

# The Pursuit of Excellence



# “Externalities and Project Approval”

- Smart Rivers Conference
  - Louisville September 16-19, 2007
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- University of Tennessee
  - Center for Transportation Research
  - Retired from the Tennessee Valley Authority

# Overview

- What are externalities
- Implications for project approval
- The Chickamauga Lock study
- Why incorporate externalities
- The data are getting better
- Conclusions and Recommendation

What are

# Externalities

- Externality is a wide variety of costs and benefits which are not included in prices or rates.

# Project Benefits

- *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*
- Benefits are determined by improvements in efficiency of commodity movements on waterways
  - Externalities are indirect effects
  - Cannot be used to justify projects (when the B/C ratio is  $<1$ ).

# National Academy of Public Administration-Feb. 2007

- Made recommendations to the Corps concerning the incorporation of externalities in feasibility studies
- *Prioritizing America's Water Resources Investments: Budget Reform for Civil Works Construction Projects at the U.S. Army Corps of Engineers*
- *Page 27*

# NRC concludes that the Corps lags behind other federal agencies

- P&G has a heavy emphasis on economic development
- Others have adopted environmental analysis techniques
- Implementation of environmental impacts will require revision of the P&G or approval from OMB or both.

# Early thoughts about the Chickamauga Lock Project

- At TVA we dealt with a lock (Chickamauga) handling relatively small tonnage
- We tried to model what we felt were the true project benefits
  - This should include externalities (social costs)
    - We only had the time and money to model highway impacts (\$30k)
- The data were not available to estimate externalities

# Impacts of the Chickamauga Lock Study (externality piece)

- Got people talking about externalities
- USACE has reevaluated their position to a degree
- Were used in setting the wpc in the 2<sup>nd</sup> Chickamauga feasibility study
- Duplicated in the Red River extension EIS and the Missouri River manual update
- Currently being applied to the upper Ohio systems study regarding possible closures of one or more of the EDM navigation locks

# Categories of Chickamauga Study Externalities

- Pavement damage
- Crashes--safety
- Congestion—impacts on speed
- Incidents--(congestion caused by lane closures)
- Air pollution

A large amount of data was  
required to quantify highway social  
costs

# Water Transportation Efficiency

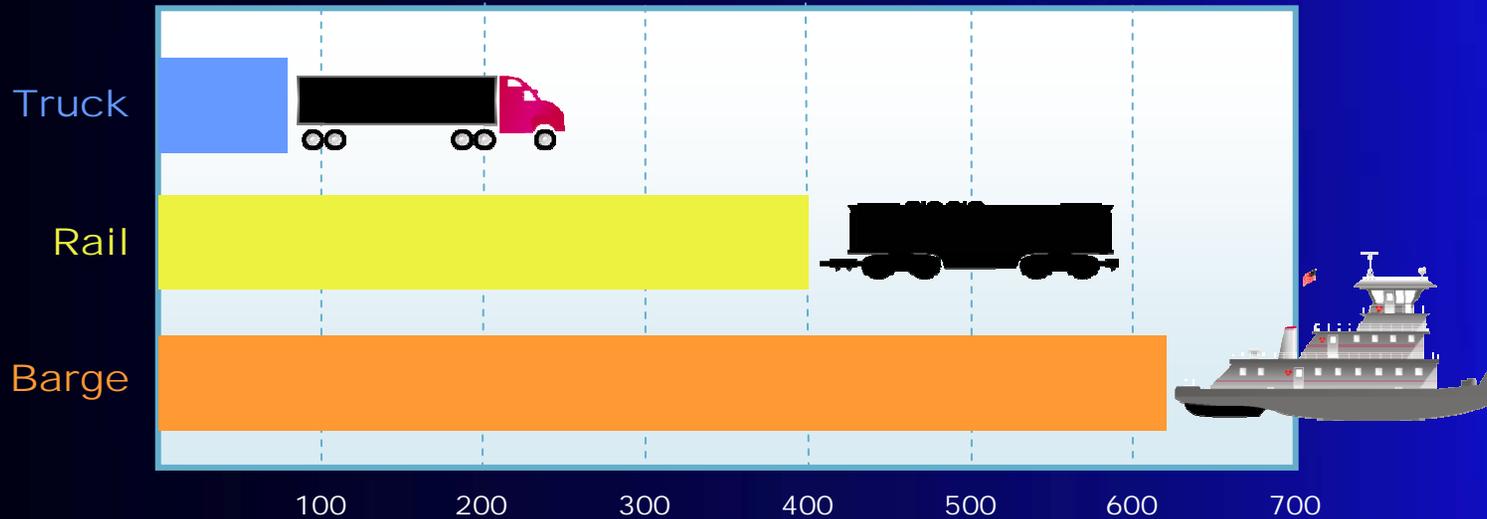
- TVA River Efficiency and Fuel Tax Model
- Estimates efficiency and tax collections by river segment.
- Upper Mississippi River is 32 percent less efficient than the system average.

