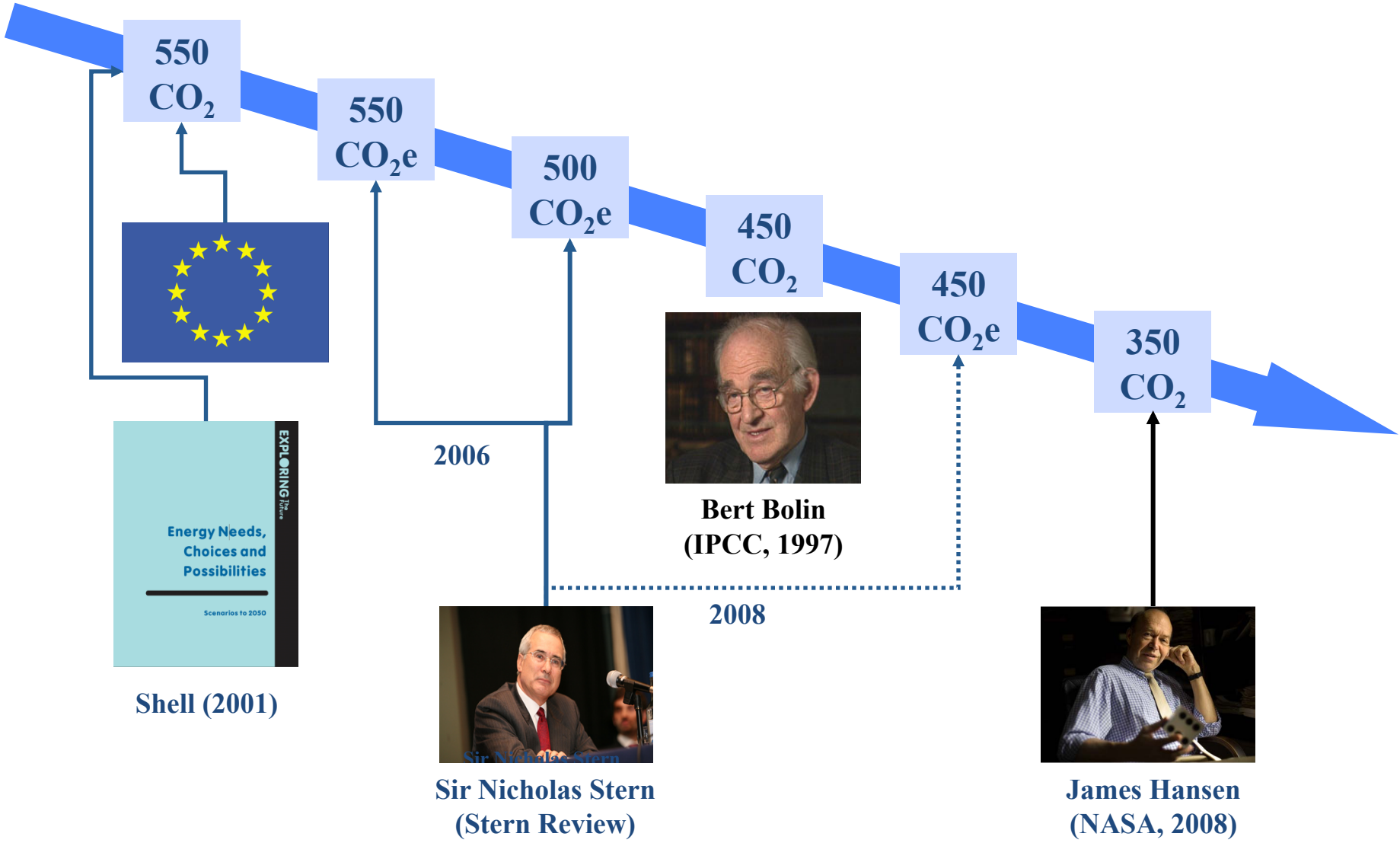
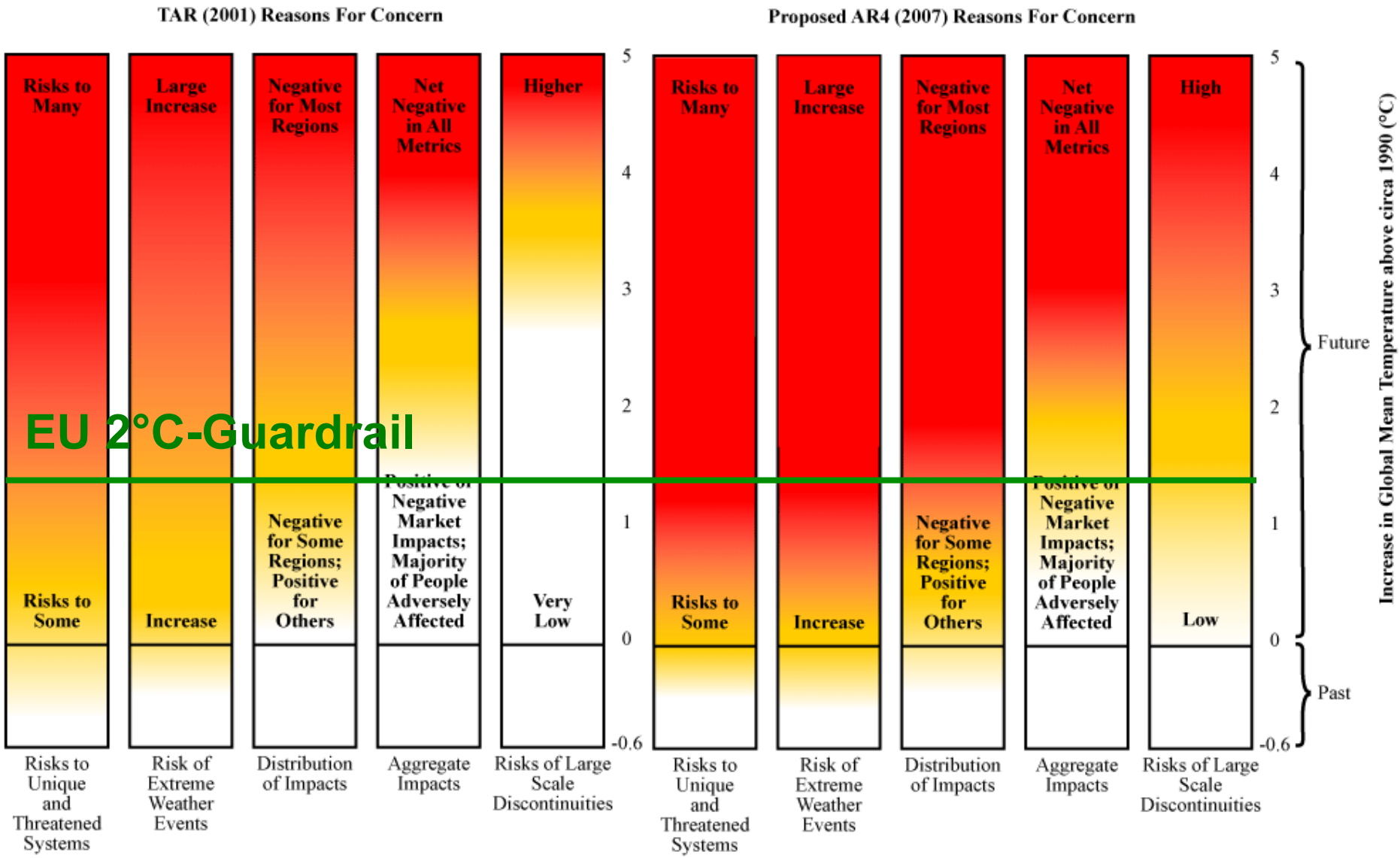

Global warming is a fact

Tightening Targets



Courtesy Martin Haigh (SXE)

Updated Reasons for Concern



(Smith et al. 2009 PNAS)

Tipping elements in the Earth's climate system

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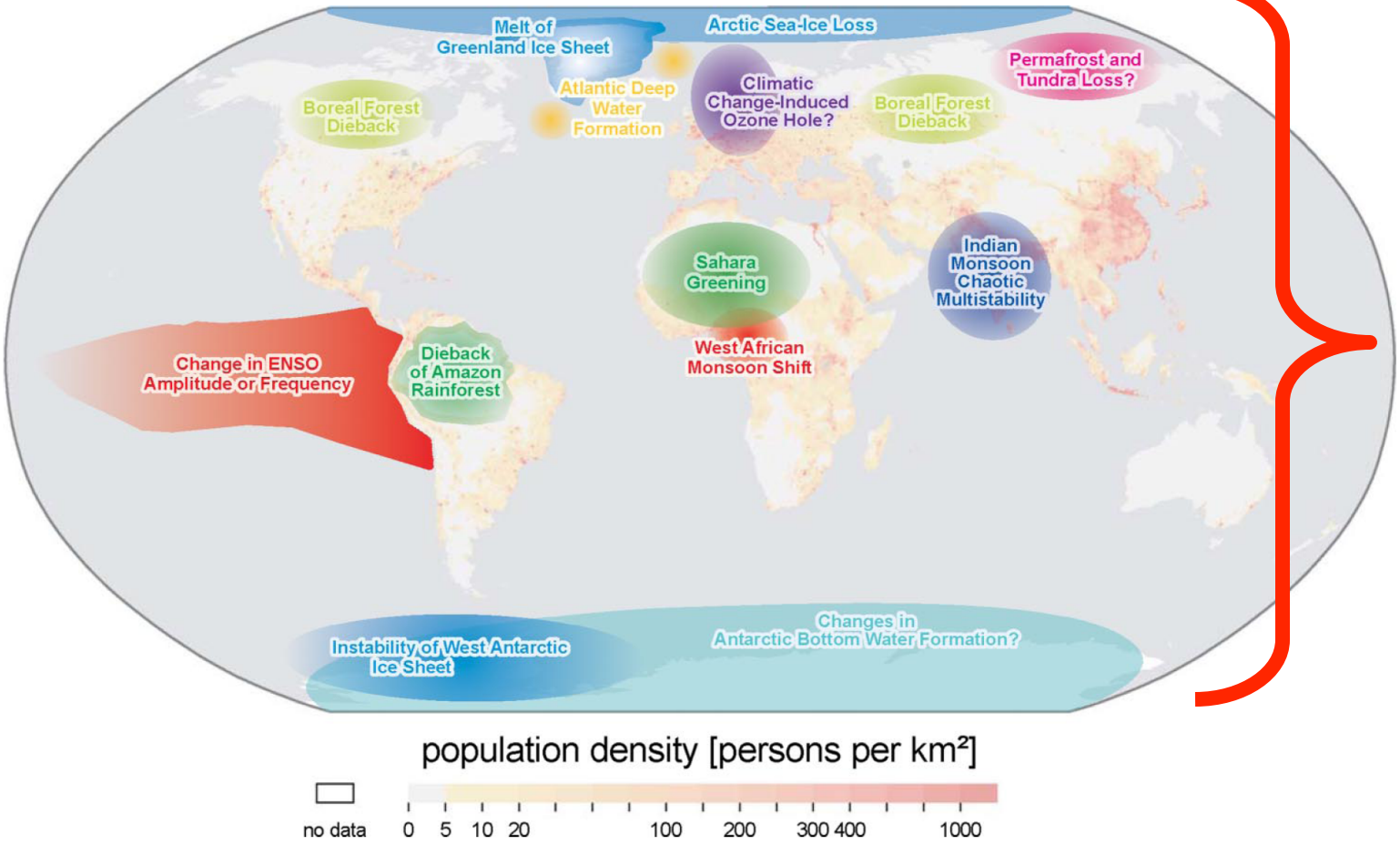
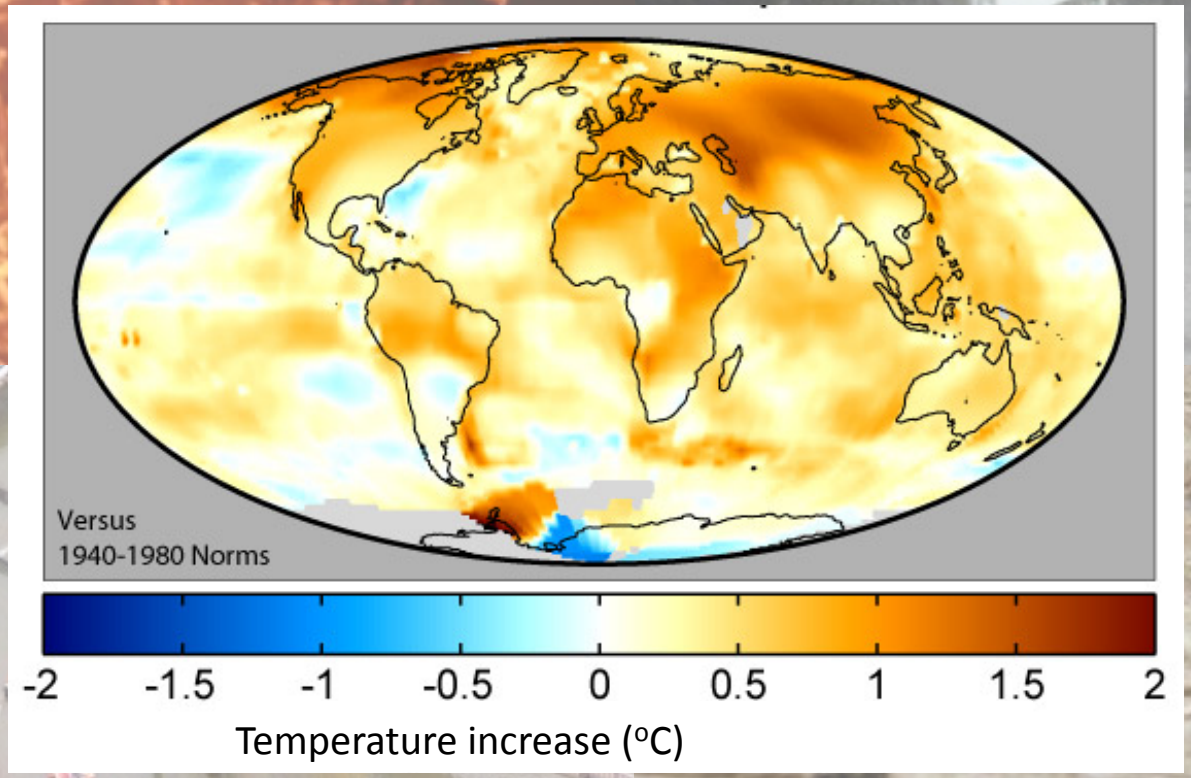
**This contribution is part of the special series of Inaugural Articles by members of the National Academy of Sciences elected on May 3, 2005.

