lying world cities, or parts of them

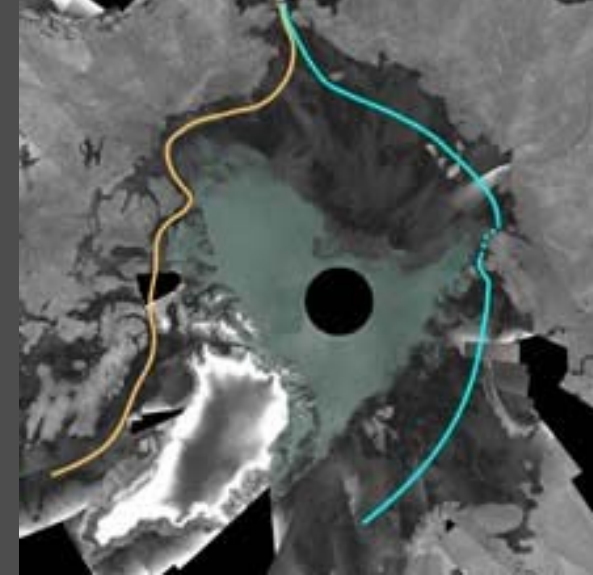


Photograph: Martin Argles



Photograph: AP

New oil fields and sea passages open



- Melting ice and new technology allows oil and gas drilling in the Arctic
- Despite major opposition, new oil fields open in Canada, Russia, Alaska
- Northwest passage increases trade and energy use

Scenario I: the impact of 3.5 - 4°C

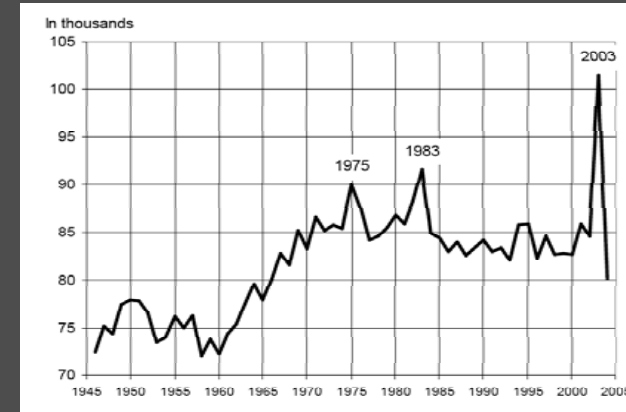
Many millions of people are flooded **every year** due to sea-level rise by the 2080s. Densely-populated and low-lying areas where adaptive capacity is relatively low, and which already face other challenges such as tropical storms or local coastal subsidence, suffer most ... [and] **small islands are especially vulnerable**



Tuvalu - Funafuti main road

Scenario I: some health effects

- Europe's 2003 heatwave (~30,000 deaths) becomes commonplace: it occurs **every second summer**
- Mortality impact worldwide doubles from present levels: over 300,000 people die every year from the side-effects of climate change



Scenario I: sinks & species

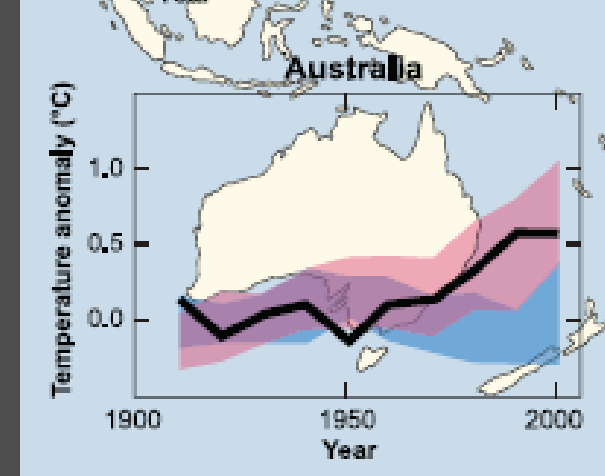
- Net carbon uptake by terrestrial ecosystems peaks by 2050 falls to zero, and forest fires **amplify** climate change
- Approximately 30% of plant and animal species assessed so far move steadily **closer to extinction**



Tony Karumba/AFP



Particular results for Aus & NZ



- As a result of reduced precipitation and increased evaporation, **water security** problems intensify by 2030 in southern and eastern Australia and, in NZ, in Northland and some eastern regions
- By 2050, these regions are under substantial stress
- ‘Tropical diseases’ become temperate diseases – e.g. dengue fever, malaria

International security threatened



Source: Climate change news

- Political destabilisation spreads among dozens of developing countries under intense climate pressure by 2030 and worsens by 2050
- Transmission of instability to developed countries occurs through refugees, immigration pressures and other means...
- Collective and individual security is profoundly threatened, in New Zealand and elsewhere

Scenario II – a more positive story

- ‘Peak oil’ helps push a transformation in the energy sector
- We and other countries pull out all stops to cut CO₂ emissions: 90% cuts in NZ emissions by 2050, and ~same elsewhere in developed world
- Carbon capture & storage (CCS) is used successfully to minimise impacts of coal use

Scenario II...