River	Ton Miles Per Gallon
Upper Mississippi	390.1
Lower Mississippi	686.3
Middle Mississippi	573.6
Ohio	641.7
Tennessee	505.5
Average	575.7

# Checked for Accuracy

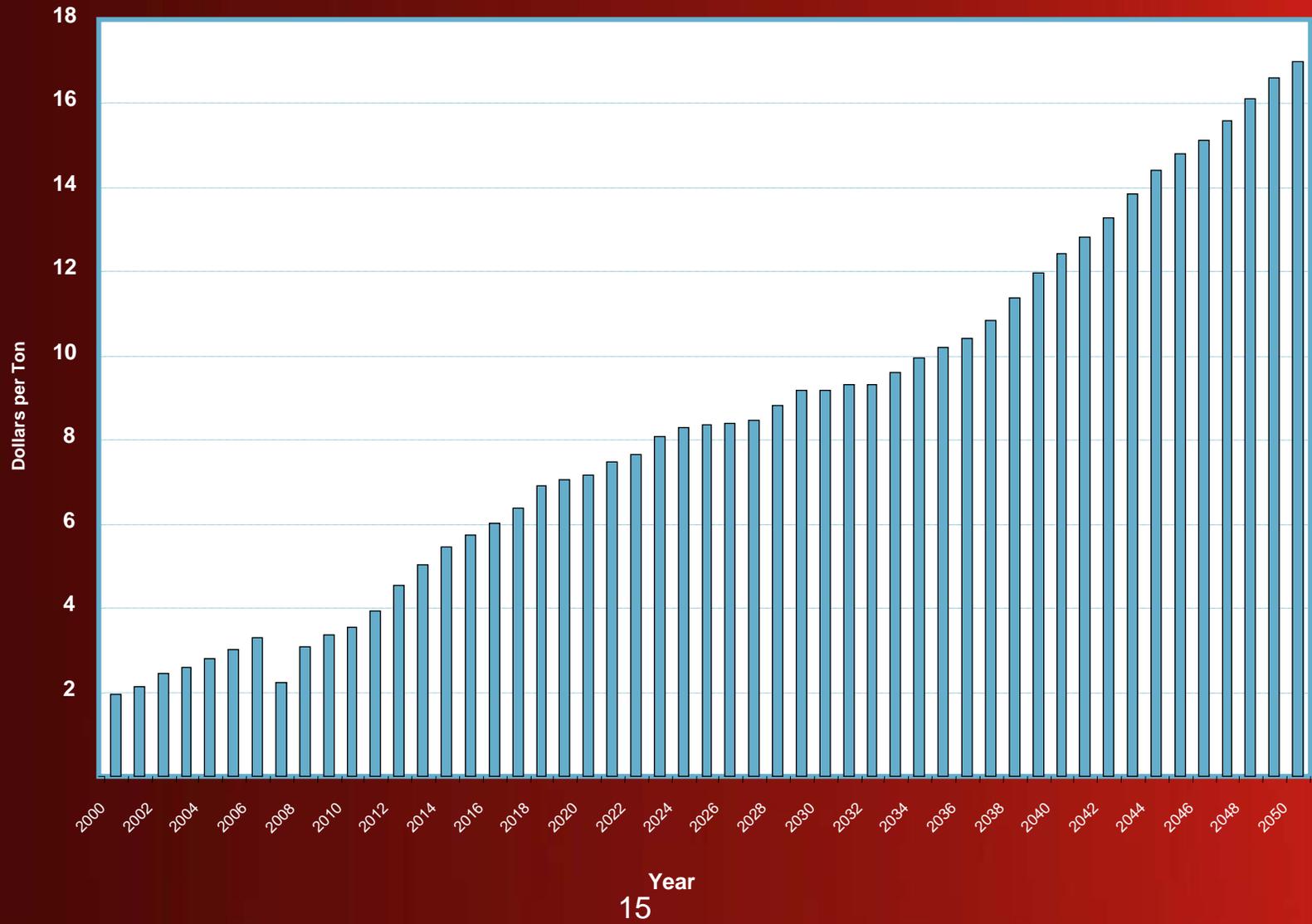
- Tax collections by river segment add up to national total fuel tax collections
  - Generally off by 3% or so

