

Using Cost-Benefit Analysis to Document Freight Project Benefits

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Outline

- Background
 - Context
 - Impact Categories
- CBA Process
 - Theory
 - Outcomes
 - Application Integration
 - LCV example



Context and Motivation

- TIGER I & II
 - 2,400 total applicants
 - \$76 billion requested
 - 126 awarded grants
 - \$2.1 billion awarded
- TIGER III
 - Awarded End of 2011
 - 848 applicants
 - Requesting \$14.29 billion
 - 46 recipients
 - Total available \$511 million



Long –Term US DOT Strategic Goals

- State of good repair
 - Asset management
- Economic competitiveness
 - Efficient movement of goods
- Livability
 - Increase mobility
- Environmental sustainability
 - Emissions
- Safety
 - Accident or severity reduction



Purpose

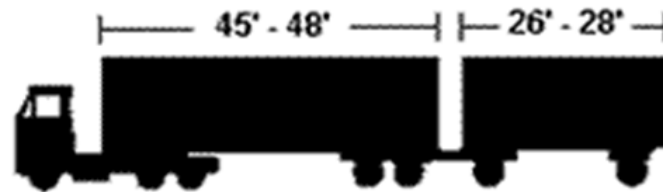
- How to use CBA as an application's framework

BCA Step	Contribution Application
1. Specify the set of alternative projects	Vision
2. Decide whose benefits and costs count (standing)	Narrative
3. Identify the impact categories, catalogue them, and select measurement indicators	Narrative
4. Predict the impacts quantitatively over the life of the project	Vision/BCA analysis/Report total in narrative
5. Monetize (attach dollar values to) all impacts	BCA analysis
6. Discount benefits and costs to obtain present values	BCA analysis/Report total in narrative
7. Compute the net present value of each alternative	Vision
8. Perform sensitivity analysis	BCA analysis/Report total in vision
9. Make a recommendation	Vision



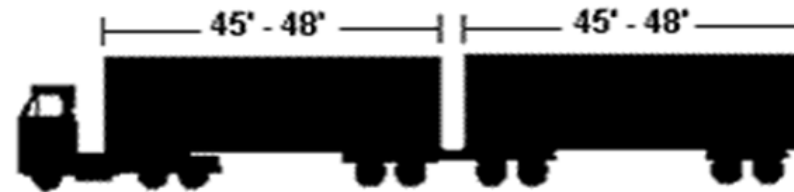
Common Types of LCVs

Rocky Mountain Double



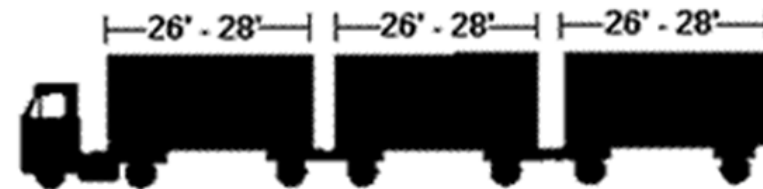
7+ axles
Max GVW 120,000 lbs
Max trailer length 48 ft