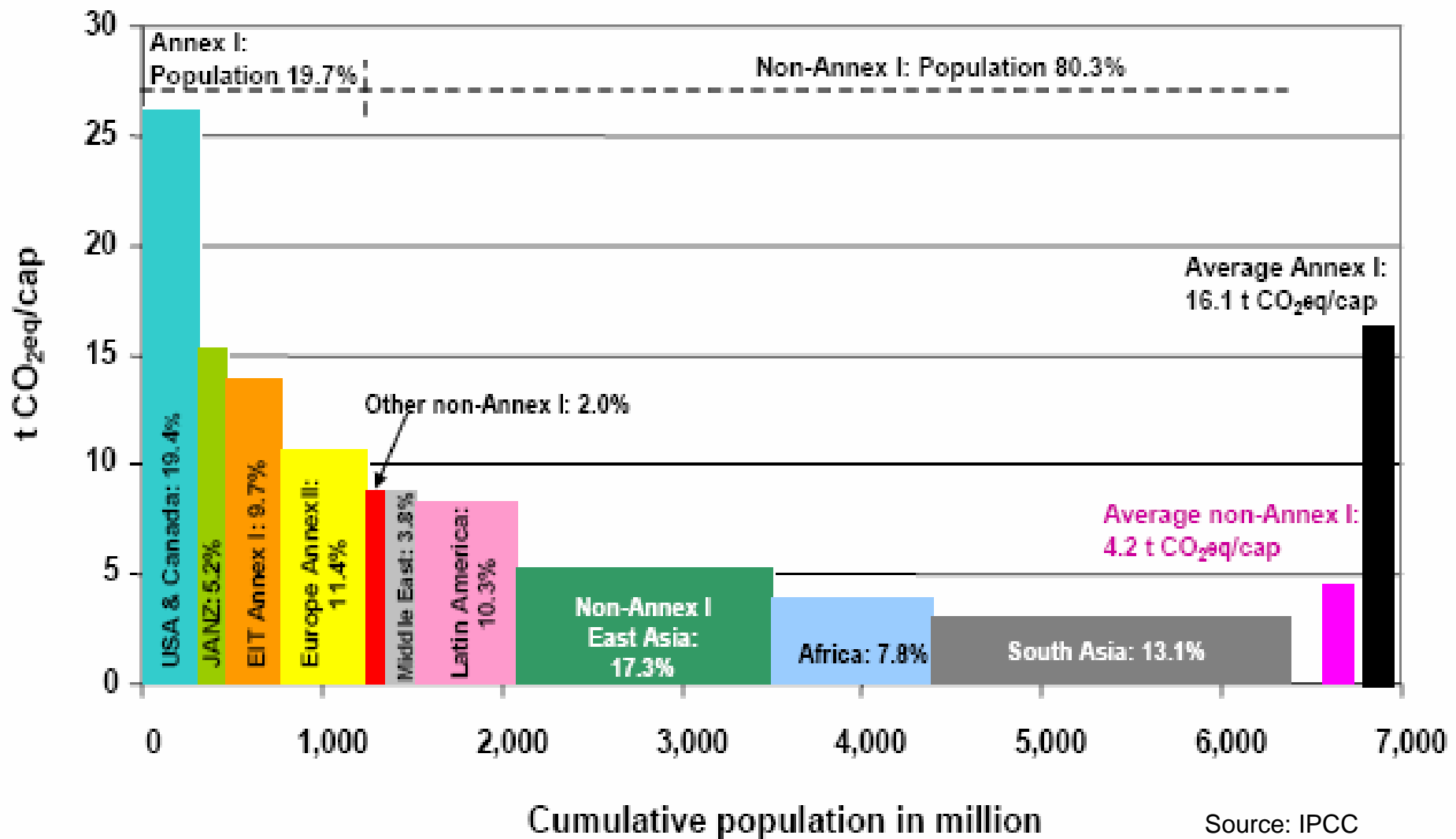
- Emission cuts stabilise CO₂e **around** 500ppm
- Climate sensitivity turns out to be slightly less than 'median' projection
- Temperature increase limited to **~2.7°C**
- Catastrophic Greenland ice sheet melting predicted to be only **narrowly averted**

Would the Greenland sheet melt?