Edited by William C. Clark, Harvard University, Cambridge, MA, and approved November 21, 2007 (received for review June 8, 2007)



Tipping Points

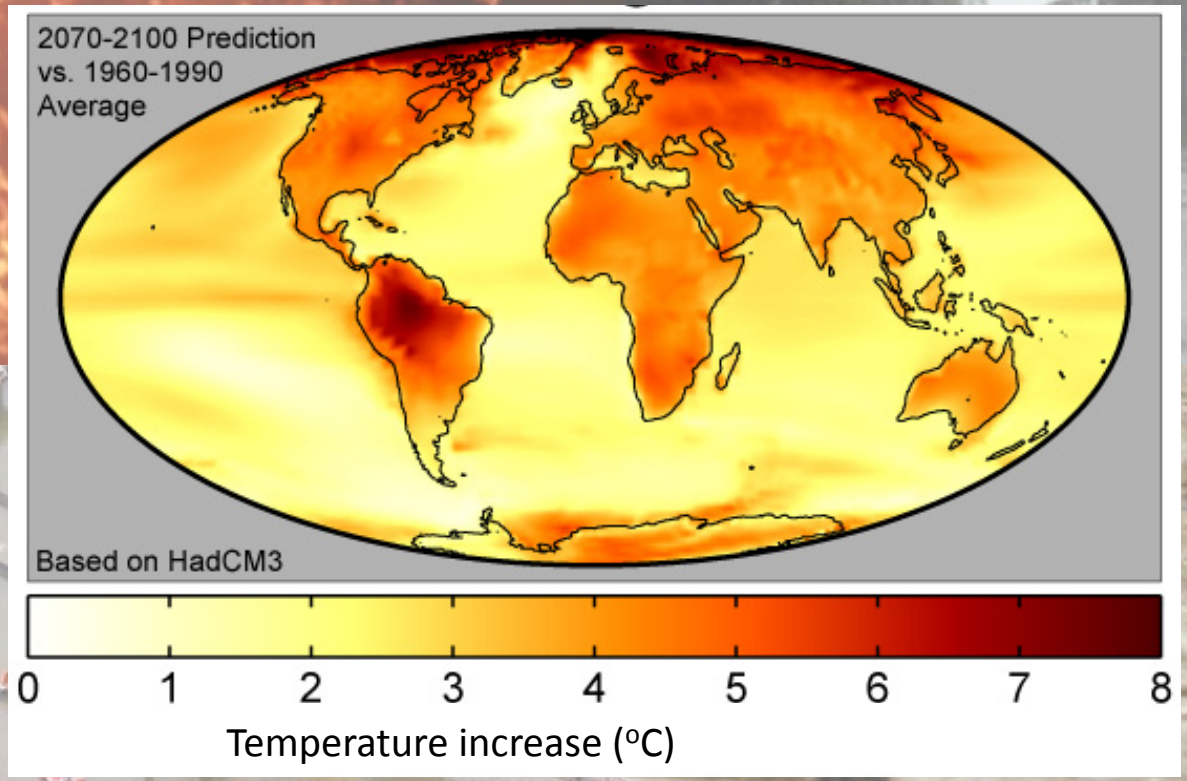
1995-2004 mean temperatures



Global temperature has increased by 1-1.5C in 9 years and…

Source: Wikipedia, ACIA 2007

Global warming predictions



…is expected to continue to increase more aggressively in the near future

Source: Wikipedia, ACIA 2007

Fig. 1.1 **Arctic sea ice extent**. Satellite imagery of sea ice extent in September

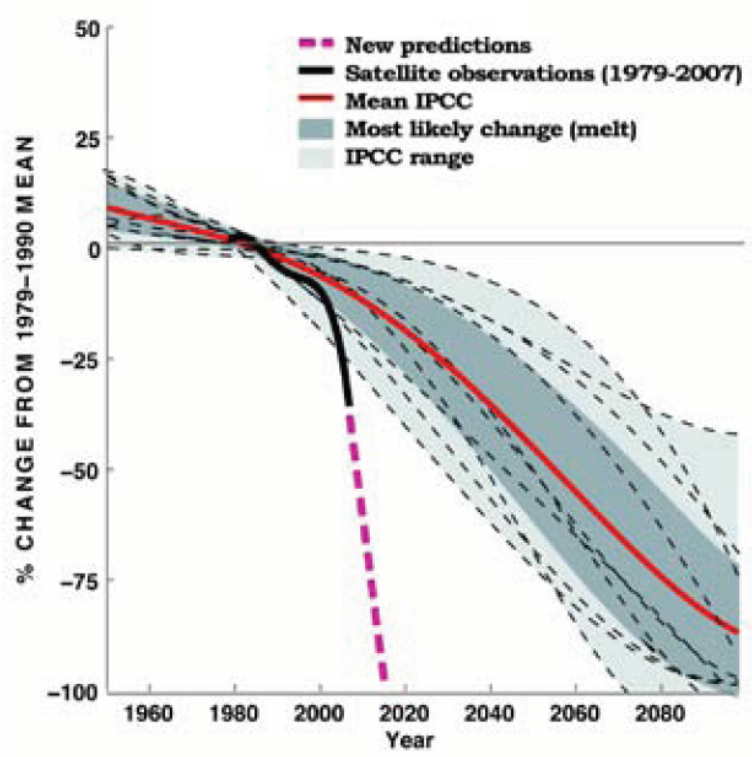


Fig 1.6 – **Permafrost coverage** in the northern hemisphere. Source: UNEP

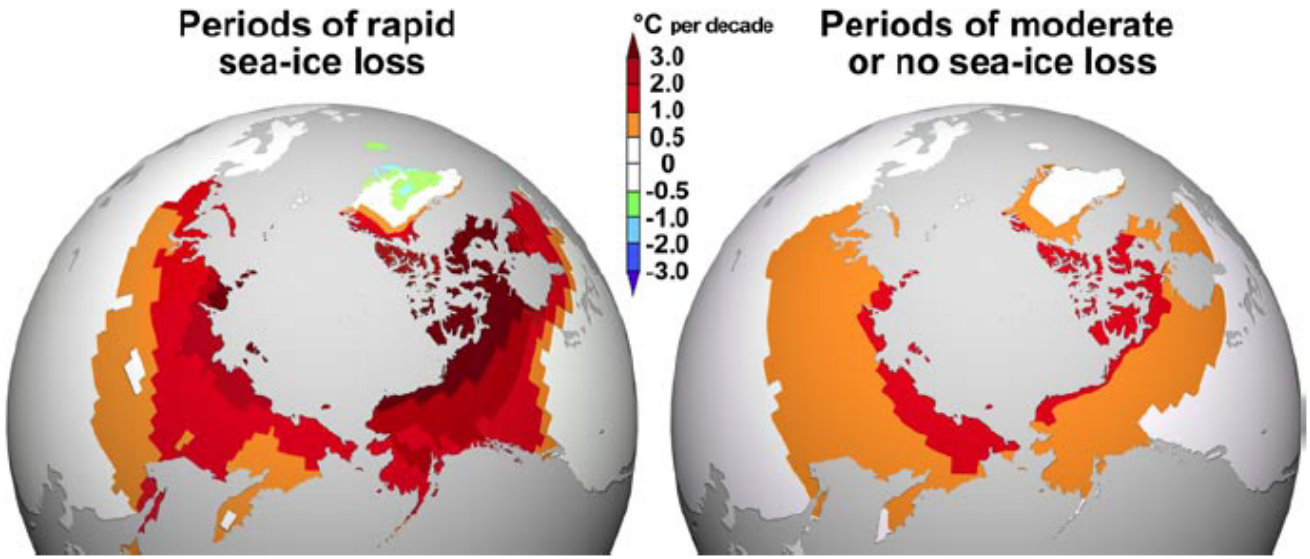


Fig 1.4 **Simulated future Arctic temperature trends**. Regional heating of the Arctic following rapid sea ice loss events. Following such events, heating extends up to 1500km inland from the sea. Source: Steve Deyo, ©University Corporation of Atmospheric Research

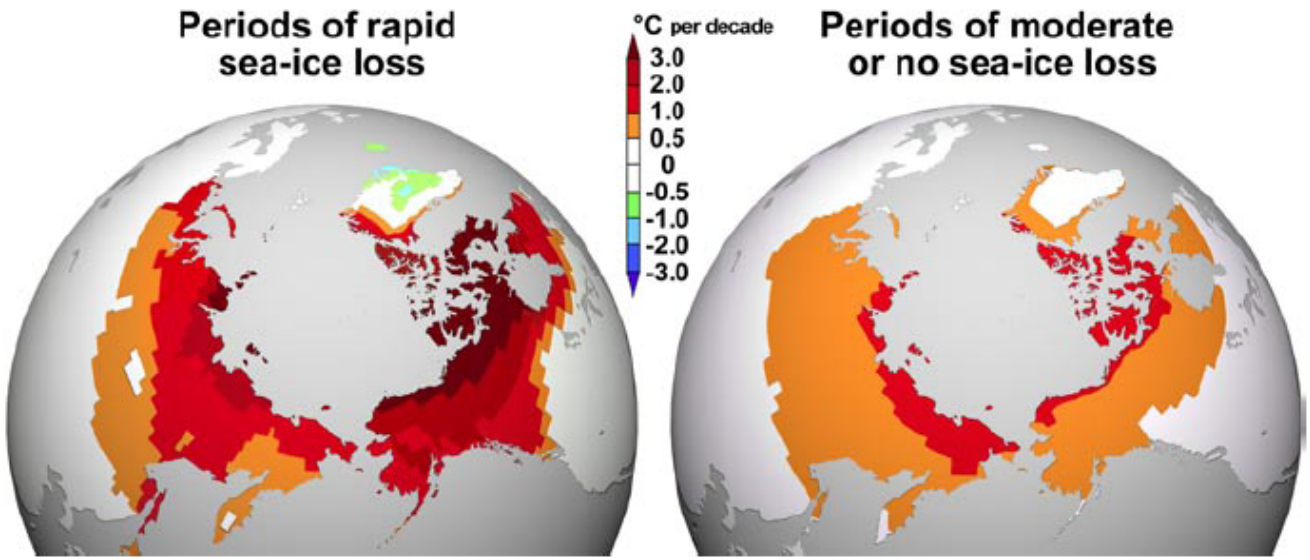


Fig 1.4 **Simulated future Arctic temperature trends**. Regional heating of the Arctic following rapid sea ice loss events. Following such events, heating extends up to 1500km inland from the sea. Source: Steve Deyo, ©University Corporation of Atmospheric Research

