



# Transportation Planning in the Age of Limits 2012 Update

Charlie Stephens  
March 14, 2012



**CAUTION**

**THIS SIGN HAS  
SHARP EDGES**

**DO NOT TOUCH THE EDGES OF THIS SIGN**



**ALSO, THE BRIDGE IS OUT AHEAD**





# Bumps in the road?



Peak Oil

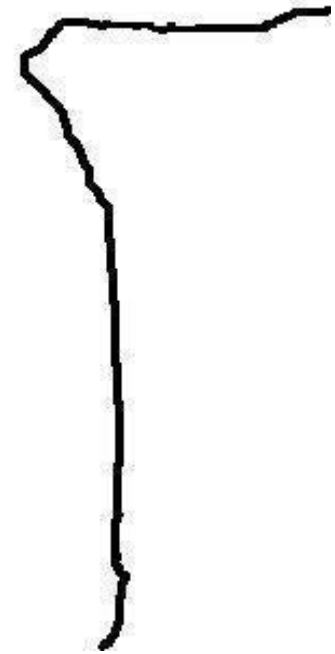
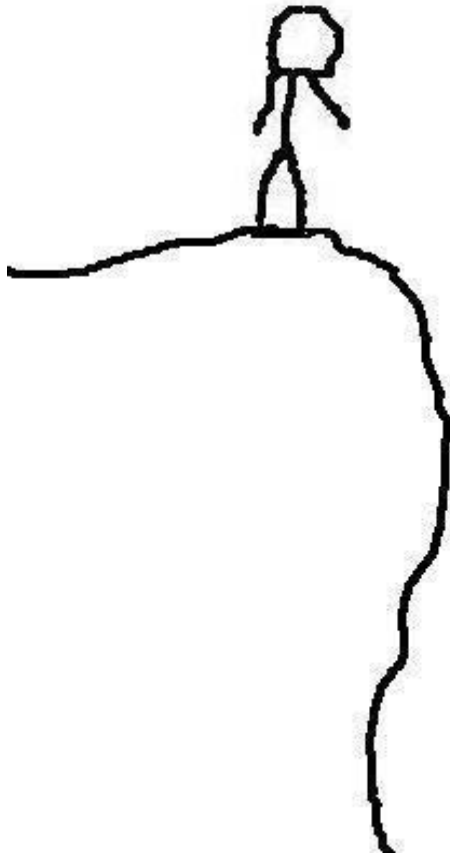
Climate Change

Competition for Resources

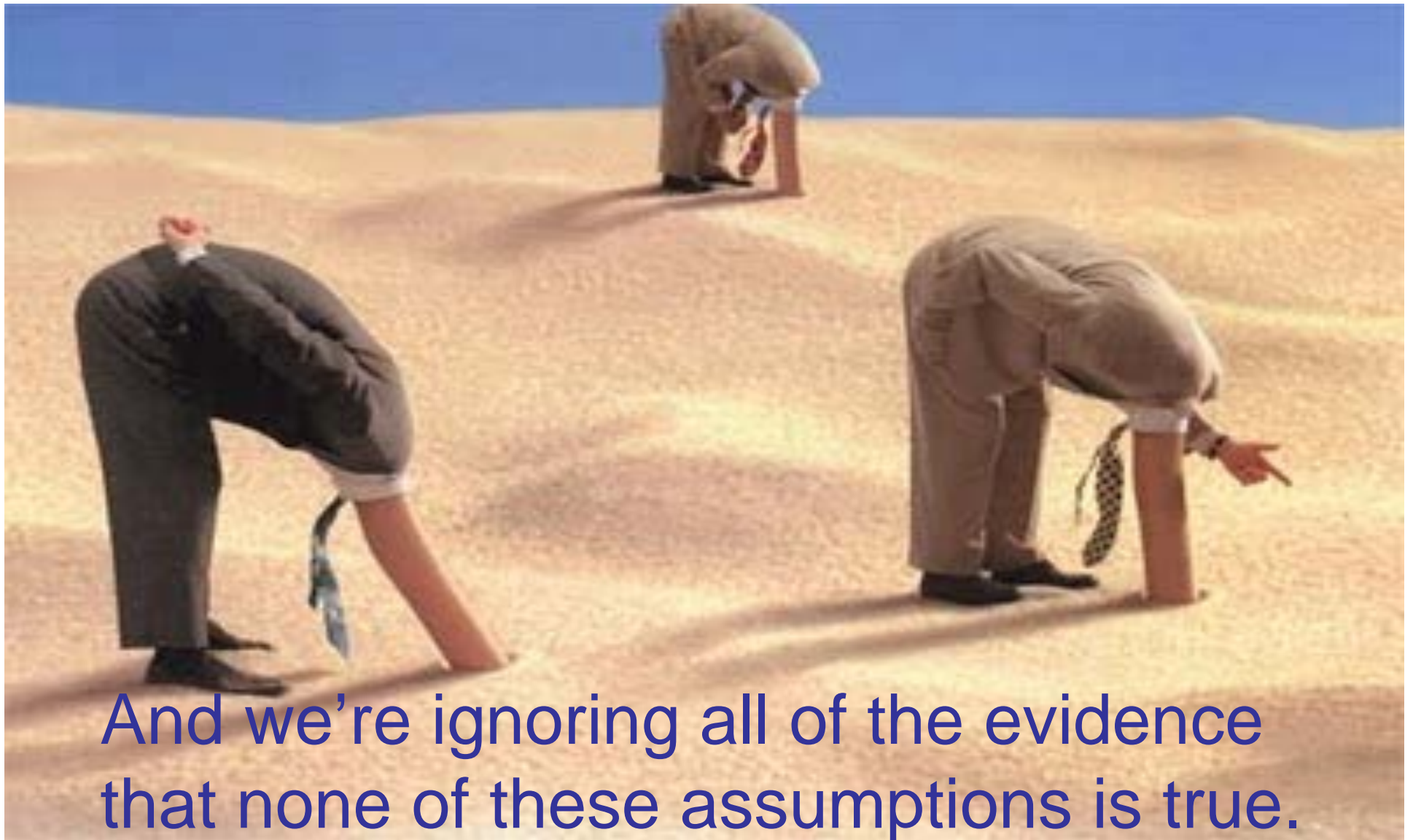
Financial Meltdown

# How are we doing as a society?

- ✗ Declining employment as globalized jobs move offshore and businesses struggle
- ✗ Child and elder poverty and abuse on the rise
- ✗ Education system struggling
- ✗ Declining health indicators
- ✗ Decaying Infrastructure
- ✗ Ecosystems in trouble
- ✗ Record consumer debt
- ✗ Shrinking middle class
- ✗ Record CEO salaries
- ✗ Financial meltdown



# Three Fundamentally Flawed Assumptions



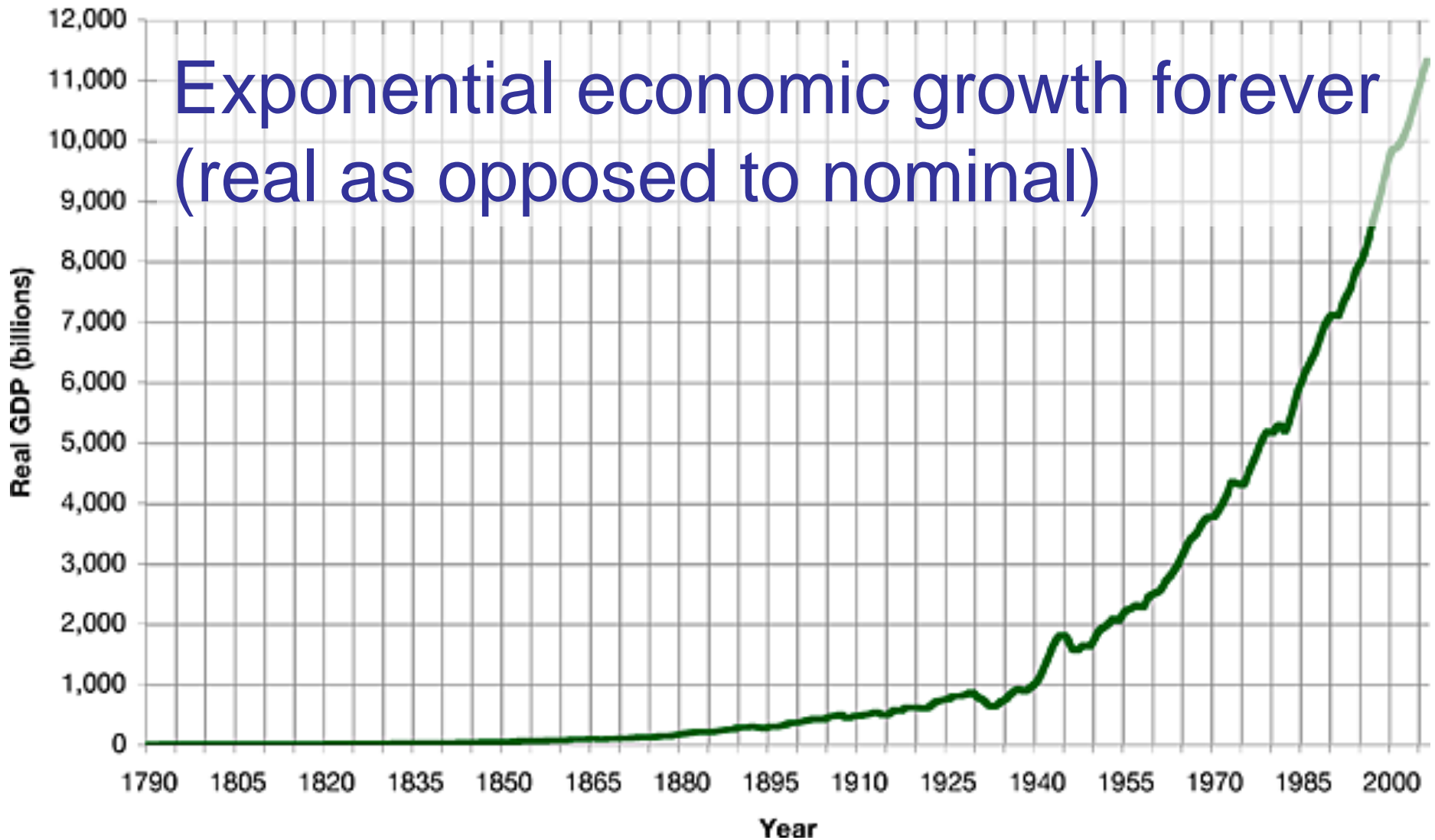
And we're ignoring all of the evidence that none of these assumptions is true.



Resource supplies, especially energy,  
and Earth capacities are infinite.