# Tons—Miles Per Gallon of Fuel Relative Fuel Efficiencies



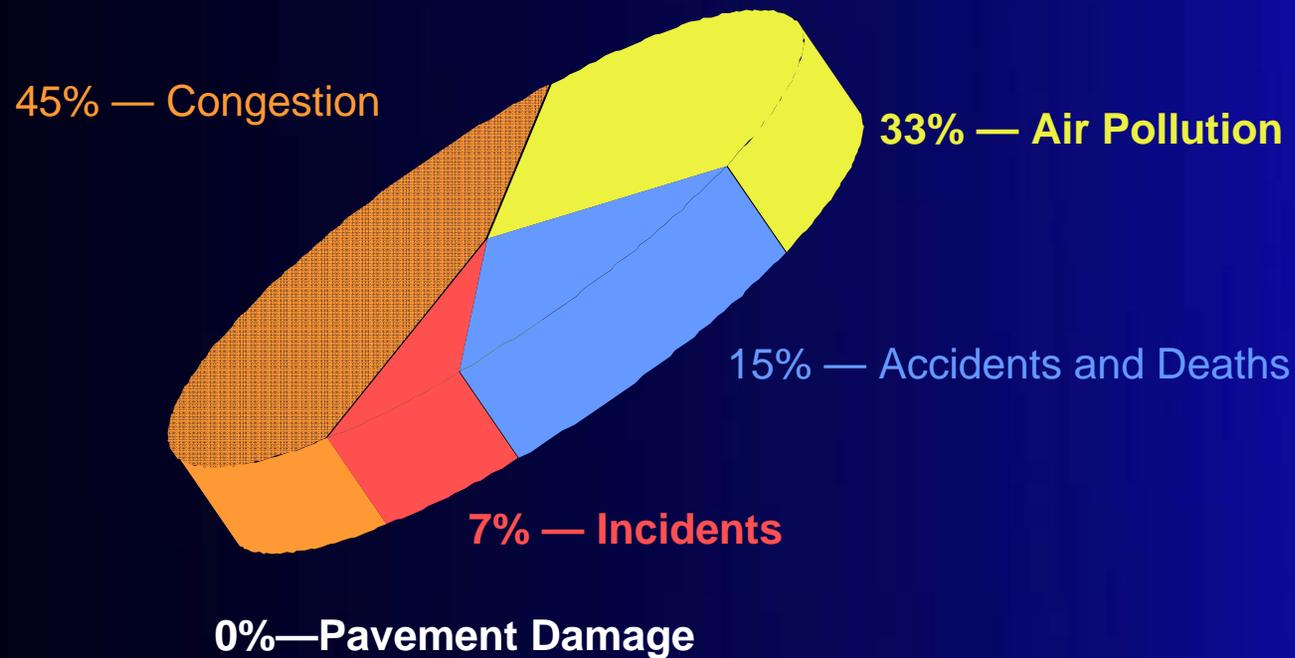
## External Costs Per Ton for Chickamauga Lock Study