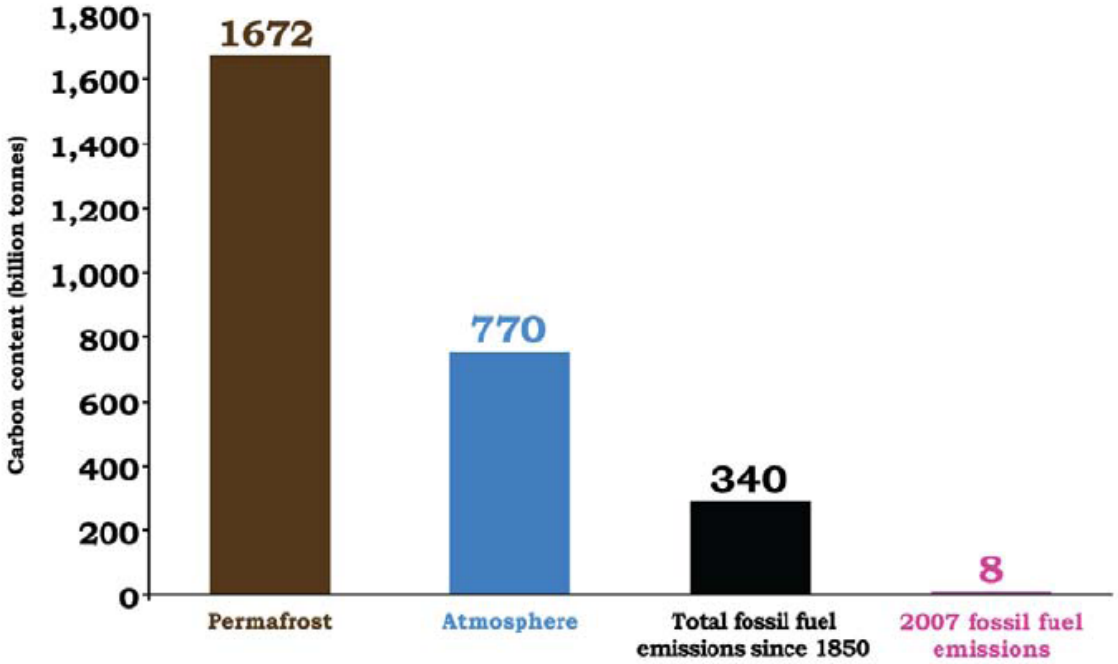
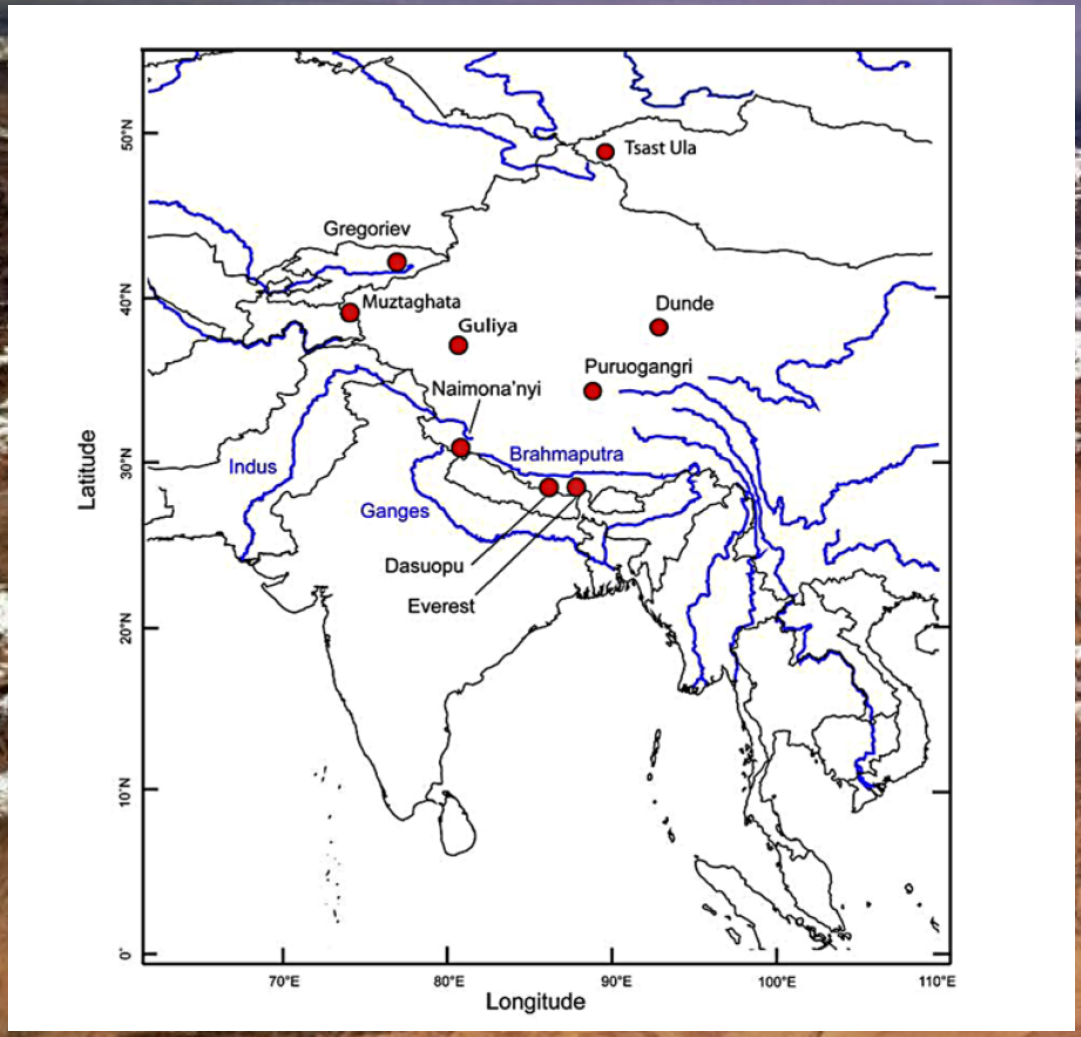


Fig 1.5 – **Carbon content**. Volumes of total carbon content estimated in billion tonnes. Sources: Schuur et al., UNEP, CDIAC.

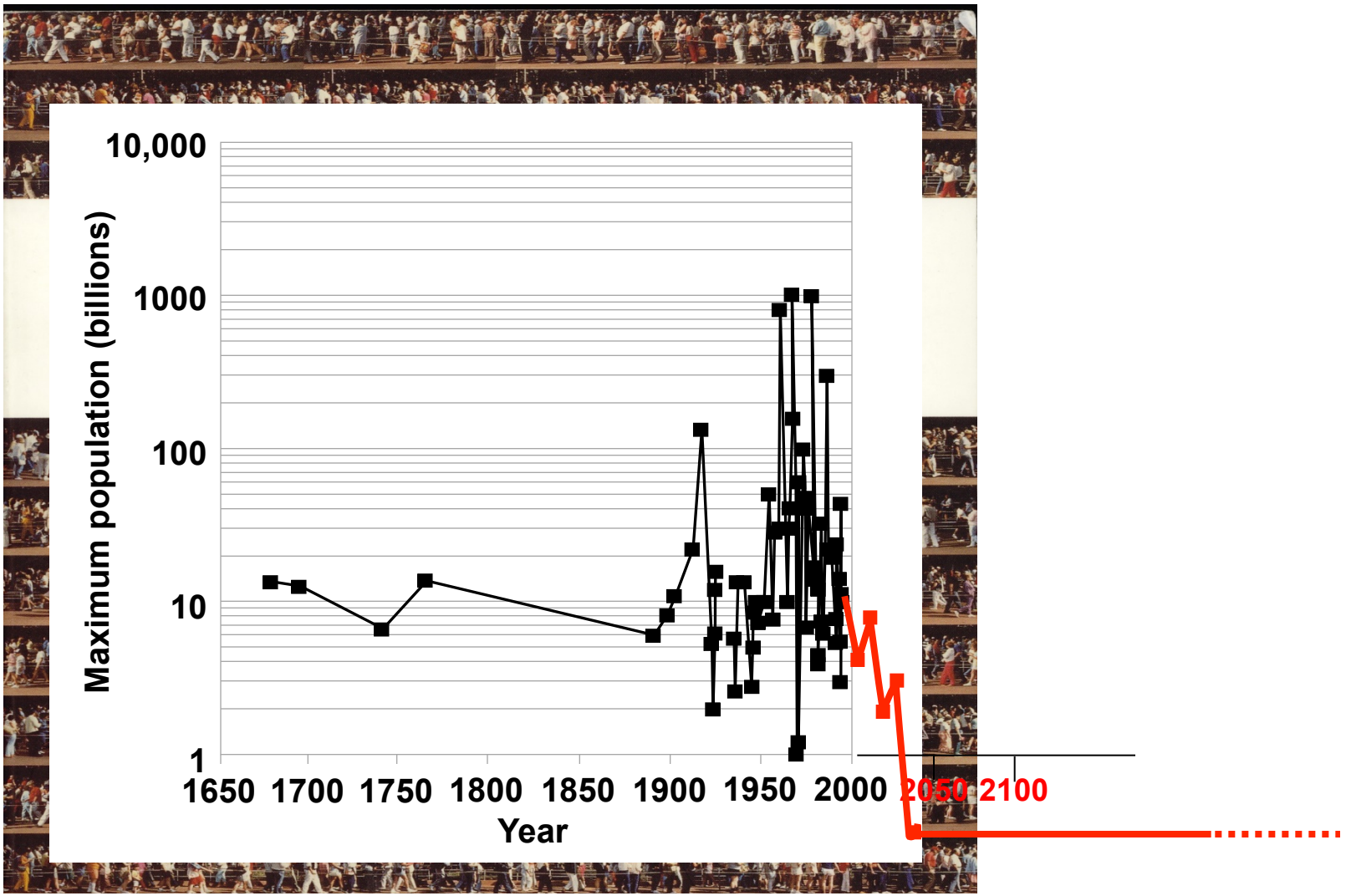


Mass loss on Himalayan glacier endangers water resources (Kehrwald et al. 2008 Geophys Res Lett)

A Miserable Alternative:

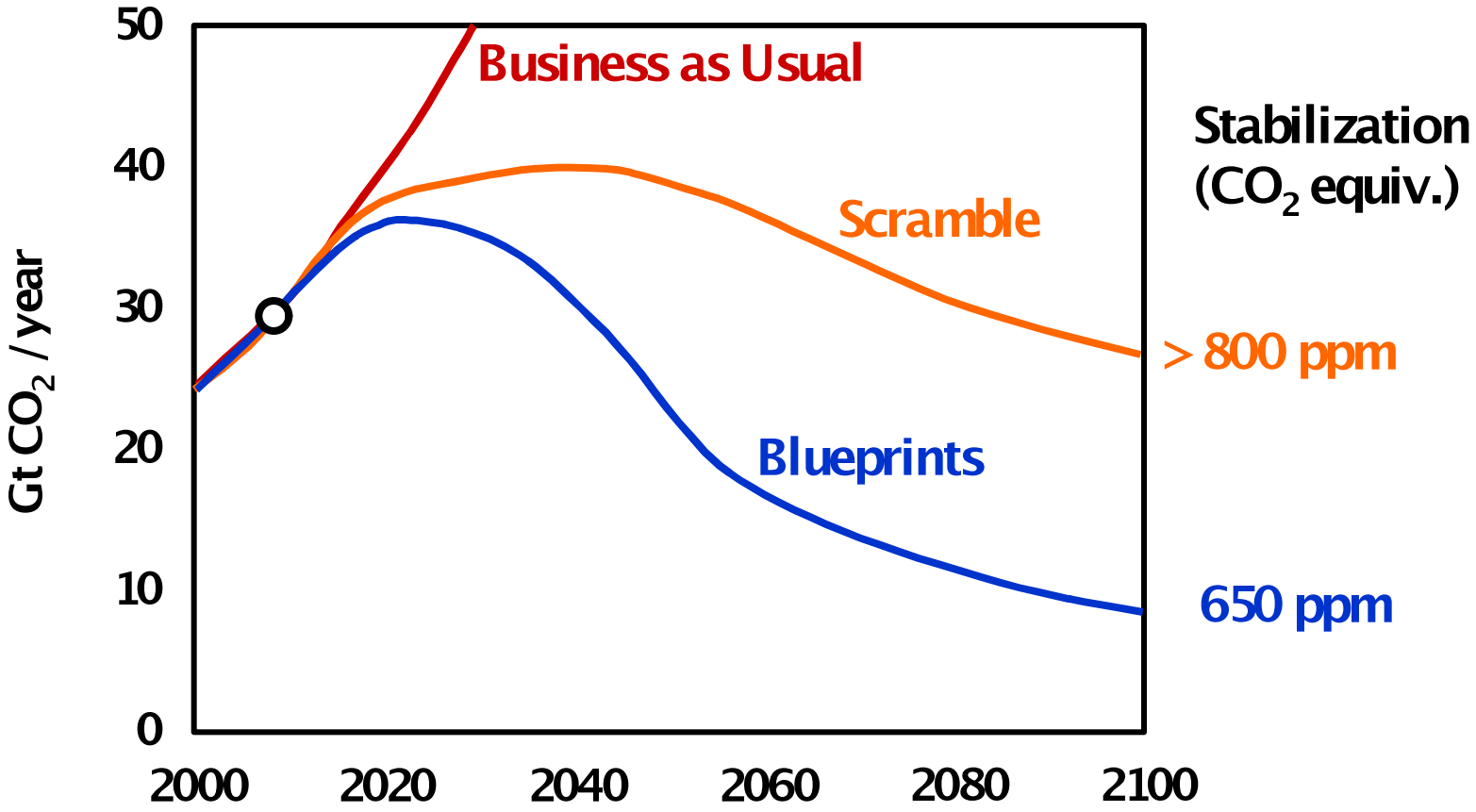
Surviving in a + 5°C World

Stabilizing, at last,…



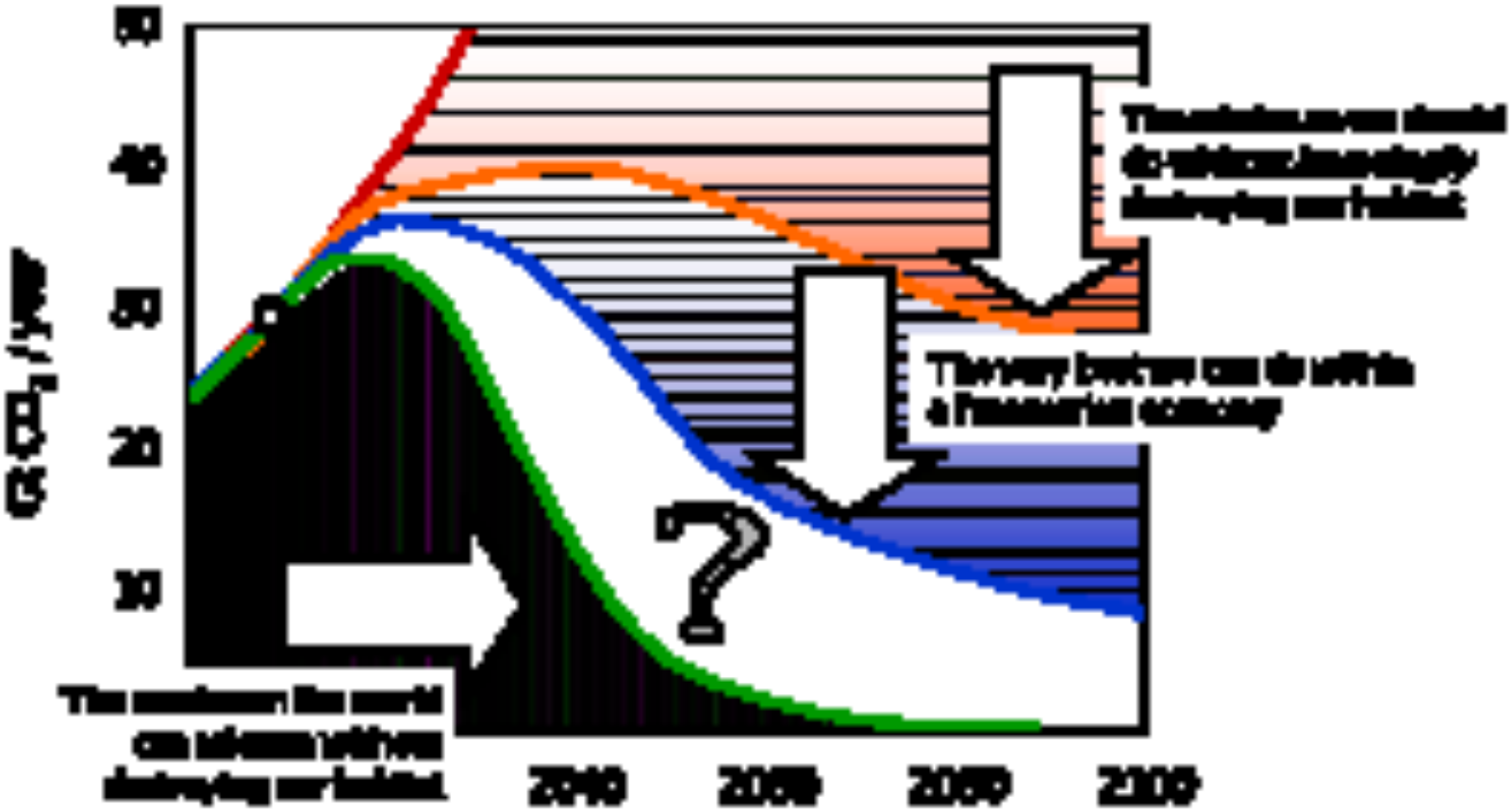
… carrying capacity estimates below 1 billion people.

Business as Usual, Scramble, Blueprints



Shell Energy Scenarios to 2050 (2008), with extrapolations to 2100 for MIT Climate Review

Business as Usual, Scramble, Blueprints, Better Blueprints ?



Why Natural Gas?

Coal is not clean

Nor are the fleets

Natural Gas versus Coal and Oil

A perfect storm to disrupt business as usual

1. **Enormous new supply of Natural Gas**

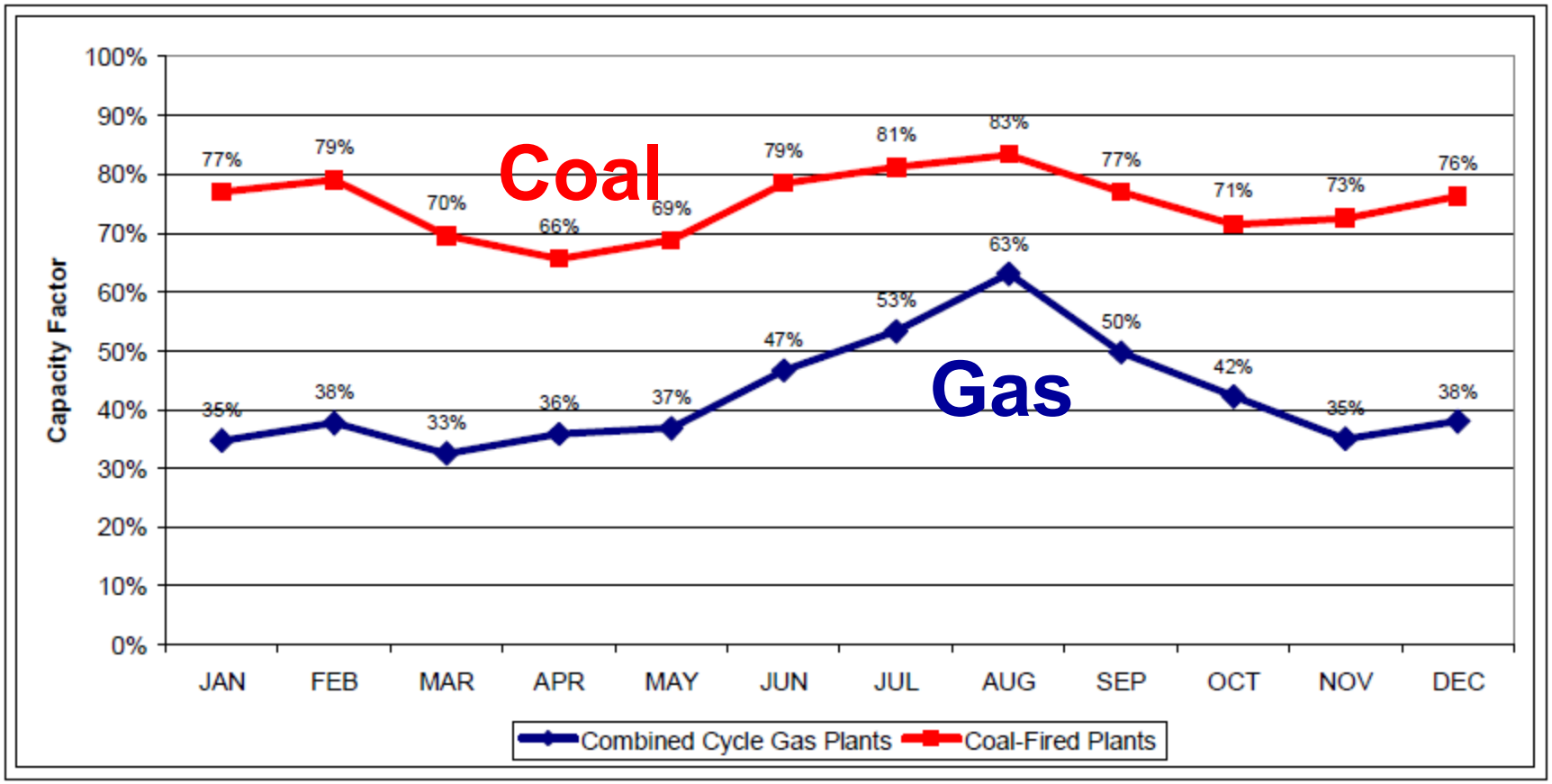
2. **Huge volume of installed, highly efficient and available natural gas power generating capacity**

   – 100 to 400 million tonnes of displacable CO_2 – 5% to 19% of total 2,000 million tonnes of coal emissions (plus SOx, NOx, Mercury)