## GDP (adjusted for 2000 dollars)



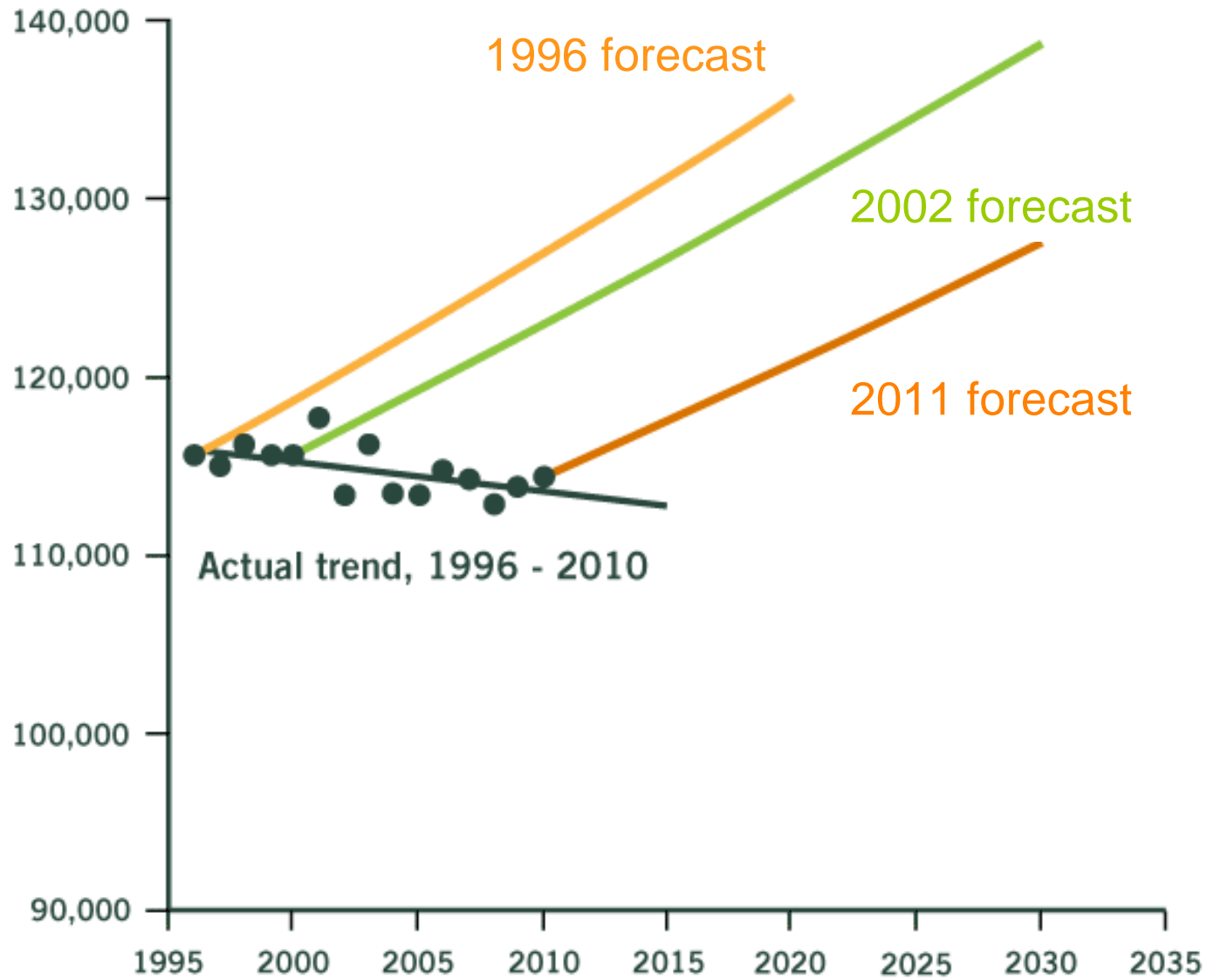


The economy will recover to some semblance of its former glory

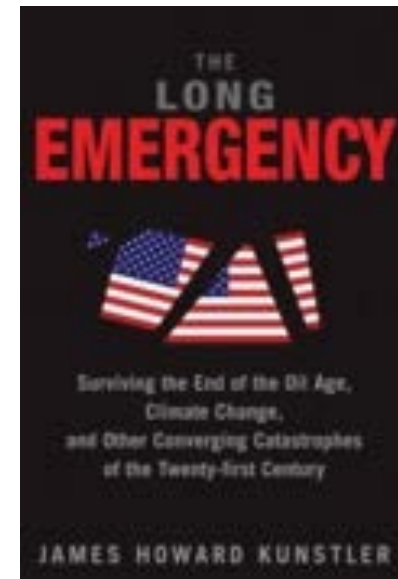
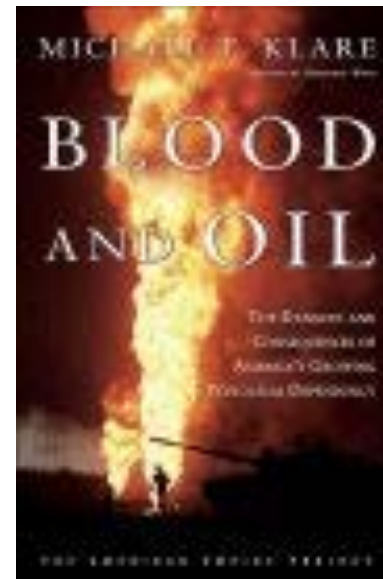
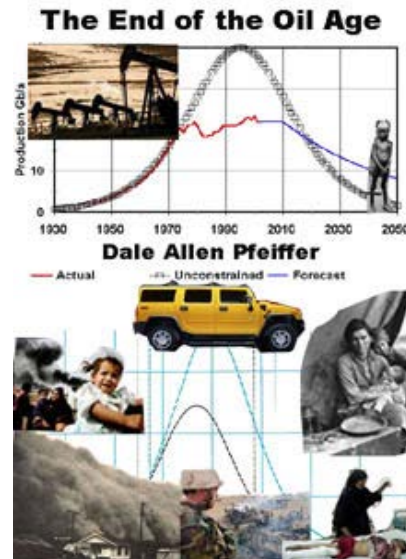
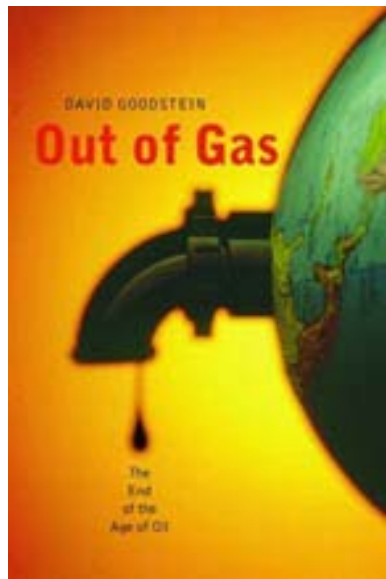
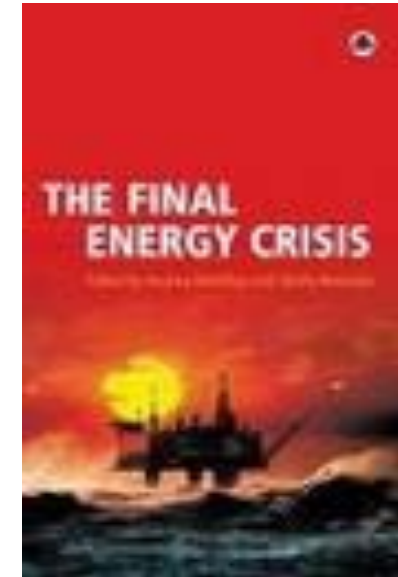
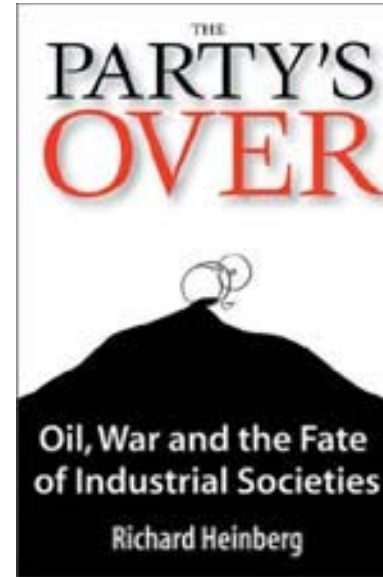
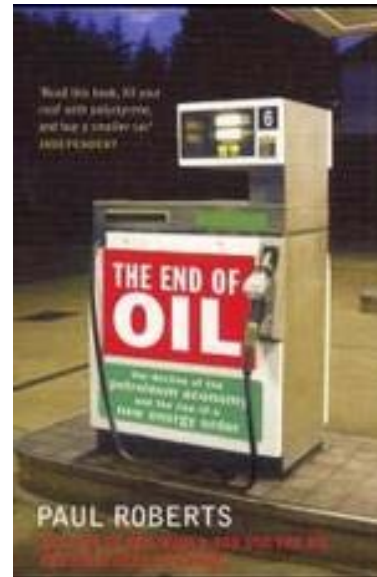
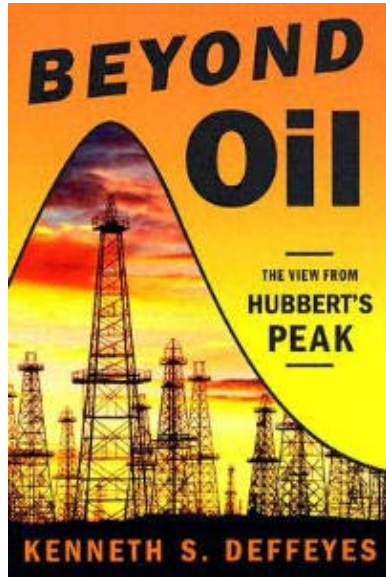