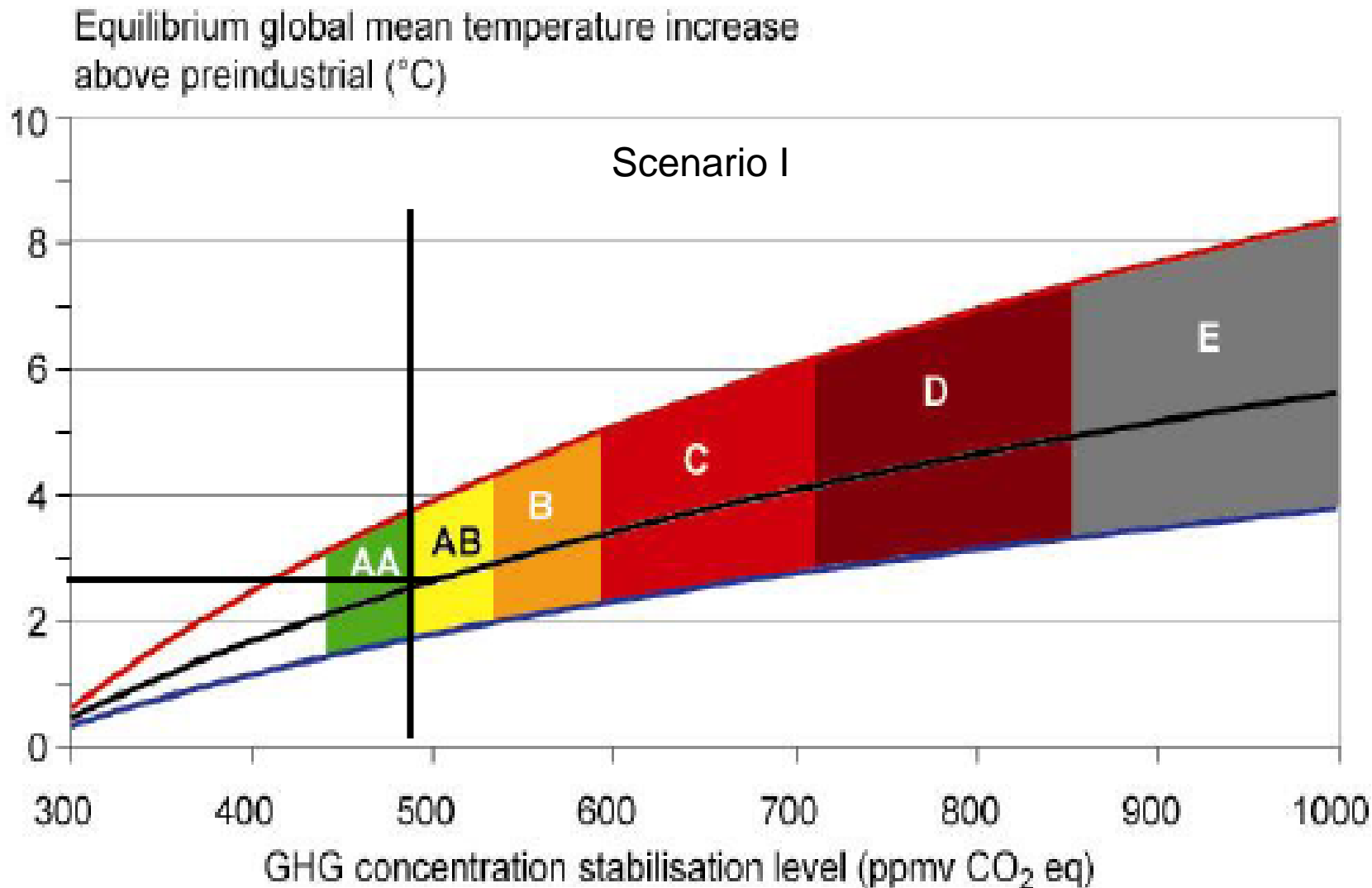
“Our **present** warming **commitment** alone seems insufficient to tip any of the elements we have identified. However, it could get us close to the threshold for irreversible melt of the Greenland ice sheet. ... If [we are **lucky** and] the threshold is further away (we estimate an upper limit of 2 °C [further] global warming) then mitigation would still need to be **extremely aggressive** to avoid it. “

– Lenton [UEA Norwich] (2007)

Ethics in action: emissions are cut to <2 tonnes per capita across the board



Temp. increases under scenario II



Scenario II

- Cost of emission cuts turns out to be in line with current models, i.e. around **3% of GDP** in 2030
- High co-benefits in range of areas provide offsetting savings
 - E.g. About 30% of projected GHG emissions in the building sector are avoided with net economic **benefit**