   – 1.2 to 4.6 TCF (5% to 20%) of increased demand for Natural Gas

Switch the capacity curves

Figure 9. Monthly Capacity Factors in 2007 for Study Group Coal and NGCC Plants

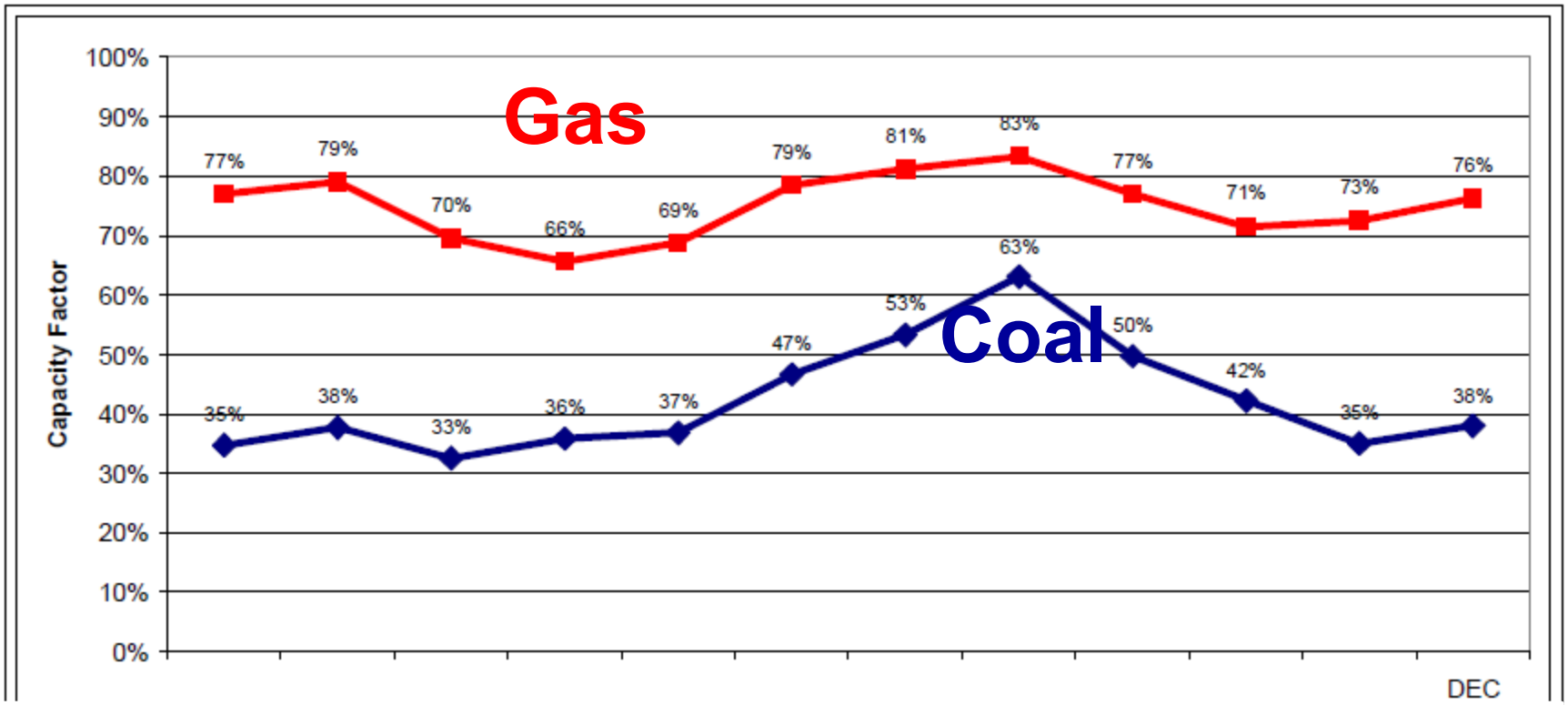


Source: Calculated by CRS from the EIA-906/920 and EIA-860 databases.

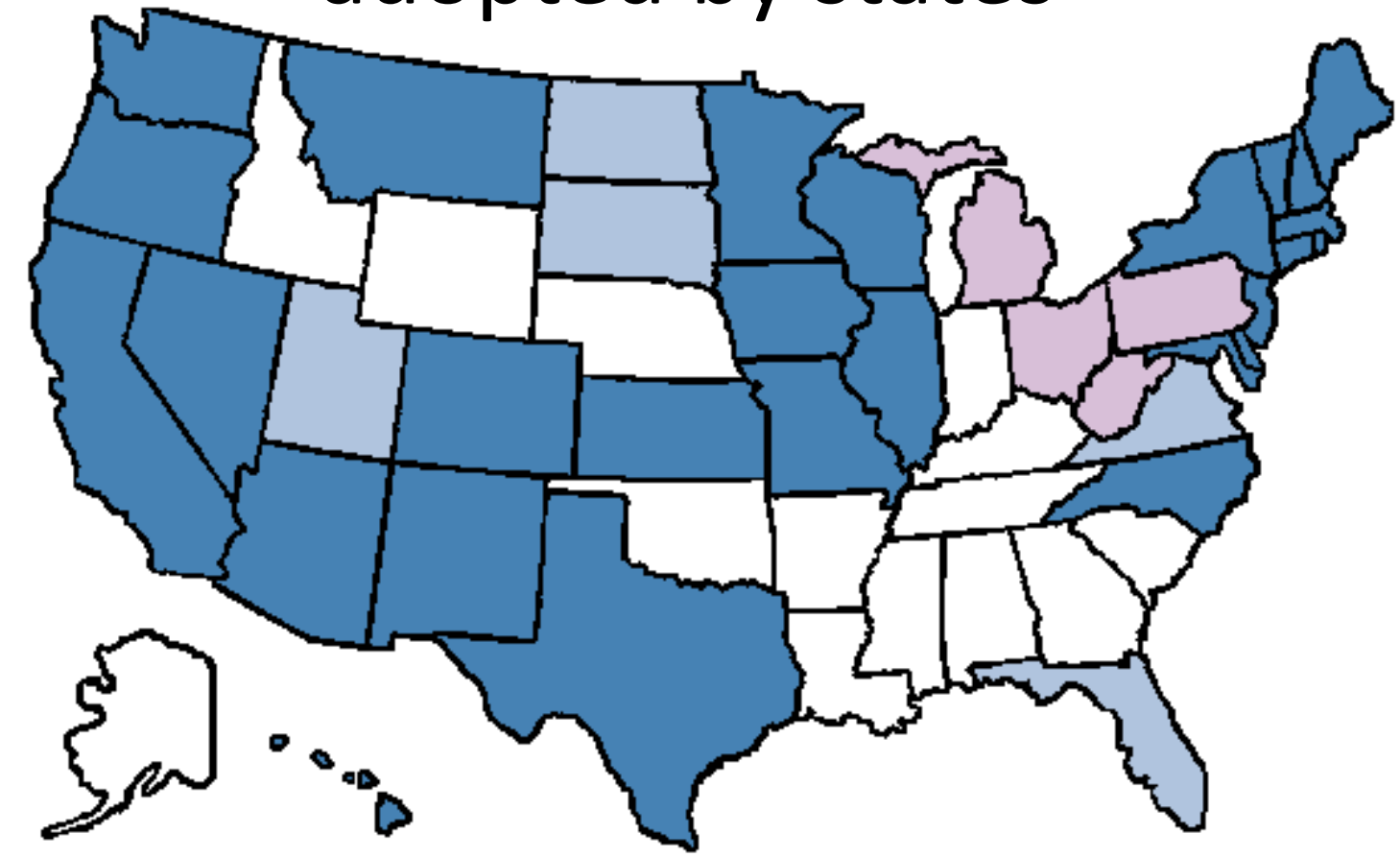
Notes: For information on the study groups of coal and NGCC plants, see footnote 11. NGCC= natural gas combined cycle.

Switch the capacity curves

Figure 9. Monthly Capacity Factors in 2007 for Study Group Coal and NGCC Plants



Renewable Portfolio standards adopted by states



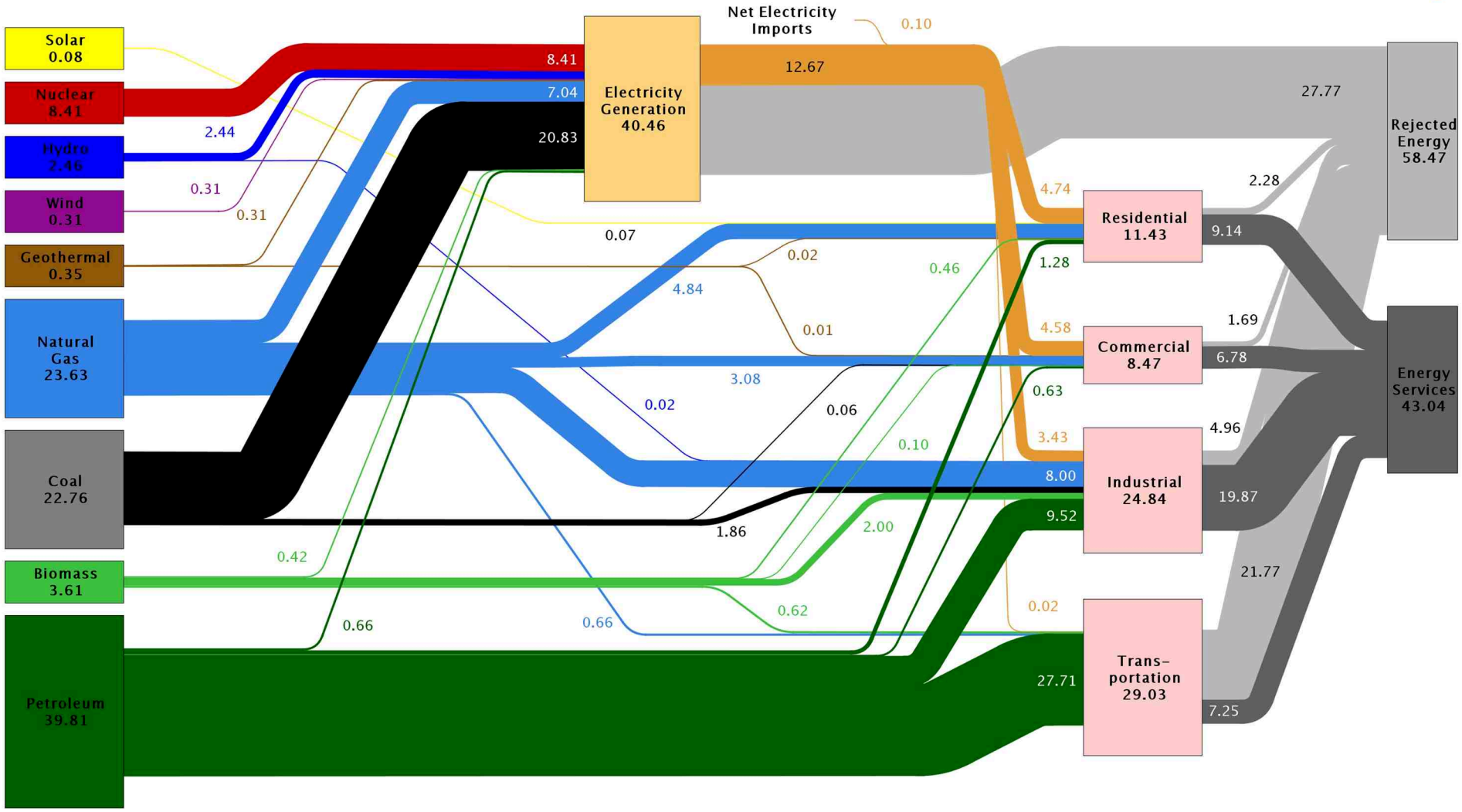
Renewable Portfolio Standard
Alternative Energy Portfolio Standard
Renewable or Alternative Energy Goal