# Pervasive Denial

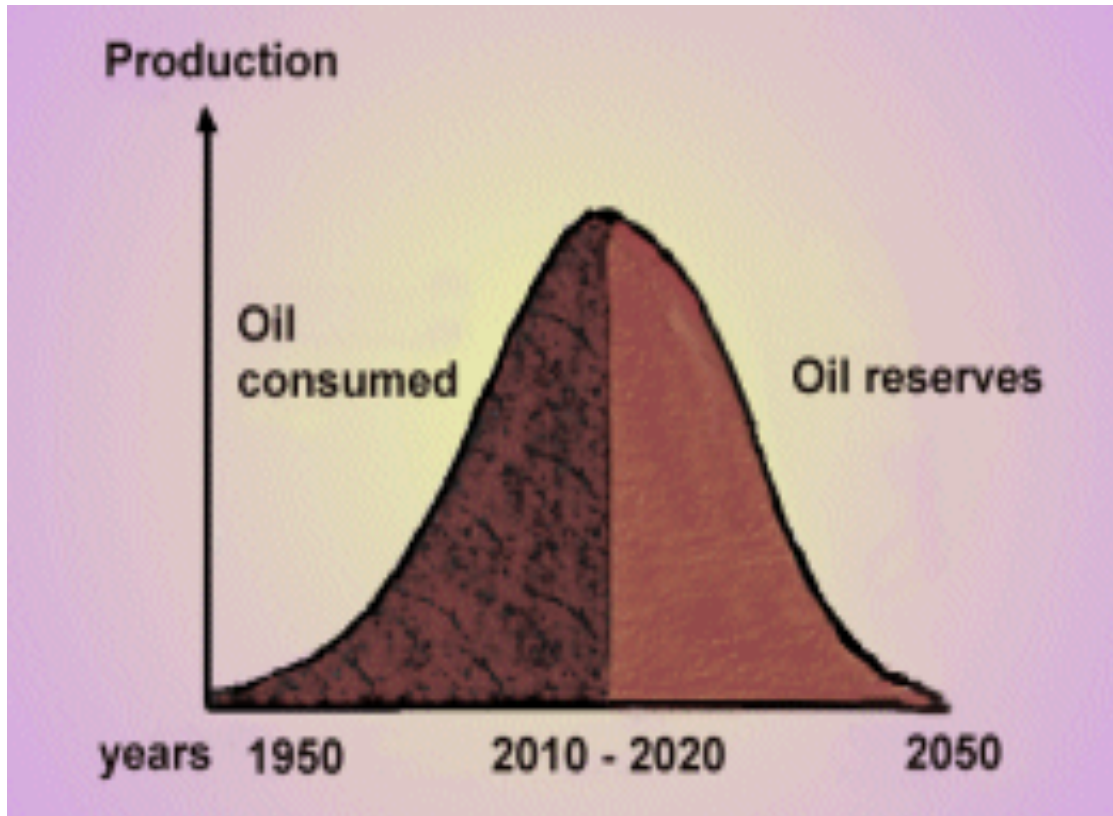


# Resource Limits



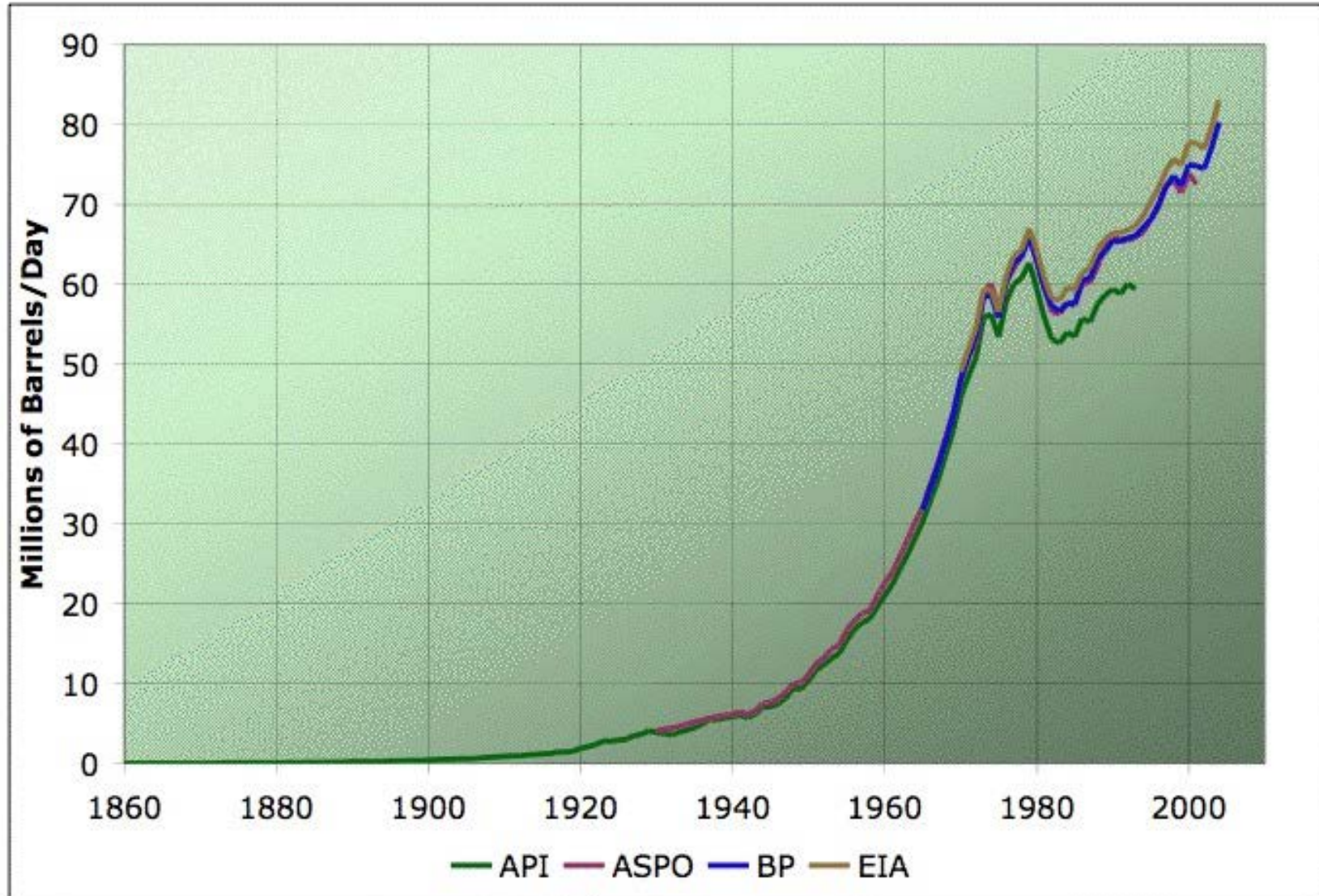


# Peak Oil Defined



- Supply (flow) can no longer be increased
- Supply (flow) can no longer meet demand
- Roughly half the oil has been used (the cheapest & easiest oil, or gas)
- Supply (flow) will level off and begin to decline