Turnpike Double



9+ axles
Max GVW 129,000 lbs
Max length 48 ft

Triple



7-8 axles
Max GVW 110,000 lbs
Max trailer length 28.5 ft

*Short doubles are not considered LCVs



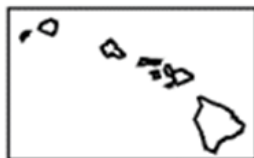
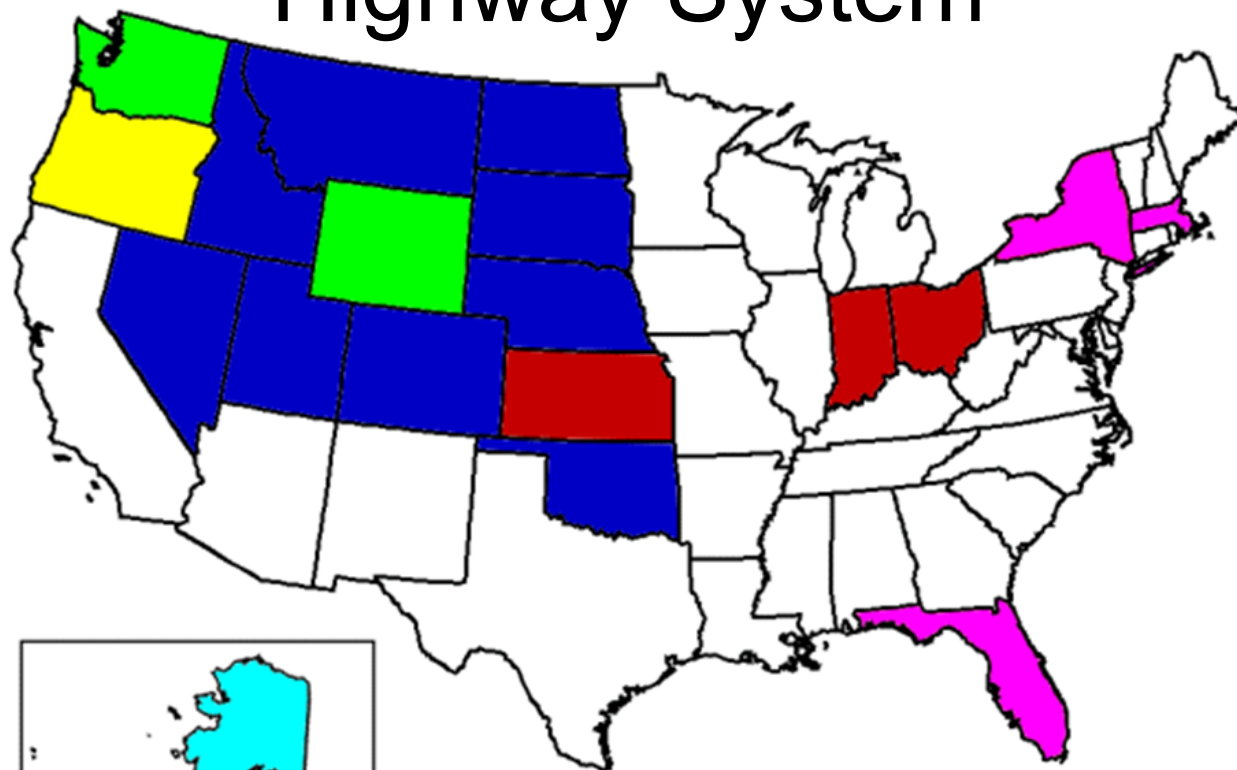
Current Policy/History

- In **1991**, Congress passed the Intermodal Surface Transportation Efficiency Act (ISTEA) which **prohibited states from increasing the size and weight** of combination vehicles beyond that already allowed on June 1, 1991.
- A “**grandfathering clause**” in ISTEA, allows LCVs in states where they were in operation before June 1, 1991.
- During the 2003-2004 legislative session, Senate Joint Resolution (SJR 7) memorialized the President and Congress to **maintain the current federal truck size and weight limitations**, and to oppose proposals to experiment with longer and heavier trucks on public highways in the reauthorization of the federal SAFETEA-LU.

From: “Longer Combination Vehicles.” California Department of Transportation.
<http://www.dot.ca.gov/hq/traffops/trucks/exemptions/lcvs.htm>



Current LCV use on the National Highway System



Rocky Mountain Double (RMD)



Turnpike Double (TPD)



Triple Trailer (TT)



Permitted by State		Permitted by Turnpike Authority	
■	RMD	■	TPD & RMD
■	TPD & RMD	■	All LCV types
■	TT & RMD		
■	All LCV types		
■	LCV not permitted		



LCV Benefit-Cost Analysis

Ohio Turnpike



Type of Truck	Status Quo		Counterfactual Alternative	
	Trips using LCVs	VMT	Trips without LCVs	VMT
Standard	7,232,767	987,363,637	7,466,517	1,019,273,425
Turnpike Double	40,313	5,705,432	-	-
Triple	101,413	13,641,949	-	-
Total	7,374,493	1,006,711,018	7,466,517	1,019,273,425

- LCV impacts

- Emissions
- Driver Cost
- Fuel Cost
- Equipment

- Driver training
- Infrastructure wear and tear
- Congestion



BCA Application

Parts BCA Application	Goal
Vision	Explain the current system and explain how the project will change its functionality. Should provide the background and performance metrics for the narrative to build upon.
Narrative	Relates project to the long-term outcomes. State how the project will change the performance metrics of the infrastructure system.
BCA	Monetizes the effects laid out by the narrative and explains how each impact was derived.



Step 1: Specify Alternatives

- Frame the problem
- Introduce alternatives
 - Lay out status quo
 - Projected into the future
 - Associated costs and benefits
 - Consider plausible options
 - Keyword plausible
- Application
 - Vision of project
 - Status quo



Step 2: Identifying Standing

- Standing
 - Whose benefits and costs count
 - Local, regional, state, or national
 - Important considerations
 - Transfers
 - Double counting
 - Narrative
 - Explicitly state standing
 - Federal programs dictate
- National vs. State
 - Tolls
 - Justification for each



Step 3: Identify the impact categories and select measurement indicators

- Narrative
 - State impacts and be clear about indicators
- LCV impacts
 - Emissions
 - Driver Cost
 - Fuel Cost
 - Equipment
 - Driver training
 - Infrastructure wear and tear
 - Congestion



Step 4: Predict the Impacts Over the Life of the Project

- Data is important
 - What is available and how is it measured
- Consider changes over the life
 - Will demand change?
- Vision
 - Who is affected and what are the aggregate numbers?
- BCA Analysis
 - How are impacts calculated?