http://www.pewclimate.org

Today

Estimated U.S. Energy Use in 2007: ~101.5 Quads

Lawrence Livermore National Laboratory

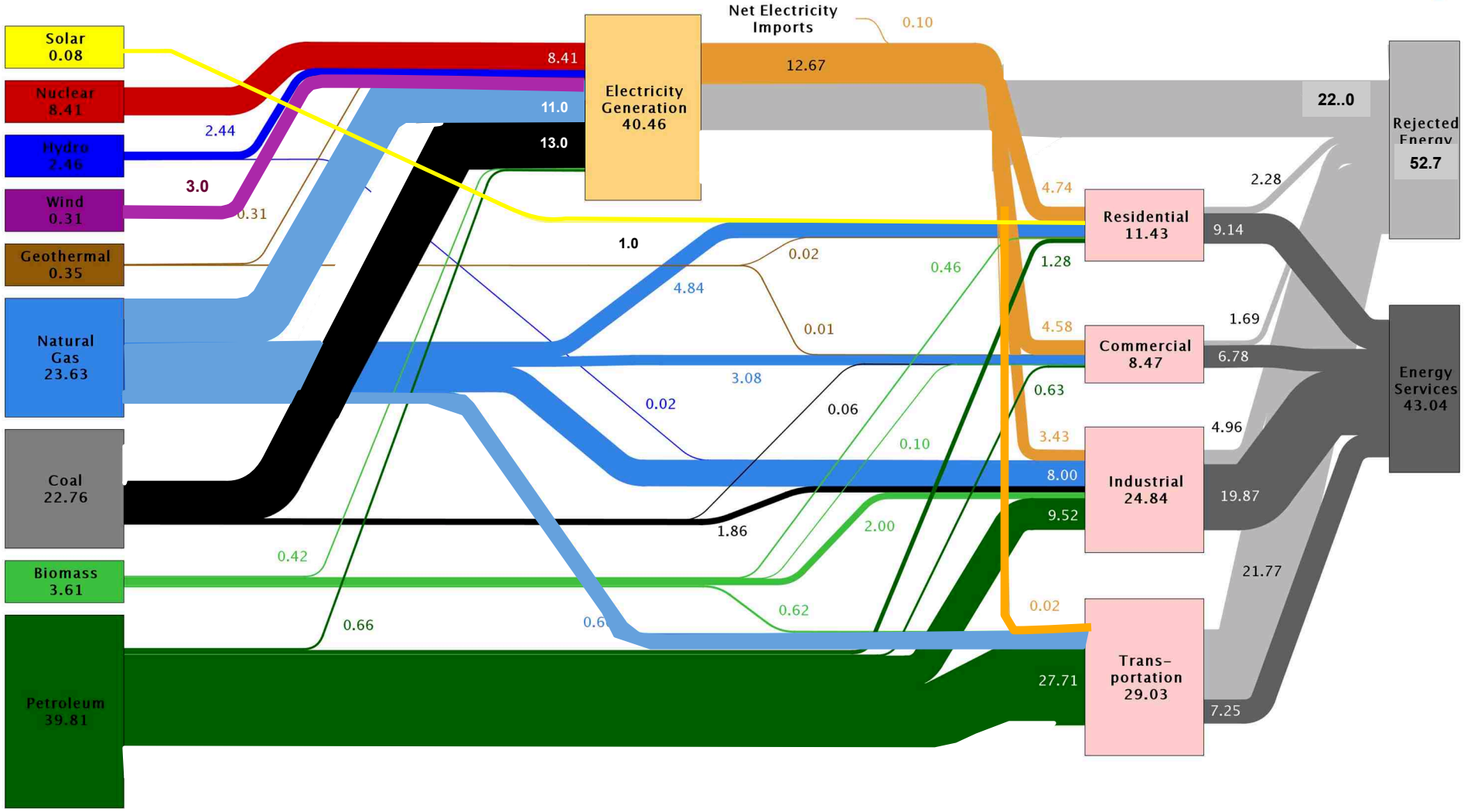


Source: LLNL 2008. Data is based on DOE/EIA-0384(2007), June 2008. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

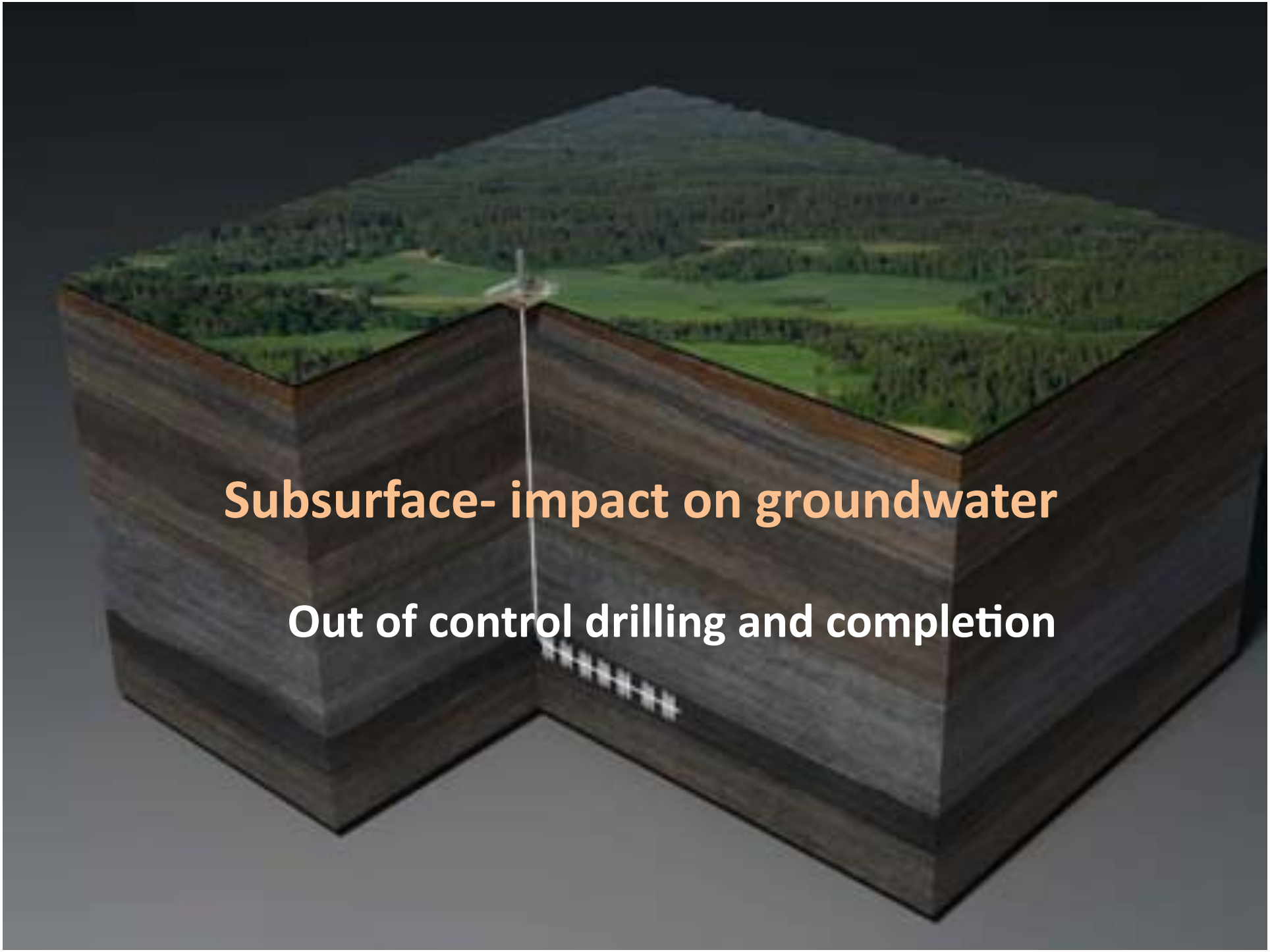
5-10 years from now

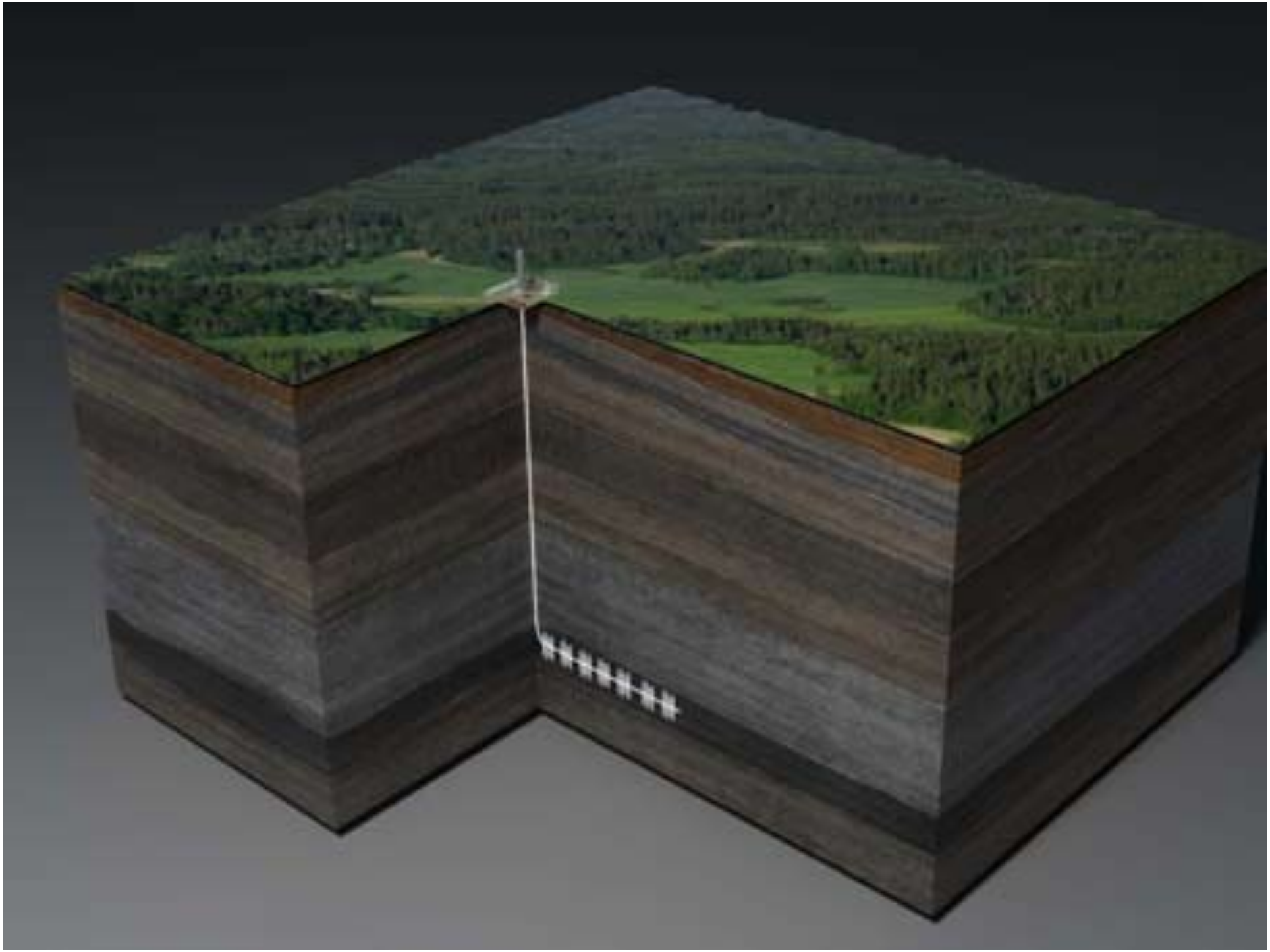
Estimated U.S. Energy Use ~101.5 Quads

Lawrence Livermore National Laboratory



Source: LLNL 2008. Data is based on DOE/EIA-0384(2007), June 2008. If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports flows for non-thermal resources (i.e., hydro, wind and solar) in BTU-equivalent values by assuming a typical fossil fuel plant "heat rate." The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 80% for the residential, commercial and industrial sectors, and as 25% for the transportation sector. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527