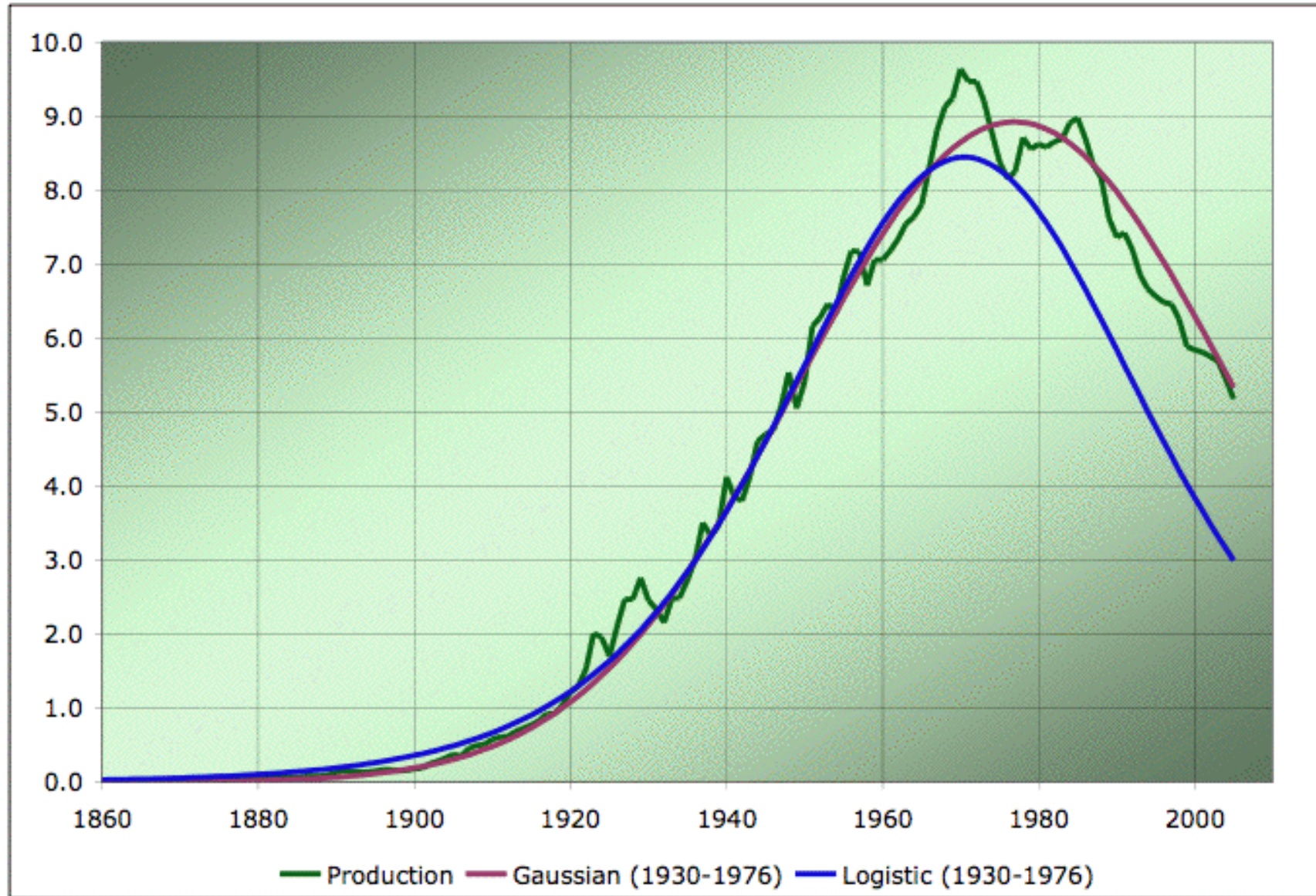
# U.S. Oil Consumption



Source: The Oil Drum: Stuart Staniford



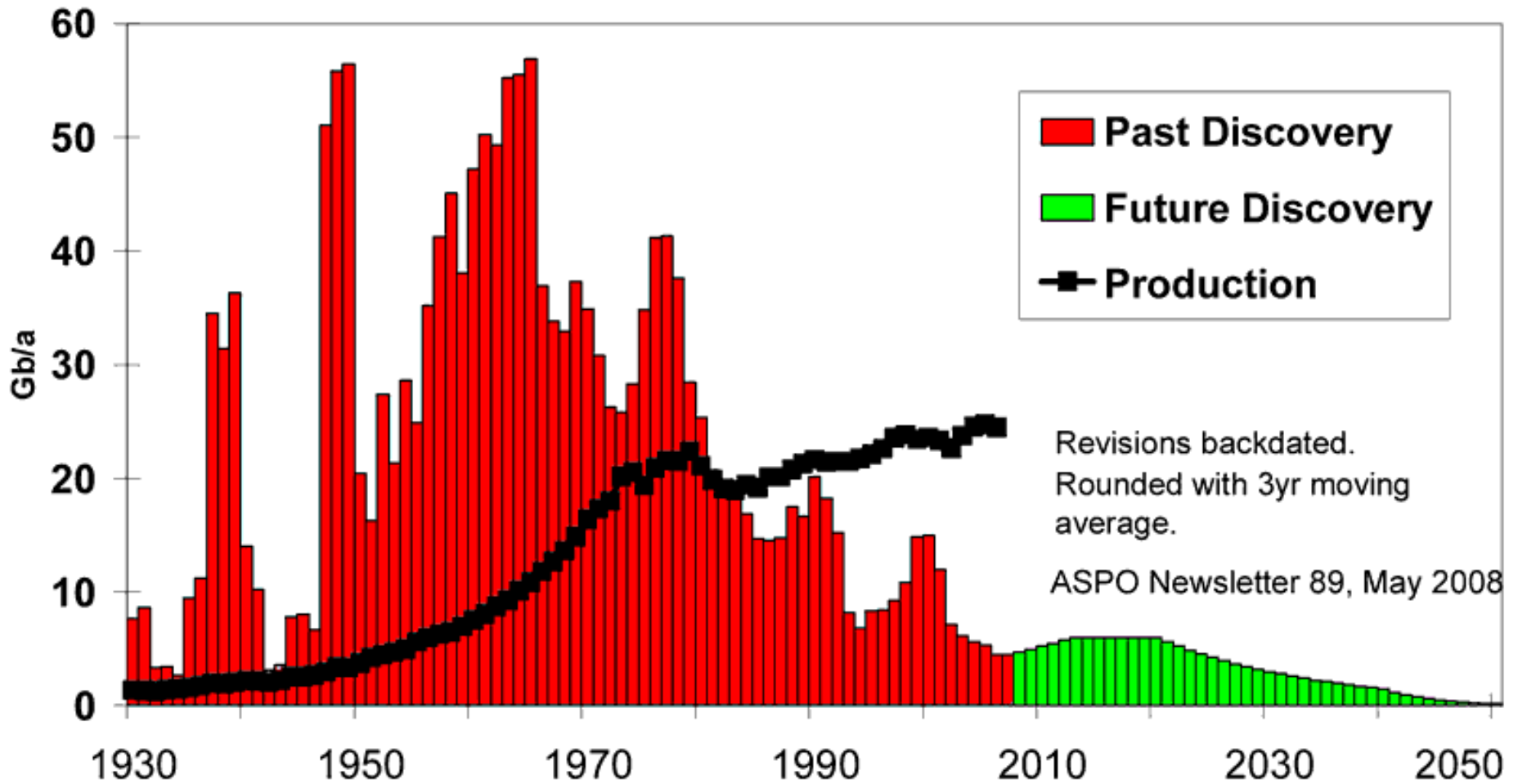
# U.S. Oil Production Peaked in 1971



Source: The Oil Drum: Stuart Staniford

# Oil Discovery

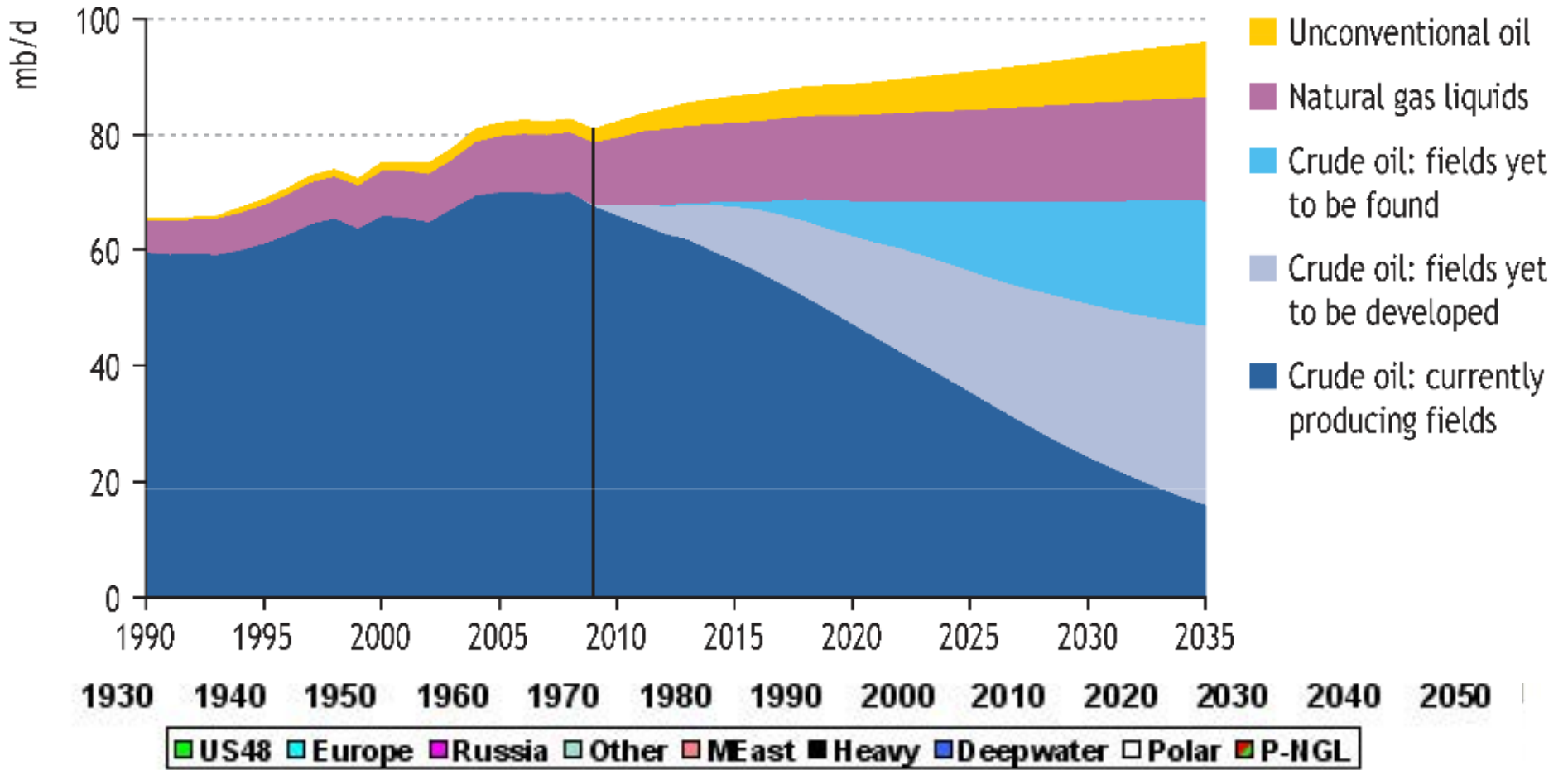
## THE GROWING GAP Regular Conventional Oil





# Oil Production

World oil production by type in the New Policies Scenario



Source: USEIA, 2009

# The Bakken, Shale Gas and Other Misinformation

Conventional	Shale
Deep water oil production / well: 90,000 bbls / day	Bakken oil production / well: 150 bbls / day
Number of Bakken wells per conventional well: 600	
Break-even cost of oil production: ~\$25 / bbl	Break-even cost of oil production: ~\$65 / bbl
Break-even cost of gas production: ~\$2.00 / Million Btu	Break-even cost of gas production: ~\$4.50 - \$8.00 / Million Btu
U.S. pipeline price of gas (Henry Hub): \$2.70 / Million Btu (2/18/12)	

# The Bakken, Shale Gas and Other Misinformation

Recoverable Bakken reserves (USGS):

**2.2 - 3.0 billion bbls**

U.S. annual consumption:

**6.6 billion bbls**

Bakken production:

**480,000 bbls / day**

U.S. consumption:

**18,600,000 bbls / day**

Recoverable shale gas reserves (USGS):

**347 tcf**

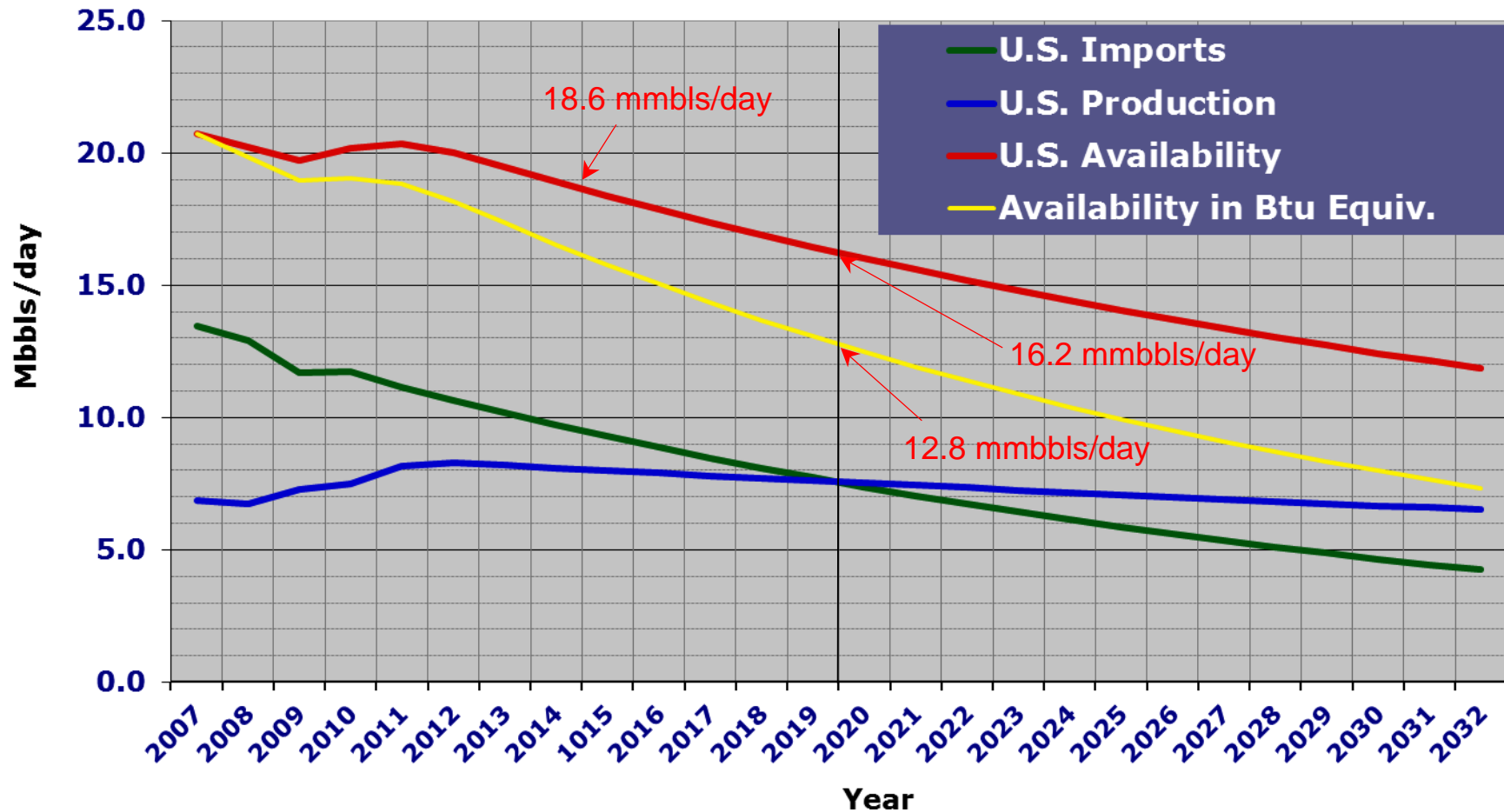
U.S. annual consumption:

**22 tcf**

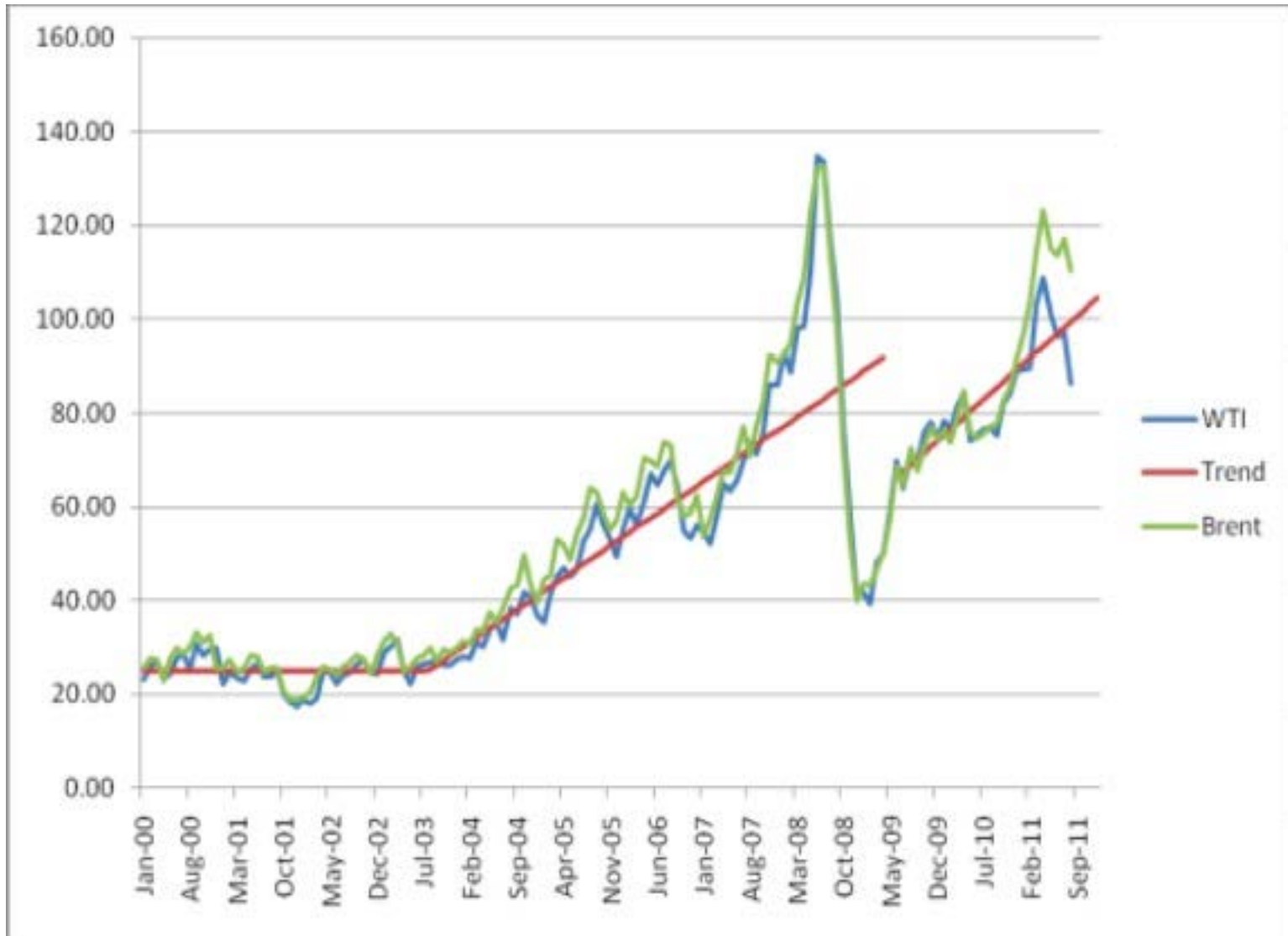


# U.S. Oil Availability Forecast

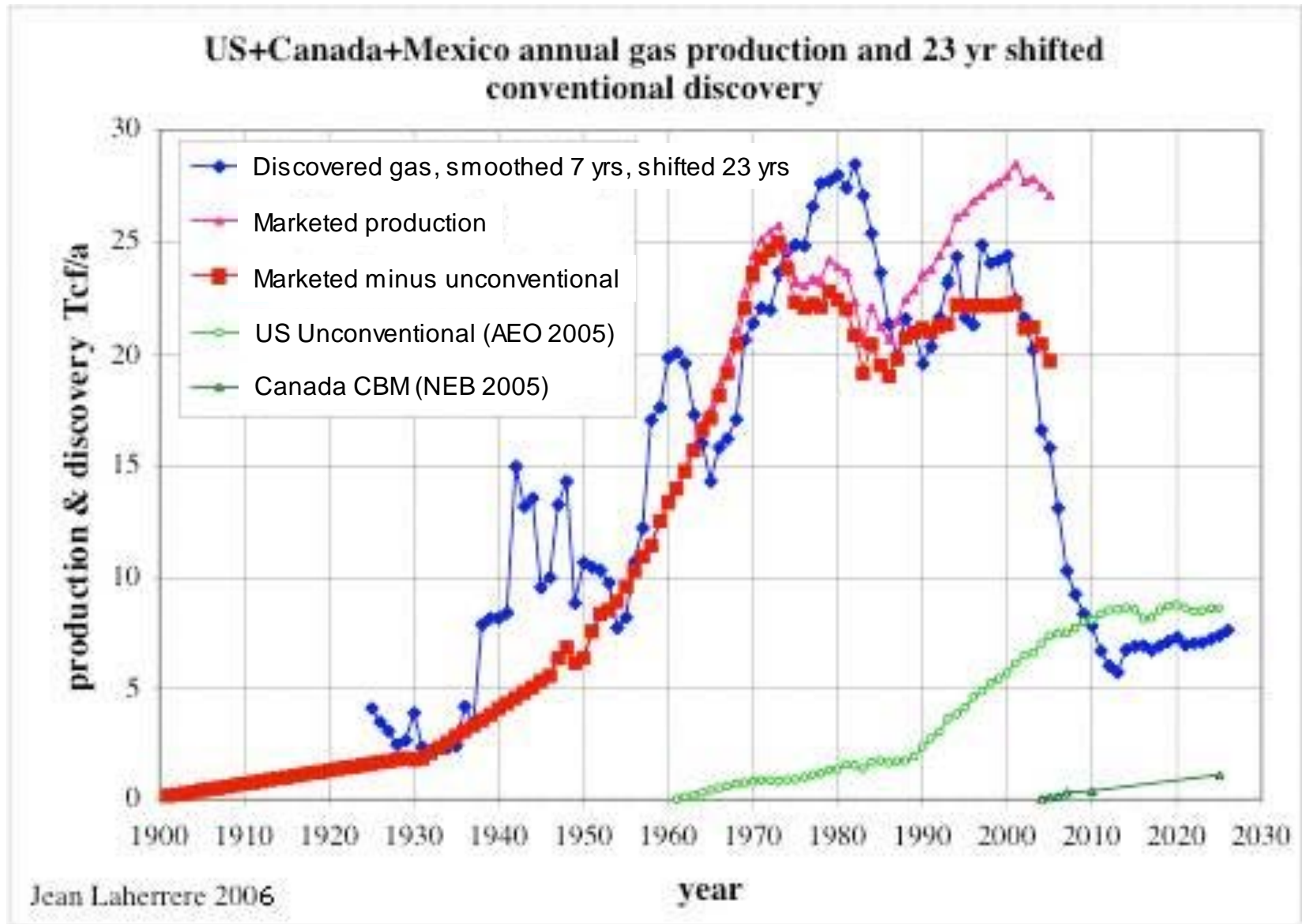
## U.S. Oil Availability



# Oil Prices



# North American Natural Gas



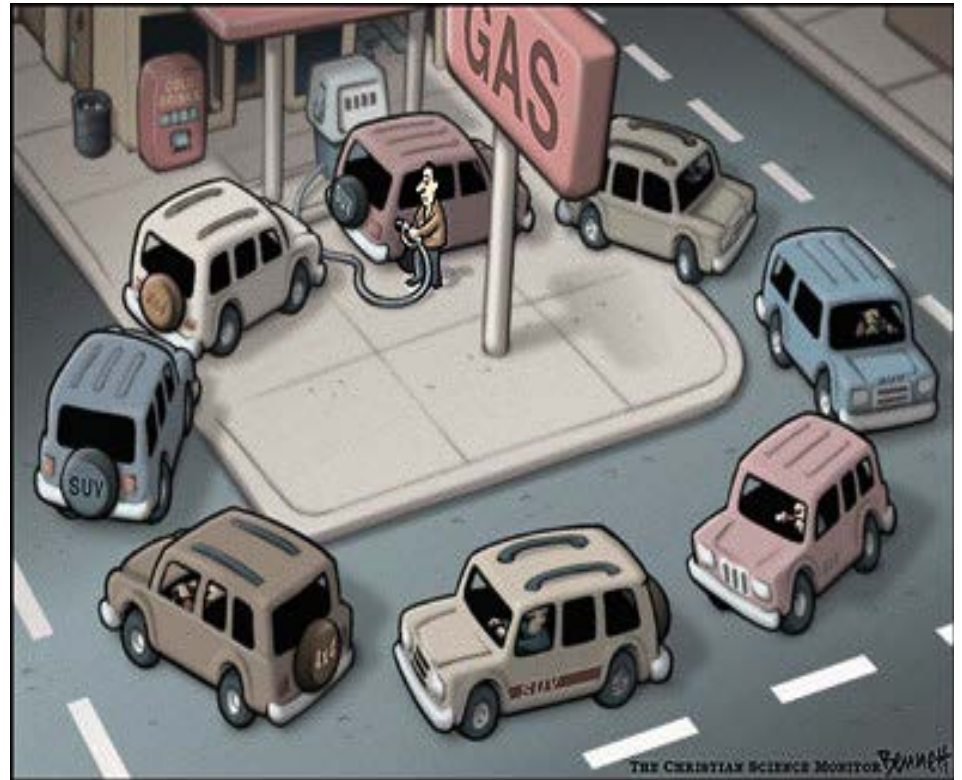


# Bridge Fuel?



# Comparative EROEI

Old oil	100
Middle-East oil	30
US Oil	18
Natural gas (conv)	20
Shale gas	8-10
Coal	10-20
Hydropower	10-40
Wind	5-10
Nuclear	5
Solar	3-8
Oil Sands	3
Shale Oil	3
Ethanol	~1





# The Source of Labor Productivity

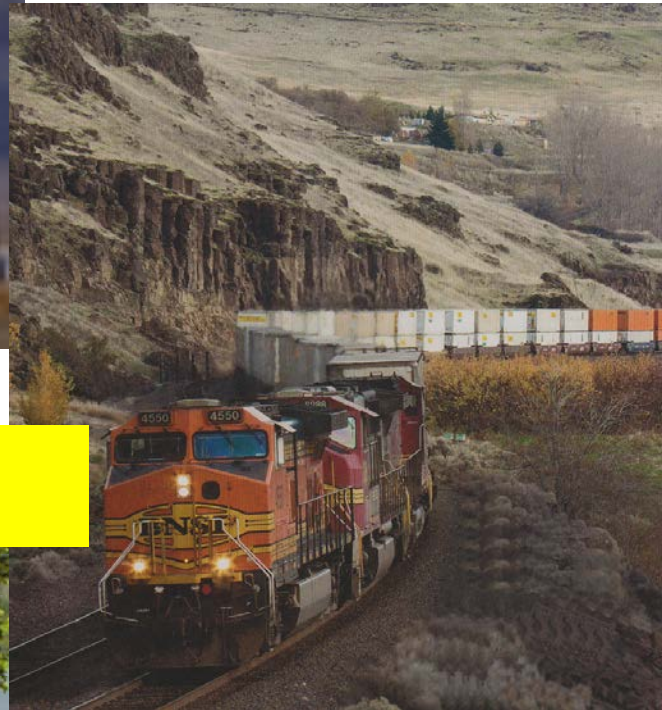




# Freight Transport

Ton-miles per gallon:

Truck 59



Rail

202



Barge

514

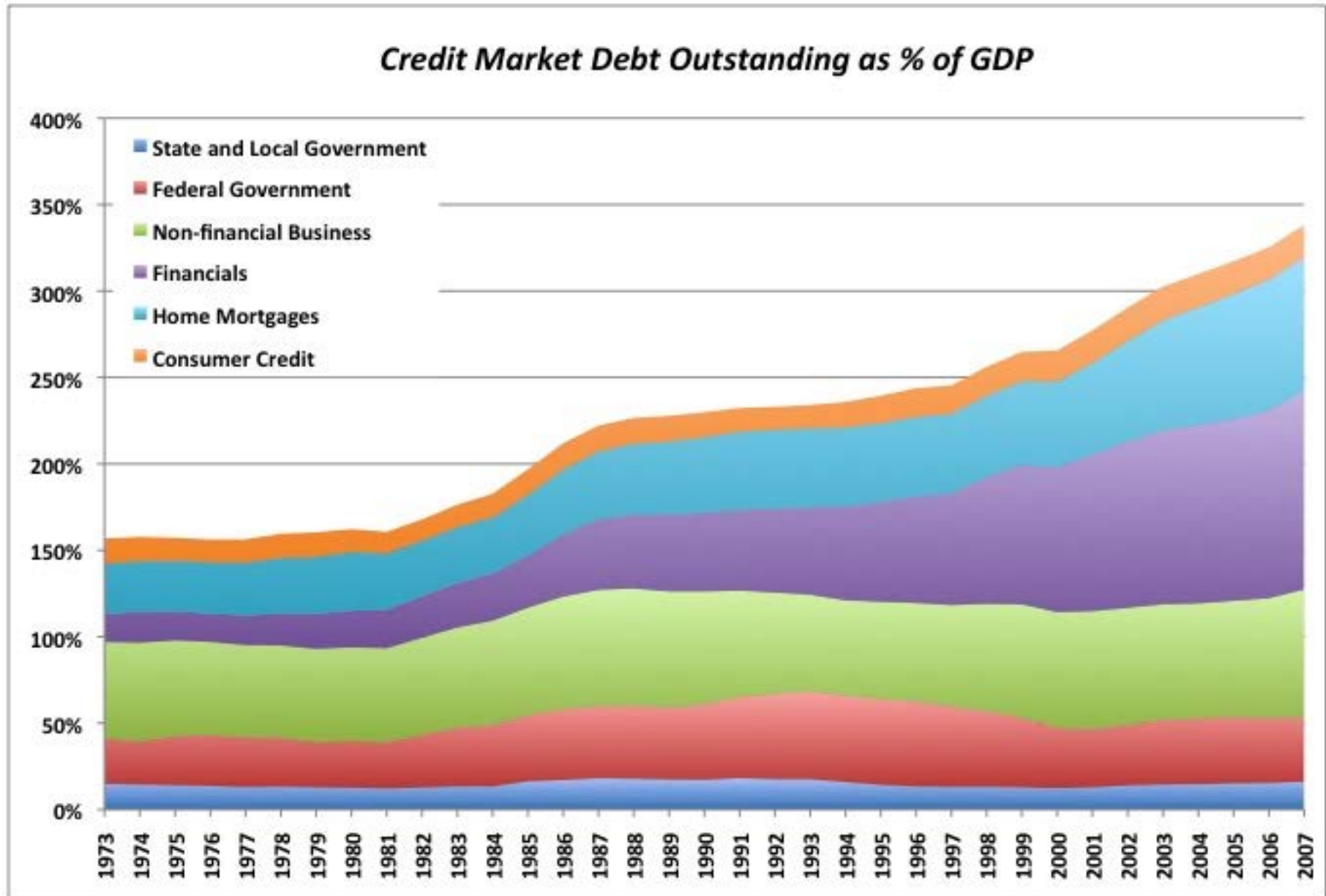
Source: USDOT 2002



Financial  
Meltdown



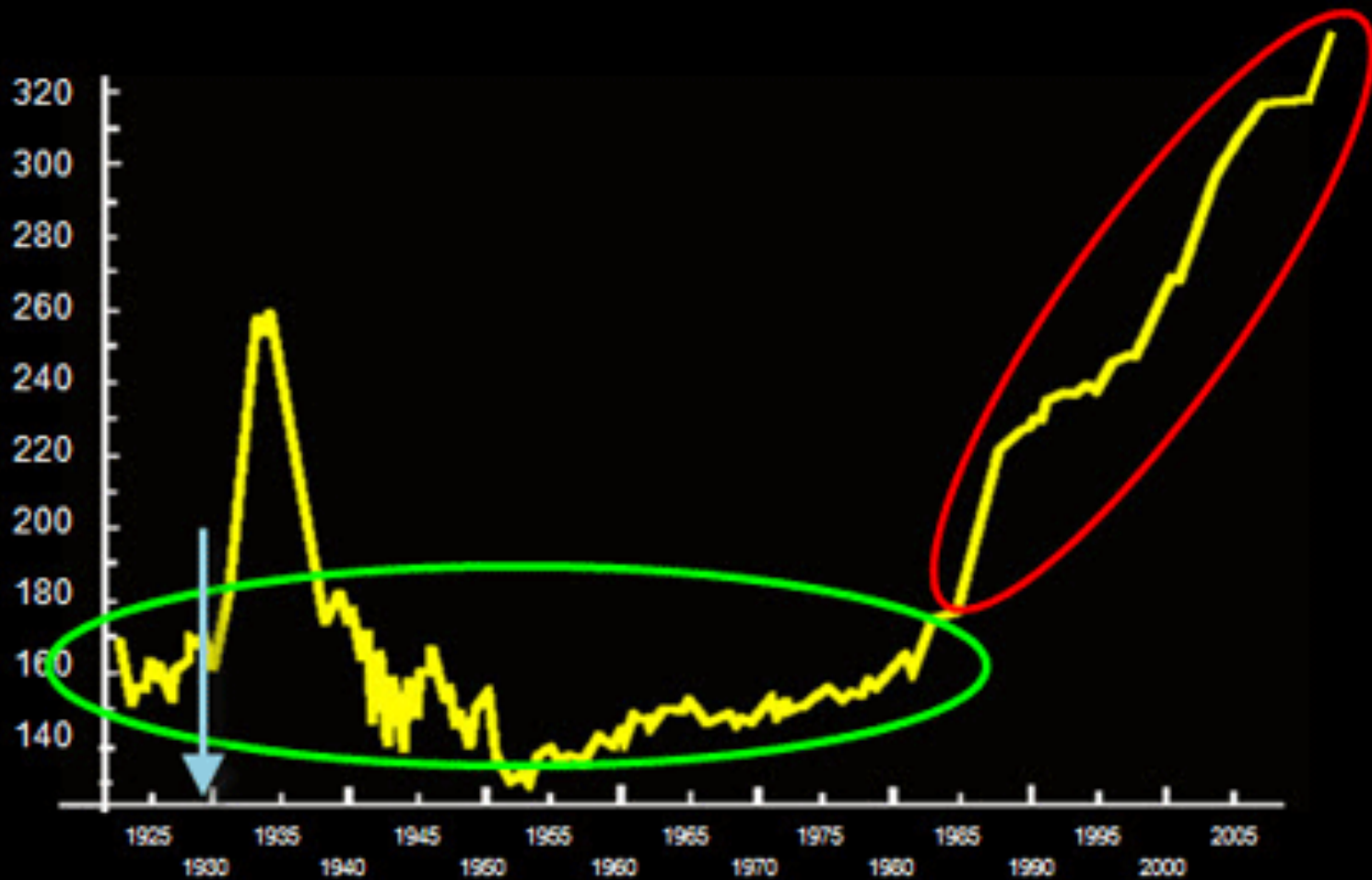
# All Debt, All the Time





# Another View of the Crisis

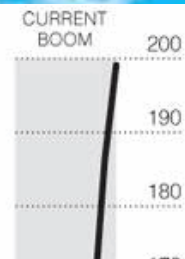
## A Historic Level of Debt



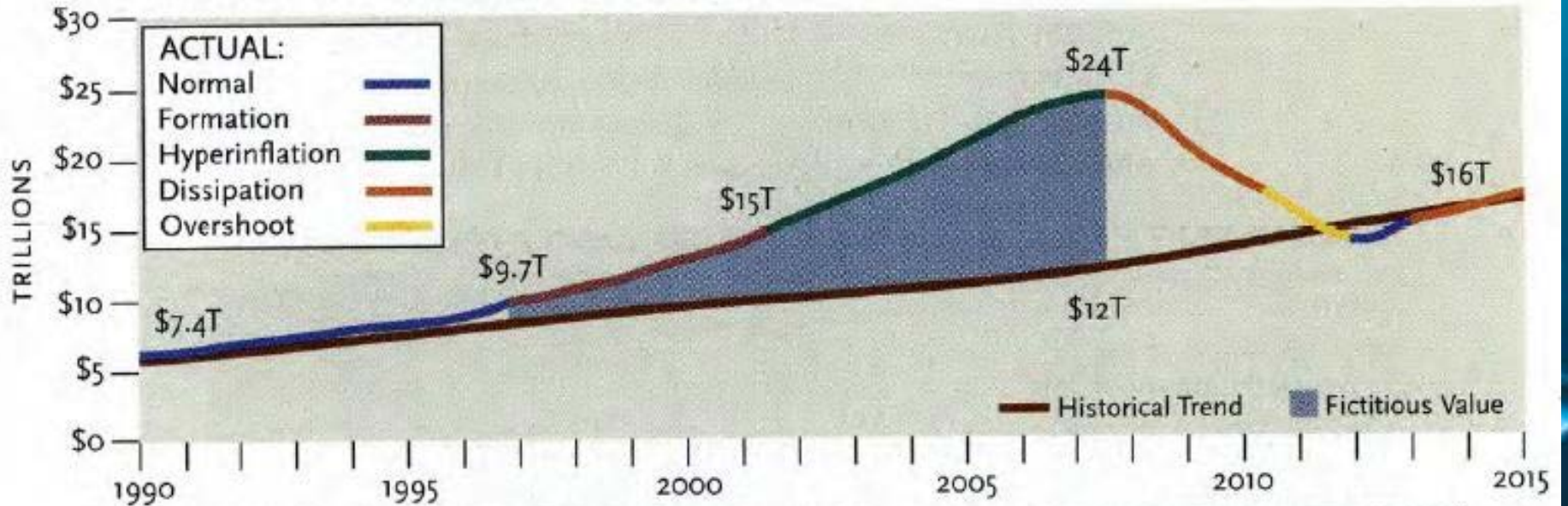
# Bubbles

## A History of Home Values

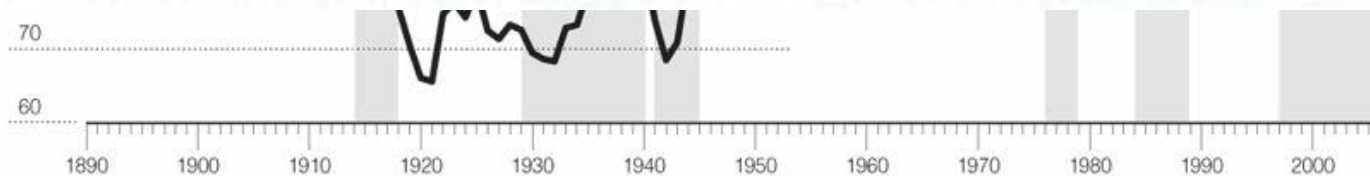
The Yale economist Robert J. Shiller created an index of American housing prices going back to 1890. It is based on sale prices of standard existing houses, not new construction, to track the value of housing as an investment over time. It presents housing values in consistent terms over 116 years, factoring out the effects of inflation.



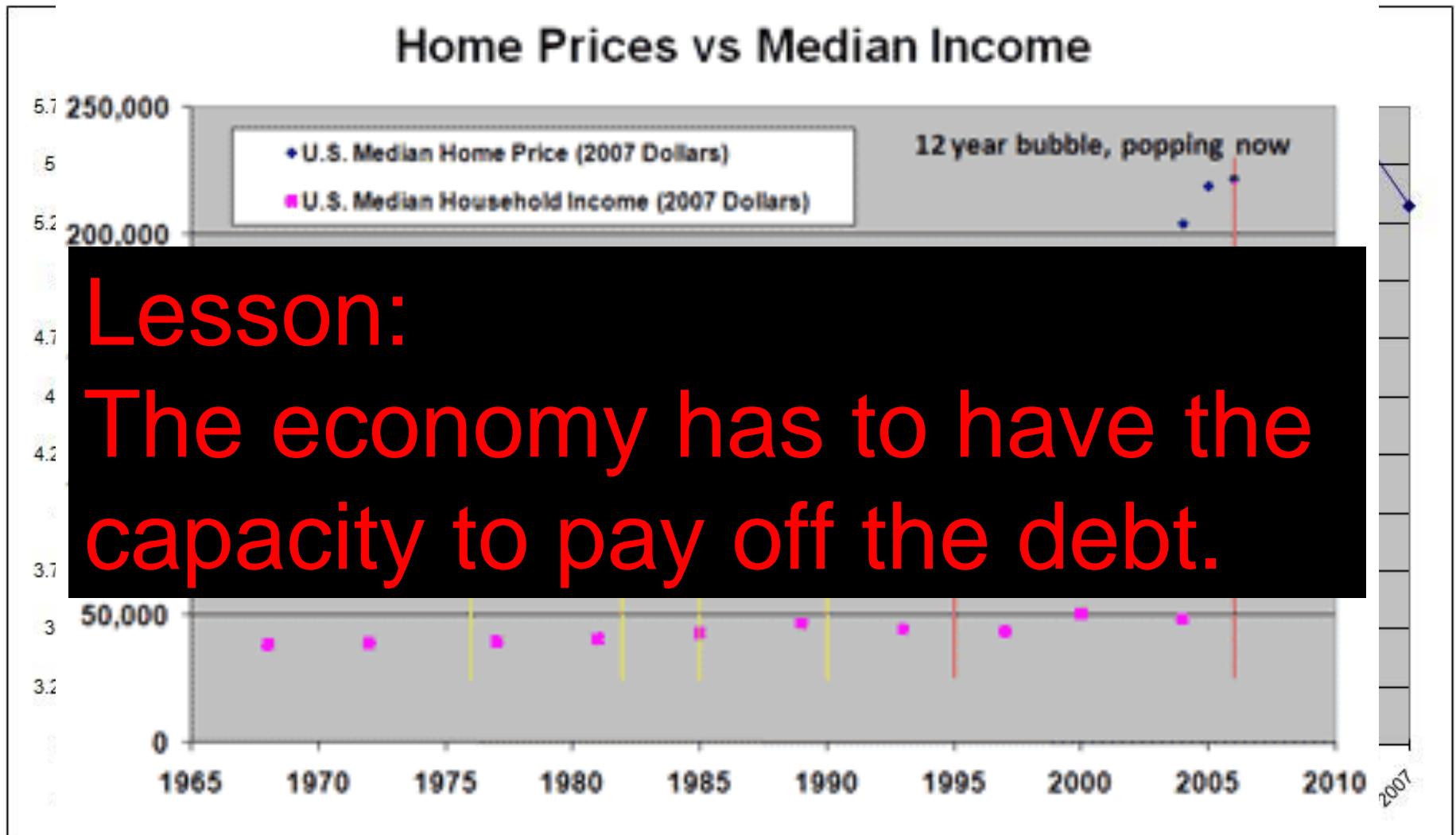
### TOTAL MARKET VALUE: REAL ESTATE



ACTUAL MARKET VALUE FROM "FEDERAL RESERVE FLOW OF FUNDS ACCOUNTS OF THE UNITED STATES"