# 180-Day Unscheduled Lock Closure



## External Costs of Chickamauga Lock Study

# 180-Day Unscheduled Lock Closure



# ITR and Users

- Dr. Donald Jones of ORNL performed the independent technical review
- Only source of waterway transportation efficiencies by waterway segment
- Used by agencies and universities
  - MARAD, IRS, North Dakota State, Transportation Center at Texas A&M
- Inland Waterways User Board

The data are getting better

# EPA models have improved

- EPA has improved MOBIL5 to MOBIL6a:
  - MOBIL5 had 8 vehicle types; MOBIL6 provides finer detail
  - Emission factor estimates were given by day and now are given per hour
  - Much finer detail in the precursors
- EPA has made progress in the estimation of social cost data—now use BENCOST

USEPA

Office of Air Quality and Standards

Air Benefits and Cost Group

Research Triangle Park

North Carolina

# Social Benefits/Ton from a 25% Reduction in Precursors

	Pope	Laden
Carbon	\$561,910	\$1,203,363
NH <sub>3</sub> (anhydrous ammonia)	\$40,171	\$86,073
NO <sub>x</sub> (compounds of nitrogen)	\$9,237	\$19,801
So <sub>x</sub> (compounds of sulfur)	\$52,020	\$111,360
Voc (volatile organic compounds)	\$325	\$695

Pope—based on American Cancer Society

Laden—based on a Six Cities Study and smaller in scope

- Pope-*JAMA*, 2002
- Laden—*American Journal of Respiratory and Critical Care Medicine*, 2006

# Others Use Externalities

- EPA compares the benefits of clean air to the costs of implementation.
  - This is why EPA developed BENCOST
- FRA (Fed. RR Administration)—noise and crashes at railroad crossings
- FHA – congestion, crashes, maintenance, and air pollution
- FAA—noise abatement procedures

# Red Book, American Association of State and Highway Transportation Officials (AASHTO)

- A Manual of User Benefit Analysis for Highways, 2<sup>nd</sup> Edition (updates 1977 edition)
  - A tool to help state and local transportation officials evaluate user benefits of highway improvements

# EPA thoughts about the Pittsburgh Study

- The senior economist of the Air Benefits and Cost Group told me that they were supportive of what we are doing here at UT
- Provided the data and gave us guidance as to the cost/ton series for UT to use in the study
- Also invited to train us in using BENCOST

# WRDA Passed the House of Representatives-HR1495

- Requires the Guidelines to be rewritten within 2 years of enactment of the Act

# Recommendation

- Some organization should be a catalyst in pushing the idea of including externalities in feasibility studies
  - Institute a dialog with OMB and those writing the Guidelines (assuming WRDA signed by the President)
  - NAS will make recommendations regarding updating planning documents
- USACE should host a symposium on the state of the art in social cost estimation
  - Examine the tools developed by TVA, EPA and others
  - Examine the data used in the analyses
  - Examine the issue of double counting

# Conclusion

- The manner in which externalities are treated can affect project net benefits
- The manner in which externalities are now being evaluated can not be used in feasibility studies when the  $b/c < 1$ .

# Last—please read our paper

- “Impact of Increased Truck Traffic Due to Chickamauga Lock Closure”
  - Center for Transportation Research
  - University of Tennessee
  - TRB (July 2000)