Subsurface- impact on groundwater
Out of control drilling and completion



Wall Street Journal: Blowout Occurs at Pennsylvania Gas Well

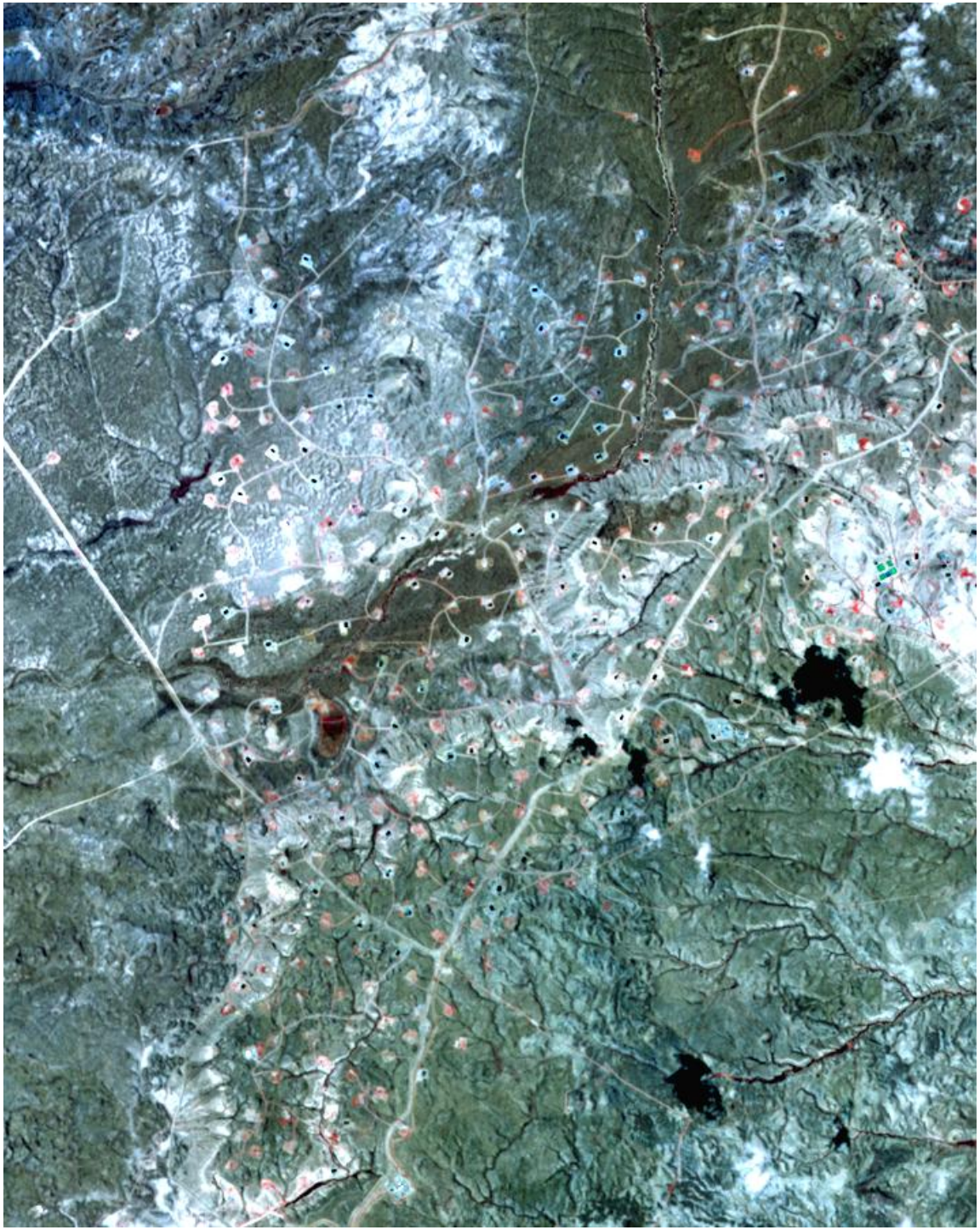
DEP orders Texas company to cease gas drilling in Pennsylvania

Bloomberg: Drilling Rules Change May Harm Industry, Exxon Says

Blast at Abandoned W. Va. Coal Mine Injures 7
Flames Shoot 70 Feet in Air as Workers Drilling Gas Well Hit Pocket of Methane in Old Coal Mine Chamber

Surface impacts on:

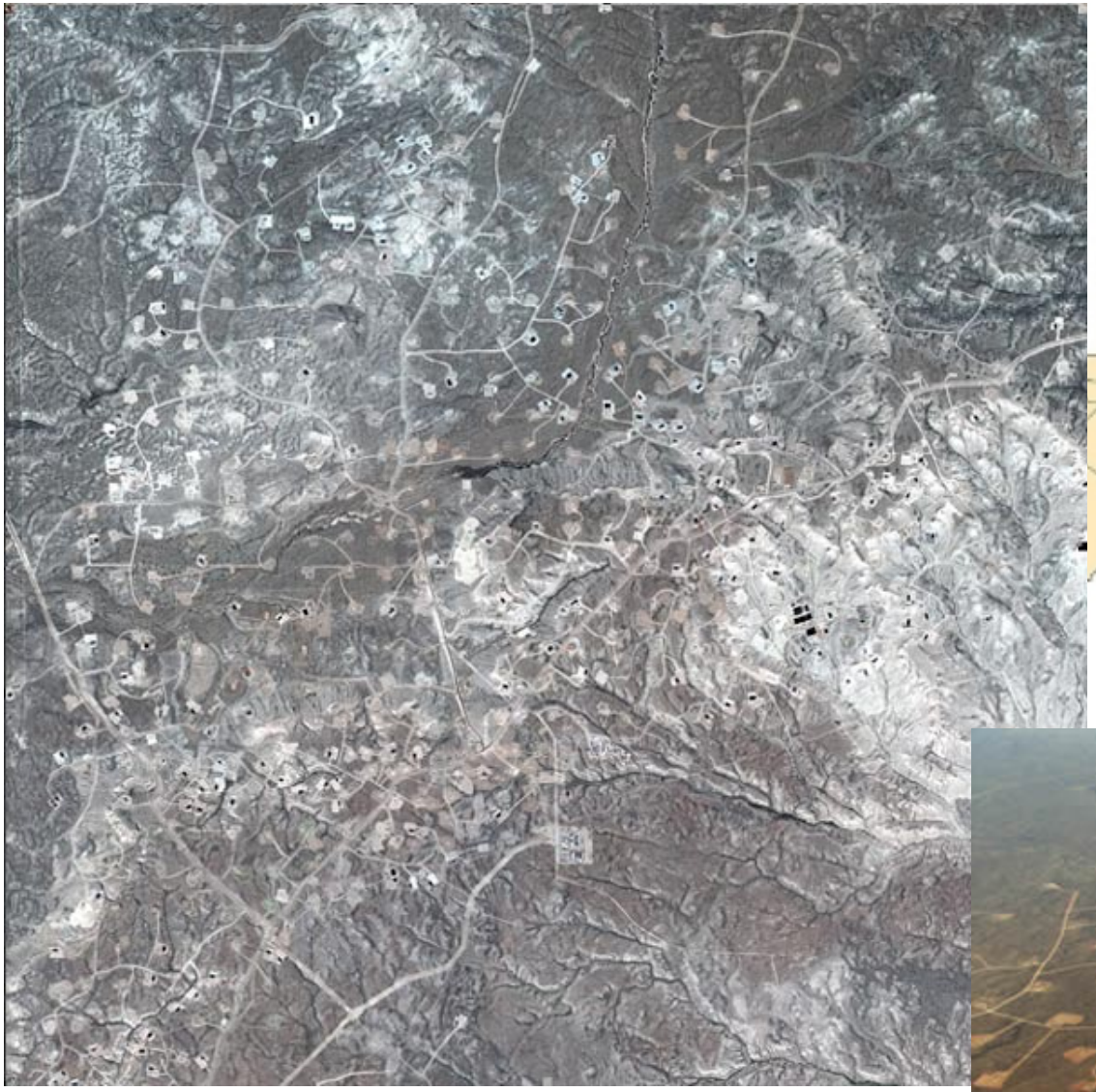
1.Surface water
2.Shallow Groundwater
3.Biodiversity and Ecology
4.Local Communities

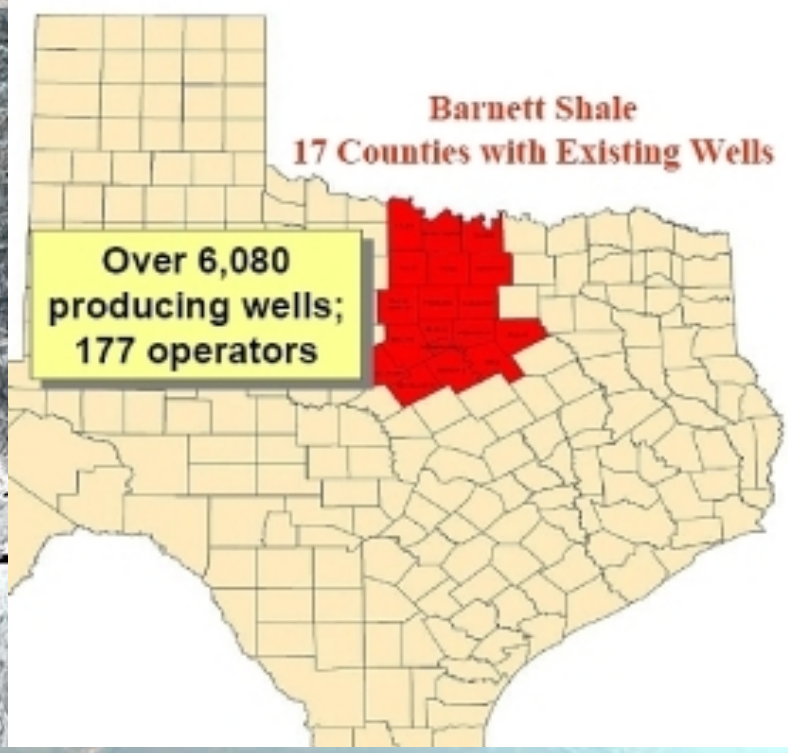


The Jonah Gas Field

Located in Wyoming's Upper Green River Valley, Jonah contains an estimated 7 to 10 TCF. In the last 10 years, the field turned from sagebrush into one of the nation's richest gas fields with 500 wells. A new proposal would add 3,100 more wells.

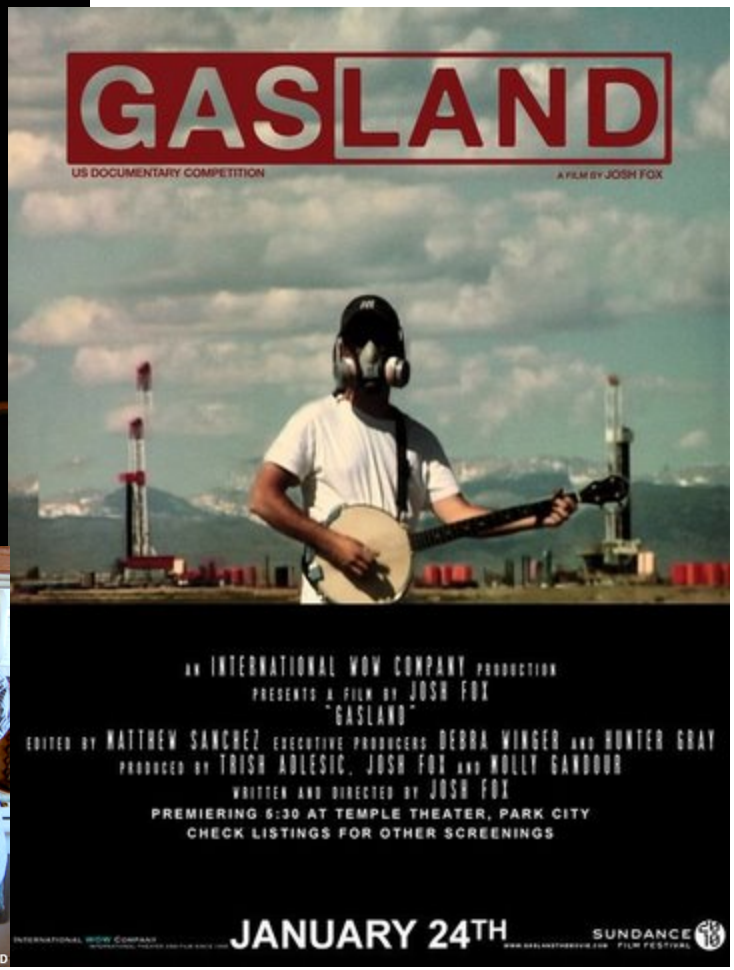
The image was acquired September 3, 2003, covers an area of 10.7 x 13.5 km NASA/GSFC/METI/ERSDAC/ JAROS, and U.S./Japan ASTER Science Team




Barnett Shale
17 Counties with Existing Wells
Over 6,080
producing wells;
177 operators