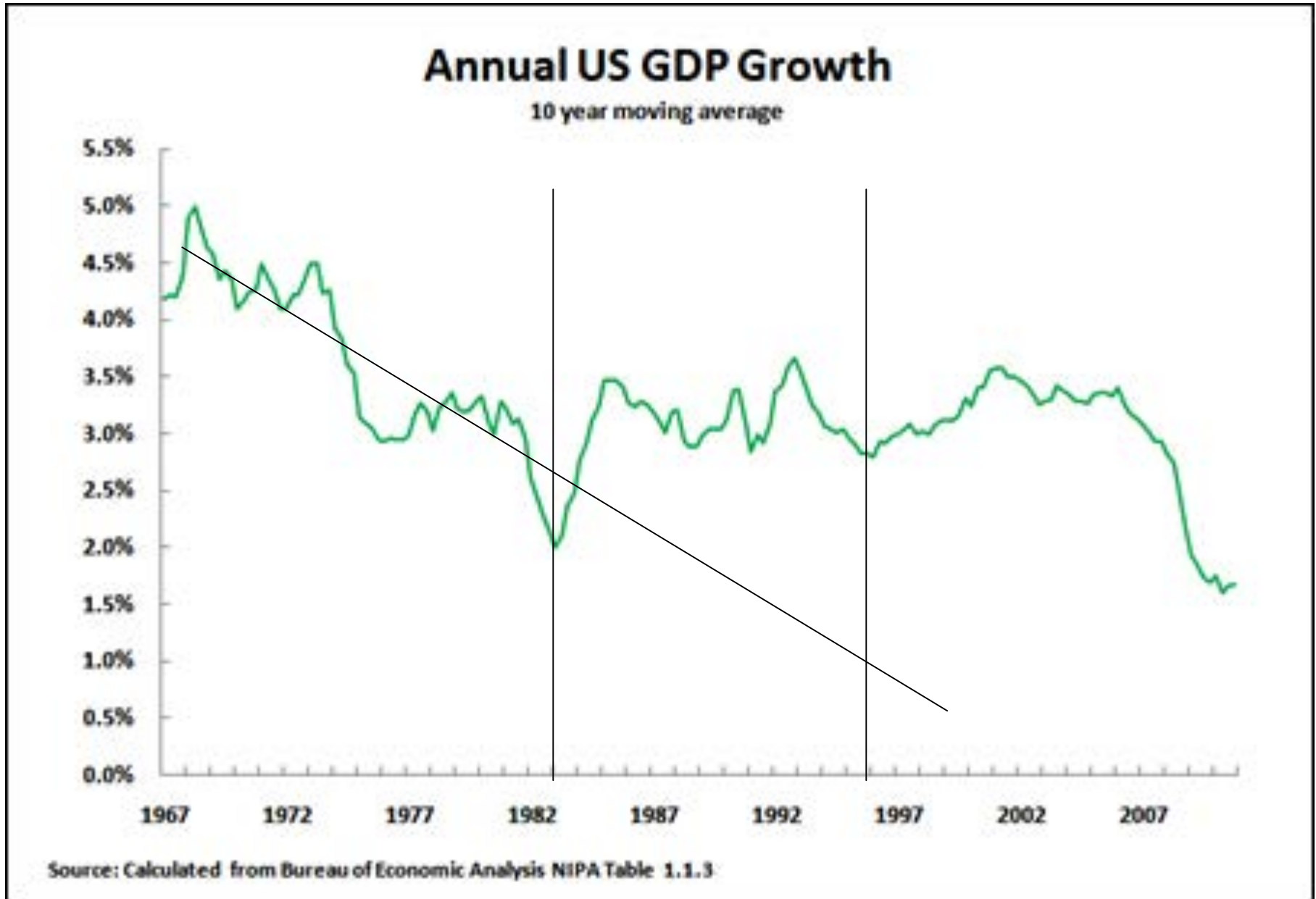


# What Really Matters





# The End of Real Economic Growth



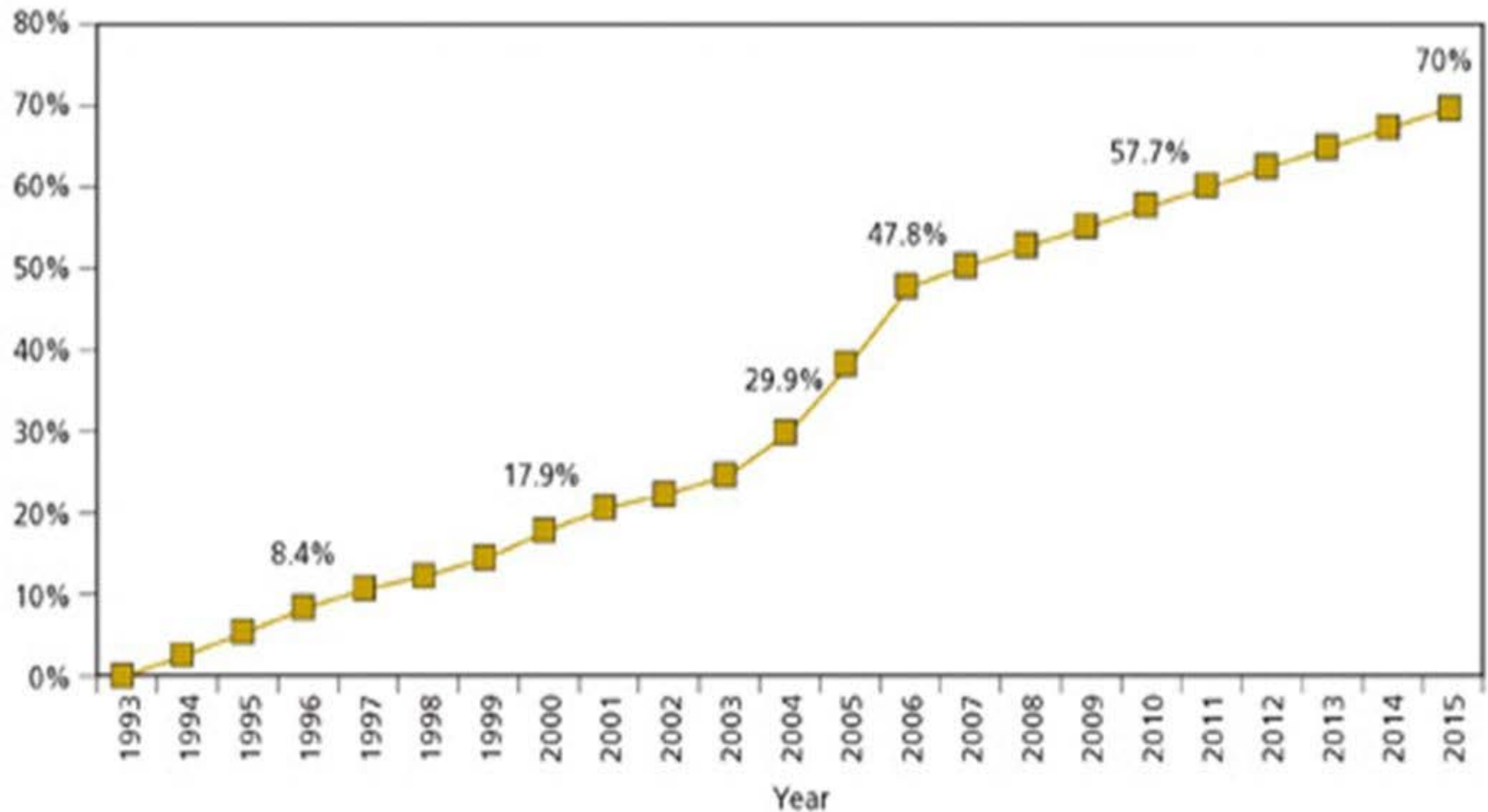




**ROUGH  
ROAD  
AHEAD**



# Cost of Construction



Note: Projected change from 2007 to 2015 based on the Consumer Price Index. Data for 2004 to 2006 based on the Producer Price Index for highway construction.



# Asphalt Supply

## U.S. Asphalt Refinery Yield



# Character Flaw?

“Americans have a major character flaw – everyone wants to build something but no one wants to do

maintenance.”<sup>1</sup>

Civil Infrastructure Maintenance Backlog:

\$3 Trillion at the end of 2010

<sup>1</sup> Kurt Vonnegut

# Oregon's Highway Backlog - 2007

## PROBLEMS

\$391 MILLION

**Total maintenance backlog  
for state of Oregon  
transportation system...**

- Modernization Program      \$222 million
- Preservation Program (overlays)      \$42 million
- Bridge Program      \$58 million
- Traffic Safety Program      \$20 million
- Maintenance Program      \$49 million



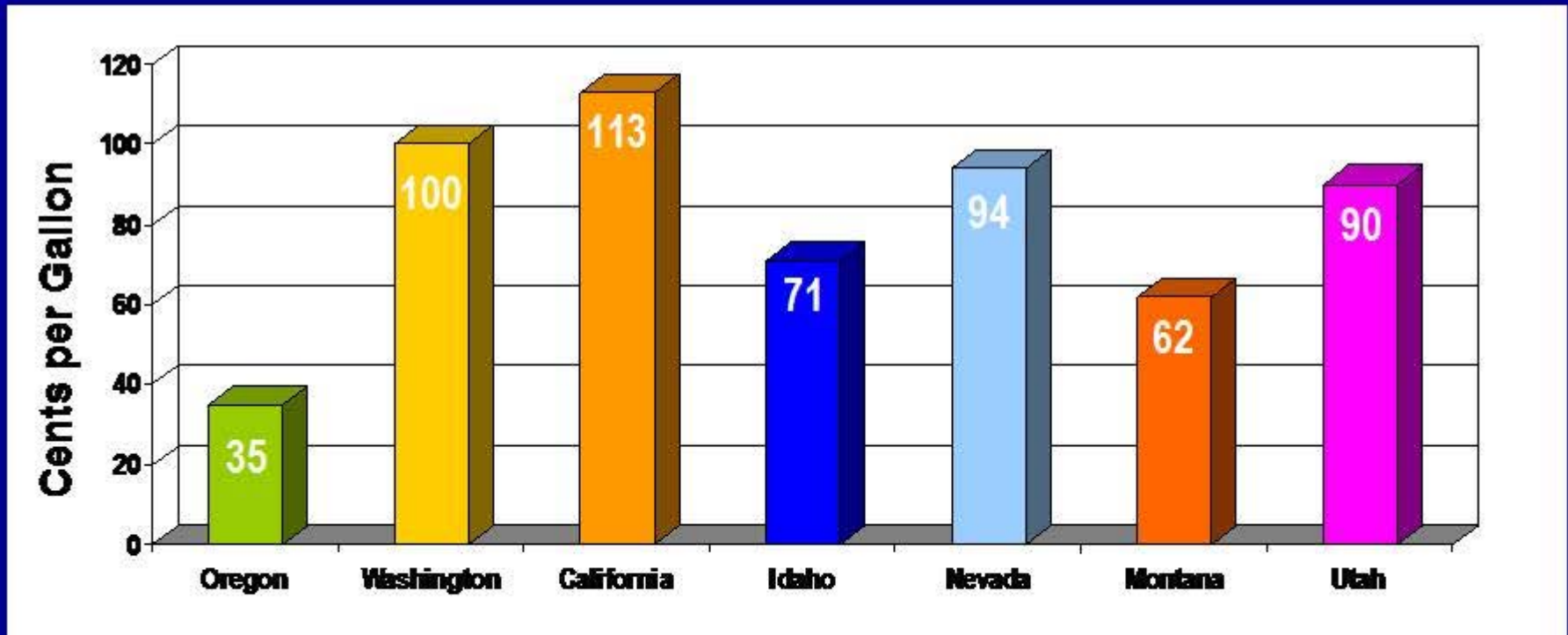
# Clackamas County Backlog - 2010



~\$80 million

# COMPARISON OF AUTOMOBILE RELATED TAXES

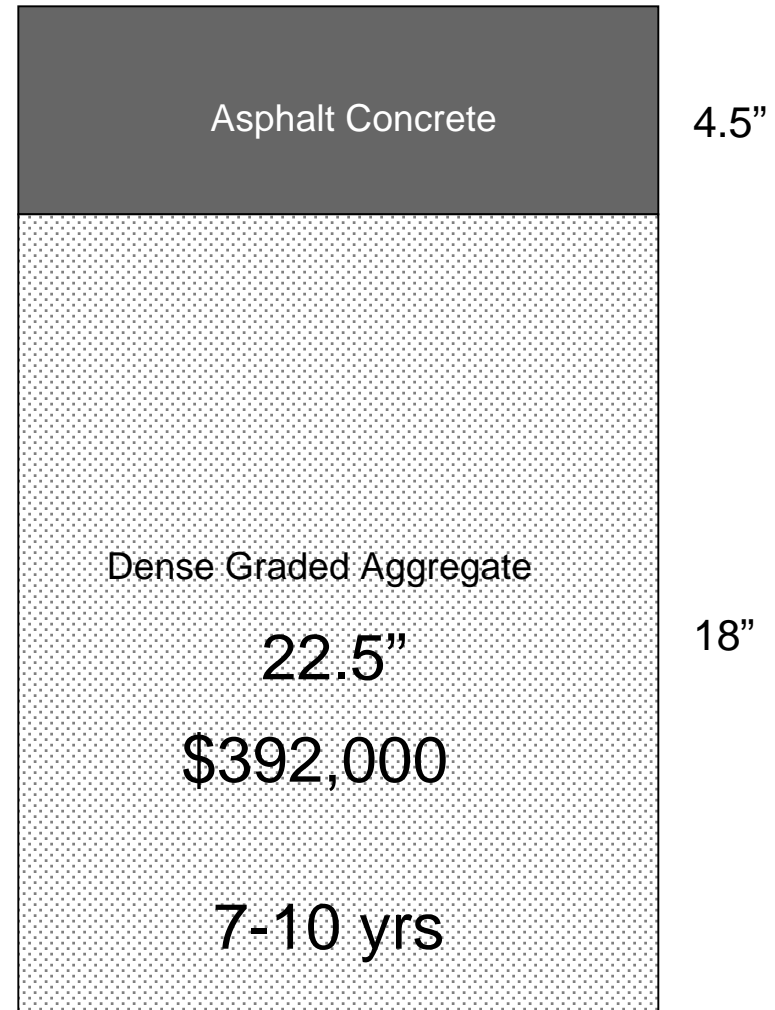
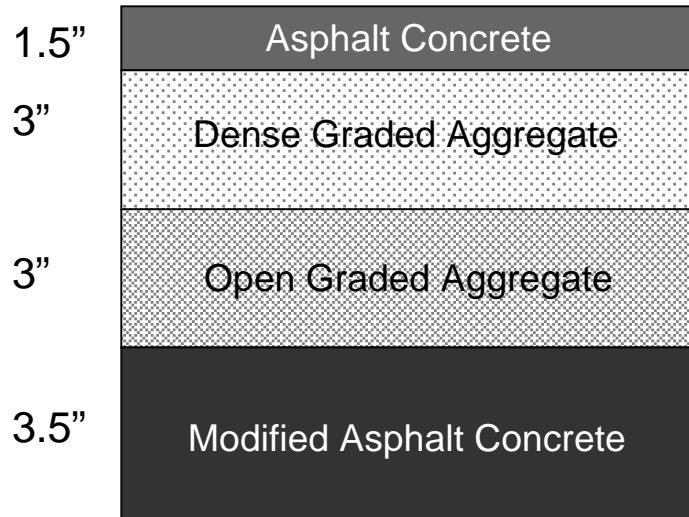
Summary of All Auto Related Taxes (Per Gallon of Gas)