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Step 5: Monetize Impacts

Variable	Scenario	
	LCV	non-LCV
Purchase 177 tractors in year 0	\$0	\$17,700,000
Fewer trailers cost savings in year 0	\$0	\$(4,092,500)
Construction of breakdown areas in year 0	\$9,000,000	\$0
Initial driver training cost in year 0	\$26,165	\$0
Emissions (annual)	\$146,039,733	\$147,688,570
Driver labor (annual)	\$382,917,787	\$387,323,902
Tractor wear and tear (annual)	\$226,509,979	\$229,336,521
Trailer wear and tear (annual)	\$33,276,882	\$32,616,750
Breakdown of cargo (annual)	\$6,802,848	\$0
Maintenance cost of breakdown areas (in years 4, 8, 12, 16, 20)	\$1,269,000	\$0
LCV driver training cost (annual)	\$13,082	\$0
Fuel costs (annual)		
High	\$521,213,734	\$527,109,971
Mid	\$462,181,239	\$467,409,671
Low	\$362,833,870	\$366,938,433



Step 6: Discount Benefits and Costs

- Discount back to present
 - Compare real dollars
 - Vary discount rate
 - 3%
 - 7%
- BCA analysis
 - Show 2 calculations in analysis
- Narrative
 - Table of total benefits



Step 7: Compute Net Present Value

- Total net benefits of project
 - Simple calculation
 - Recognize BCA limitations
 - Benefit-cost ratio may not be insightful
 - Compare alternatives
- BCA analysis
 - Show calculation
- Vision
 - Report conclusion



Step 8: Sensitivity Analysis

Cost category	Present Worth (\$2011)	
	3% Discount Rate	7% Discount Rate
Labor cost savings (drivers)	\$67,518,421	\$49,945,936
Tractor equipment cost savings	\$17,700,000	\$17,700,000
Tractor Wear and Tear cost savings	\$43,313,362	\$32,040,536
Trailer Wear and Tear cost	(\$10,115,730)	(\$7,482,989)
Construction of breakdown areas	(\$9,000,000)	(\$9,000,000)
Periodic maintenance cost of breakdown areas	(\$4,512,715)	(\$3,027,923)
Labor cost to assemble/breakdown cargo	(\$104,245,476)	(\$77,114,331)
LCV driver training cost	(\$220,798)	(\$164,760)
Emissions cost savings	\$16,647,357	\$13,018,544
Diesel fuel cost savings for predicted fuel cost:		
	Low cost	\$73,885,510
	Mid-cost	\$109,294,632
	High-cost	\$150,452,458
		\$54,748,365
		\$79,534,152
		\$108,711,572



Present CBA Results in a Different Formats

	Net Benefit Per LCV Mile	
Predicted fuel costs:	3% Discount Rate	7% Discount Rate
Low- cost	\$0.32	\$0.35
Mid-cost	\$0.44	\$0.47
High-cost	\$0.58	\$0.61

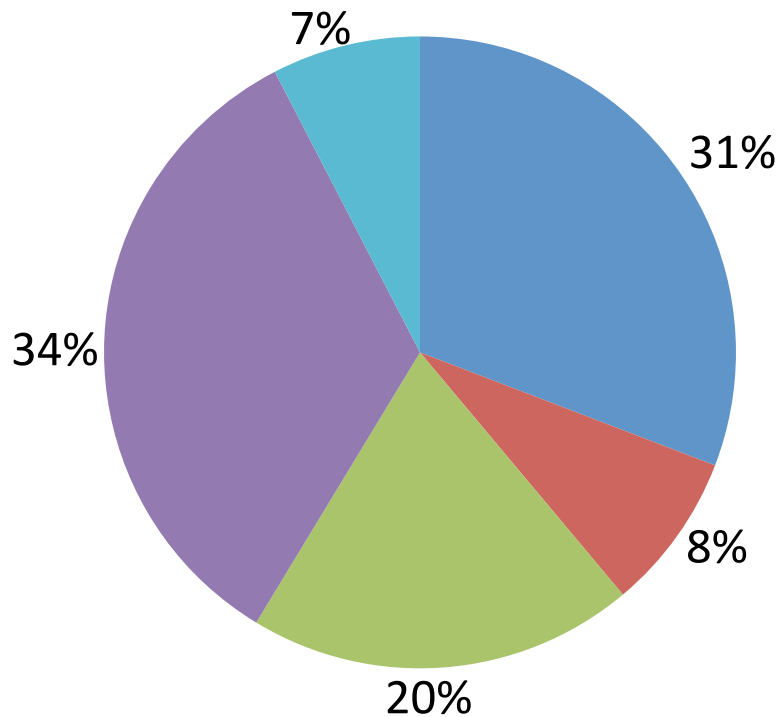


Step 9: Make Recommendation

- Make and argument for your project
 - Consistent and compelling arguement
 - Note interactions in projects
 - Important for TIGER grants
- Vision
 - Get your project funded
 - Explain intangibles



Total Benefits of LCV's on Ohio Turnpike (\$2011) 3% Discount Rate



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