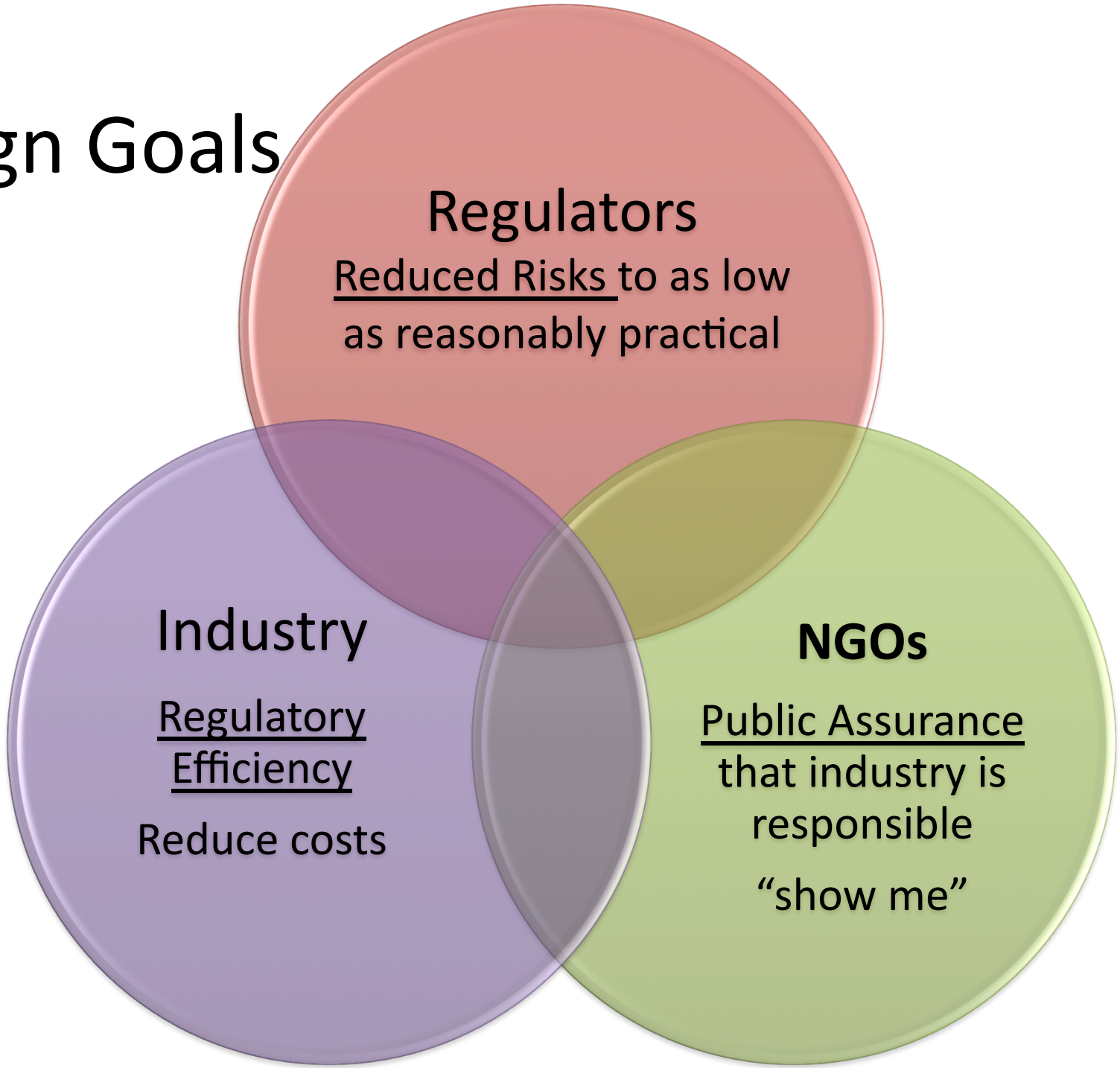

GASLANDTHEMOVIE.COM


GASLAND

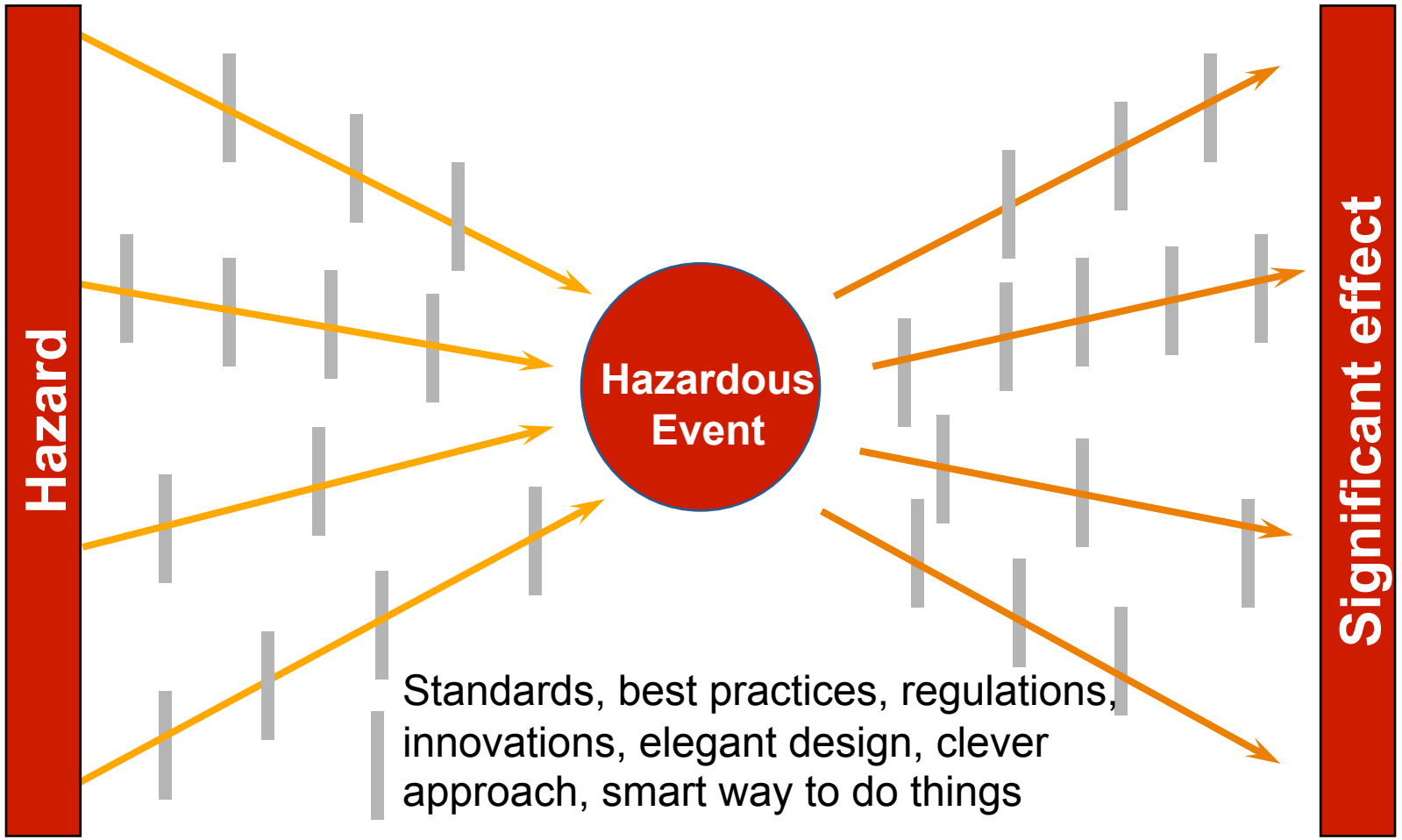

GASLAND
US DOCUMENTARY COMPETITION
A FILM BY JOSH FOX
an INTERNATIONAL WOW COMPANY production
presents a film by JOSH FOX
"GASLAND"
edited by MATTHEW SANCHEZ executive producers DEBRA WINGER and HUNTER GRAY
produced by TRISH ADLESIC, JOSH FOX and MOLLY GANDOUR
written and directed by JOSH FOX
PREMIERING 5:30 AT TEMPLE THEATER, PARK CITY
CHECK LISTINGS FOR OTHER SCREENINGS
JANUARY 24TH
SUNDANCE

Events have created an urgent CASE FOR CHANGE

Align Goals


Regulators
Reduced Risks to as low as reasonably practical
Industry
Regulatory Efficiency
Reduce costs
NGOs
Public Assurance that industry is responsible
"show me"

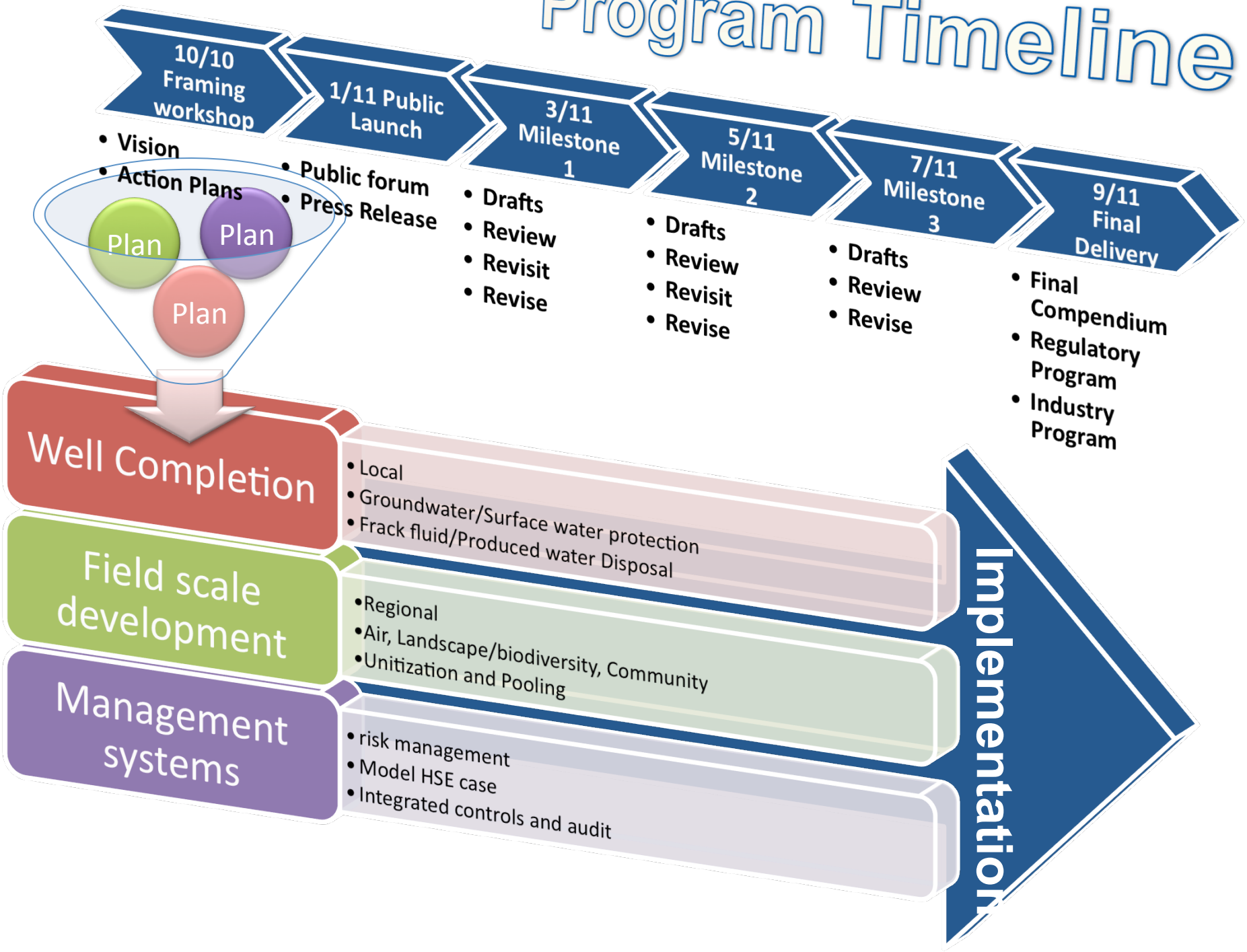
Simple model



Control

Recover

Program Timeline



Lead the change