Oregon Department of Transportation, January 2007

# Planned Obsolescence

1983, Rancho Palos Verdes, CA



Section: 11" vs 22.5"

Cost as bid: \$255,000 vs \$392,000

Structural Design Life: 50 yrs vs 7-10 yrs

Cost Savings: \$137,000 (35%)  
(or \$62,000 per lane-mile)



# Silver Bullets & Other Fantasies

*Gee Whiz!*  
*Sustainable*  
*Growth!*  
*Thank GOD*  
**TECHNOLOGY**  
*will save*  
*us!*



# So what's the plan, Mr. Wizard?

---



# Four Core Planning Principles

1. Plan on liquid fuels reductions, this decade - plan for mobility, not cars
2. There won't be any more real economic growth - plan on shrinking financial resources
3. Focus on maintenance, *unbuilding*
4. If you won't be able to afford to maintain it, don't build it



# Re-thinking the System

Minimizing resource use:

- Product durability/longevity
- Maintain Capital (social, natural, economic)
- Energy Efficiency
- Local Economy
- Zero waste
- Eco-efficiency
- Biomimicry
- Value labor



# 21<sup>st</sup> Century Core Design Principles

- Less, fewer





# 21<sup>st</sup> Century Core Design Principles

- Simple (reduce complexity)





# 21<sup>st</sup> Century Core Design Principles



- Long life , repairable & upgradable





# 21<sup>st</sup> Century Core Design Principles



- **Low/No maintenance**



# 21<sup>st</sup> Century Core Design Principles



- **Biomimicry**



# 21<sup>st</sup> Century Core Design Principles



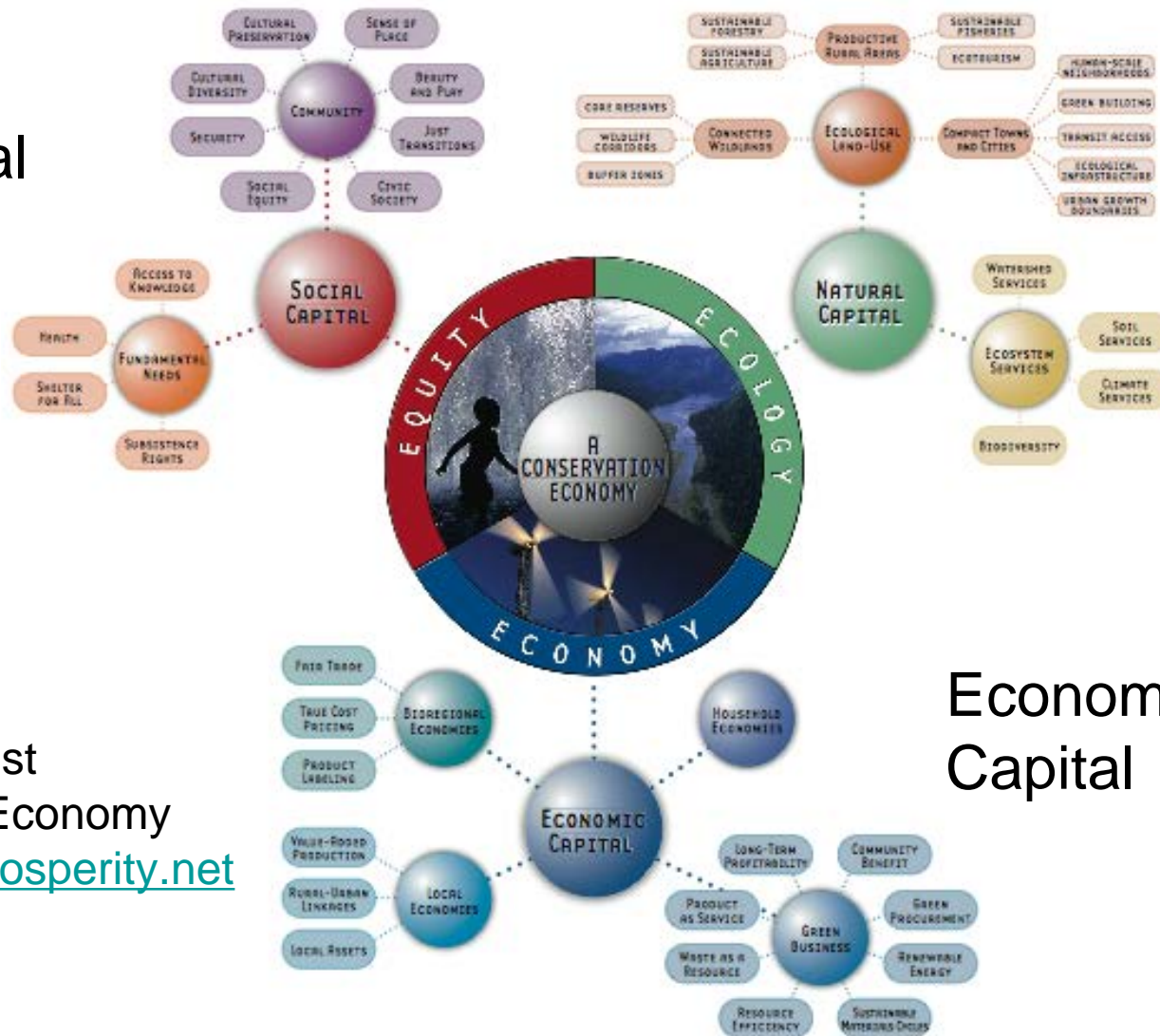
**Unbuild**



# New Economic Framework

## Based on a Richer Definition of Capital

Social  
Capital



Natural  
Capital

Economic  
Capital

Source: Ecotrust  
Conservation Economy  
[www.reliableprosperity.net](http://www.reliableprosperity.net)



# Elements of the New Economy



**Re-localize Manufacturing**





# Elements of the New Economy



**W  
O  
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K  
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O  
P**

**FINANCIAL PERMACULTURE:  
Greening a Rural Community** Oct. 24-27  
Hohenwald, TN

Linking managerial talent, business science and cutting edge ecological technology to create profit-driven sustainable solutions.

Featuring:

**Catherine Austin Fitts**  
Investment Advisor, Founder Solari, Inc.  
Catherine has designed and closed over \$25 billion of transactions and investments to-date and has led portfolio strategy for \$300 billion of financial assets and liabilities.

**Andy Langford M.S.**  
Permaculture Designer, Co-Founder Gaia U  
Andy has started many businesses, consulted with governments, and has taught permaculture for 30+ years, including graduate-level work internationally.

This 5-day interactive course will provide tools and skills to launch regenerative businesses and encourage local investment. For example, designing the business plan for a local ethanol plant/station. Topics will include:

- Mapping the financial ecosystem of a community
- Permaculture principles applied to business design
- Attracting & Engaging local investors

Info & Register @ [www.FinancialPermaculture.com](http://www.FinancialPermaculture.com)

## Re-localize Finance





# Elements of the New Economy



Re-localize our food system





# Elements of the New Economy



**Change Our Mobility Investments**





# Elements of the New Economy



**Change Our Mobility Investments**





# Elements of the New Economy



## Working as a Community

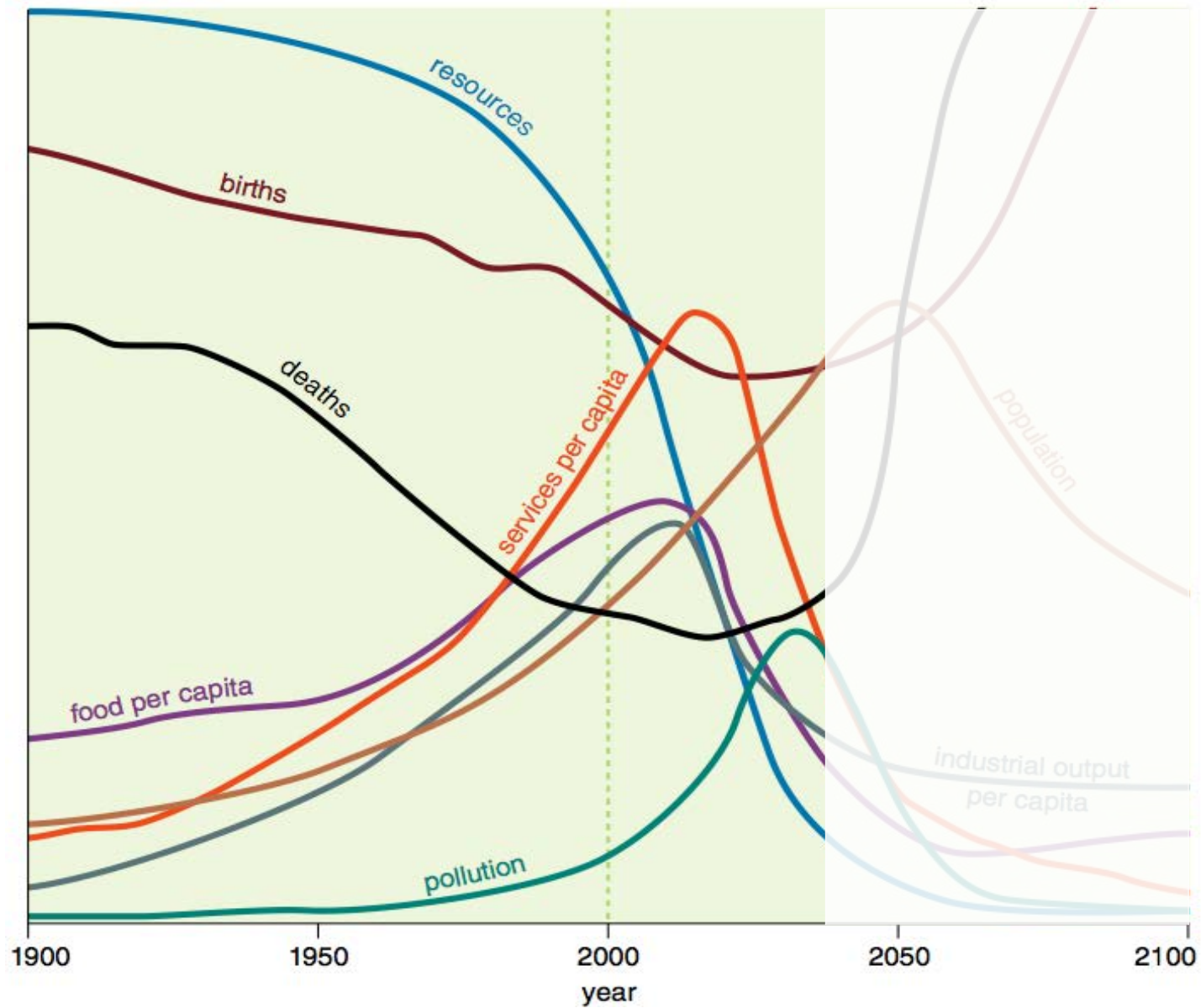




# Fork in the Road



# Forecasting Our Future





# Resources

[www.energybulletin.net](http://www.energybulletin.net)

[www.peakoil.net](http://www.peakoil.net) and [www.theoil drum.com](http://www.theoil drum.com)

The Association for the Study of Peak Oil & Gas  
and Industry Blog



Thank You

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