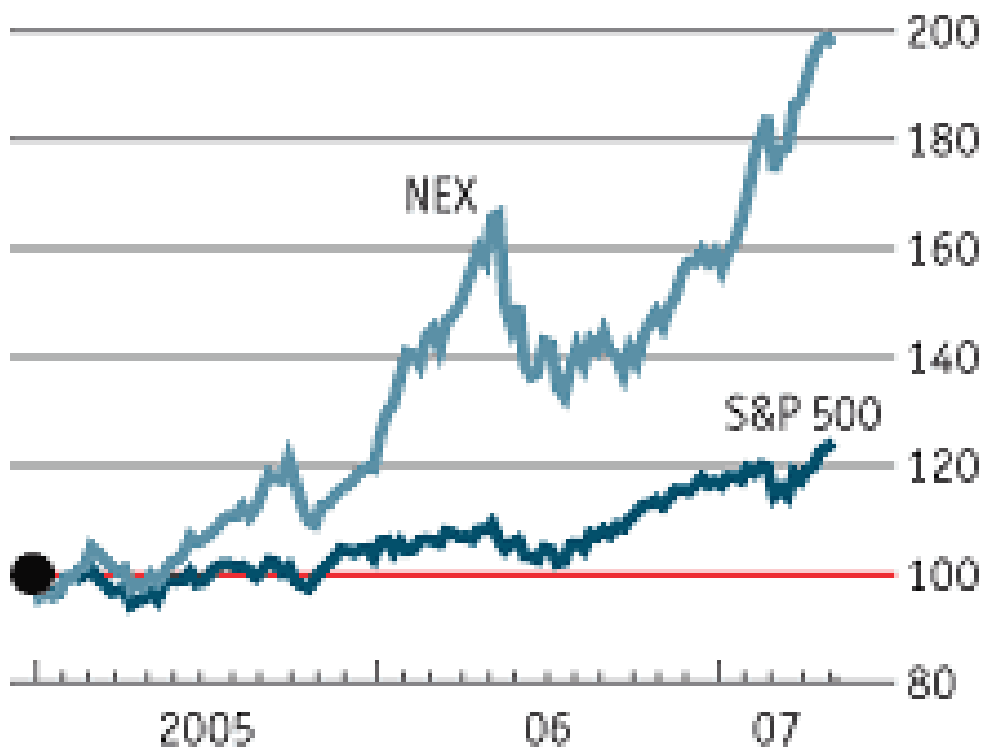
Scenario II continued

- New Zealand public gets behind **multi-party** effort to position NZ as a sustainable nation
- New Zealand achieves **100% “zero carbon” electricity** by 2030 – i.e. renewables and CCS where fossil fuels used
- Large investment in renewables spurs economy, develops export industries
- NZ successfully signals commitment to international community

Opportunities: NEX keeps doing well (represents clean-energy coys)

Greener, cleaner investors

Share prices, December 31st 2004=100



Sources: Thomson Datastream; New Energy Finance

NEX example:
Denmark's
Vestas: market
capitalisation of
\$12.5 billion

Source: The Economist
(2007)

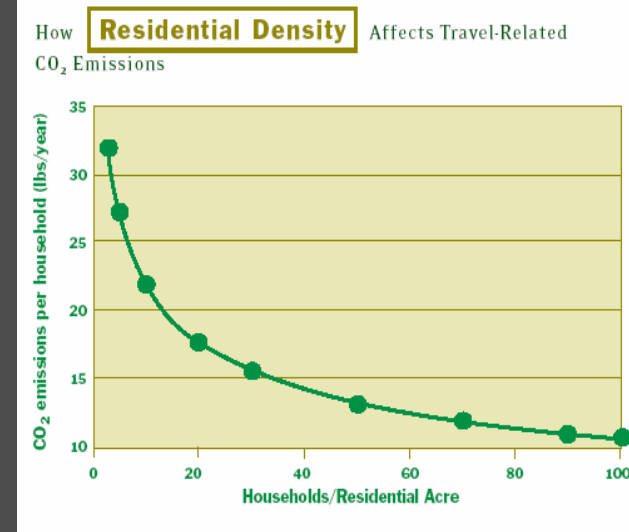
Scenario II continued



Source: Origin

- Big push to insulate housing and buildings
- Zero net energy new buildings become economic, as price of solar falls
- Innovation in heating systems improves efficiency, sustainability, occupant comfort and health

Scenario II ... possible implications for transport and urban design



- Transport in NZ switches to plug-in hybrids and 2nd generation biofuels
- Traffic generation by new roads minimised
- Cities gradually reshaped to focus around public transport nodes
- Public transport gets convenient & competitive
- Active travel modes – walking and cycling get major boost, helping solve obesity problem

Looking forward: policy implications



- Could we countenance Scenario I?
- How then do we manage Scenario II –type cuts (around 90%) in the transport sector?
- How do we allow for the risk of the ‘science’ being ‘worse than expected’?
- Focus on transition management
 - sense of urgency and direction
 - commitment to a sustainable society, economy and planet
 - willingness to seize opportunities & innovate

