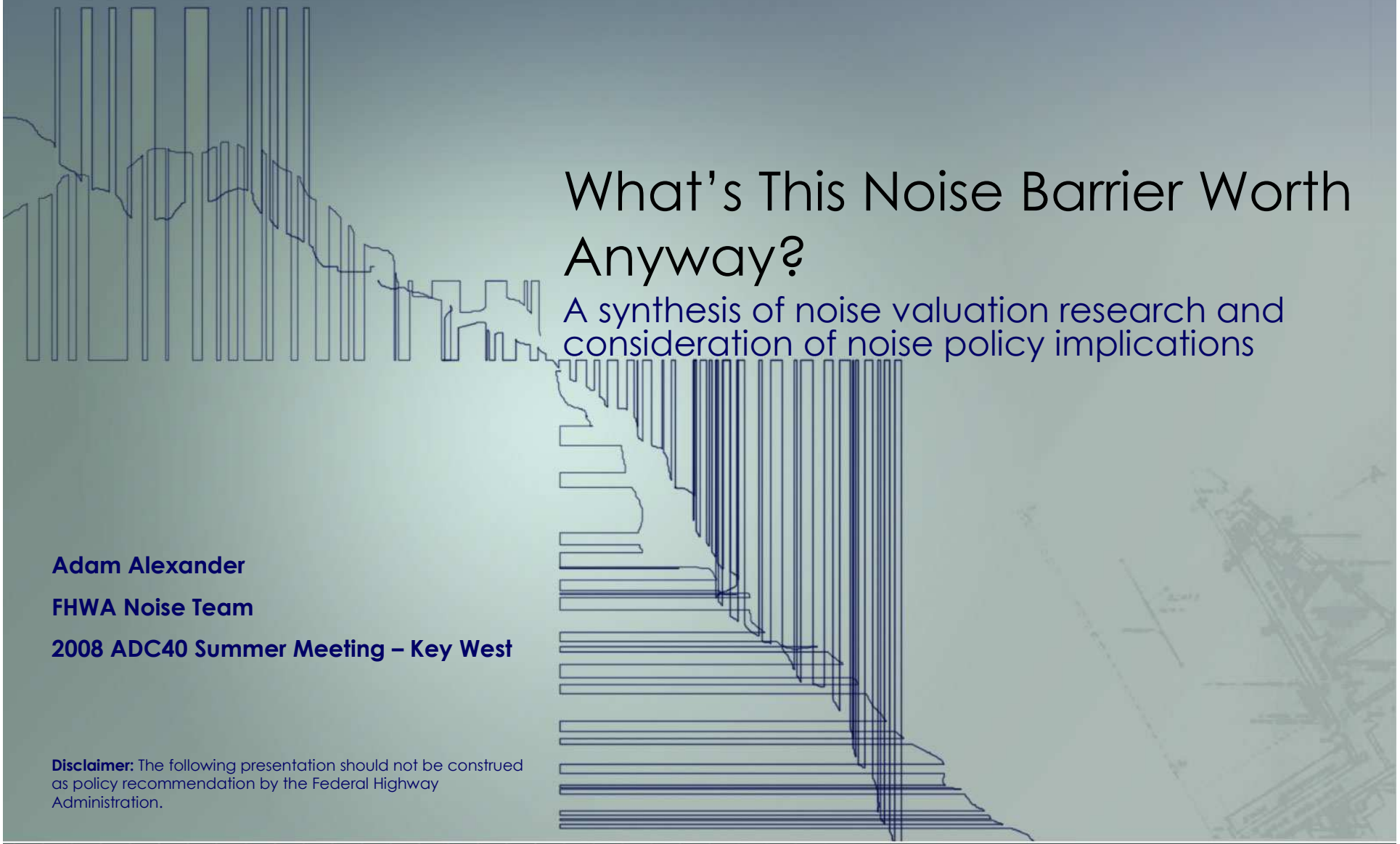

What's This Noise Barrier Worth Anyway?

A synthesis of noise valuation research and consideration of noise policy implications

Adam Alexander

FHWA Noise Team

2008 ADC40 Summer Meeting – Key West

Disclaimer: The following presentation should not be construed as policy recommendation by the Federal Highway Administration.

Overview

- What are we talking about?
- Why do we care?
- What do we know?
- What don't we know?
- Case Study
- Where do we go from here?
- Reality Check

What are we talking about?

23 CFR 772.13(a)

(a) Federal funds may be used for noise abatement measures where:

(1) A traffic noise impact has been identified,

(2) The noise abatement measures will reduce the traffic noise impact, and

(3) The overall noise abatement benefits are determined to outweigh the overall adverse social, **economic**, and environmental effects and the costs of the noise abatement measures.

What are we talking about?

NEPA Sec. 101 [42 USC § 4332]

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with **economic** and technical considerations;

What are we talking about?

- What are the economic effects of noise?
  - This is nothing knew
  - Lots of studies in US in the 80's
  - Not much since
  - Quite a bit of study in the EC
- How does noise effect residential values?
- Noise Valuation – What is noise worth?
  - Noise has no value – the market is for quiet
- If noise has no value, how do we value it?
  - Often as a negative value expressed in dollars/dB over a threshold – often 55 dBA
  - Determining values of negative externalities

What are we talking about?

- Consumer preference studies
  - Stated preference
    - Contingent valuation
    - Willingness to pay
  - Revealed preference
    - After the fact
    - Hedonic pricing
    - Repeat sale analysis
- Identify what a consumer has or will pay for an amenity

What are we talking about?

- Stated preference
  - Asks consumers what they are willing to pay for a feature
  - Typically done by survey
  - Questions about accuracy
  - Free-rider problem
  - Is it realistic?
- Revealed preference
  - After the fact
  - Values environmental and physical attributes
  - How to account for all the attributes
  - Which attributes can you ignore?

What are we talking about?

- What is a noise barrier worth?
  - The amount the state spent to build it?
  - The average cost per residence?
  - Something else?

Why do we care?

- Because we all pay
  - Consumers
  - Local Officials
  - Developers
  - State DOTs

Why do we care?

- Benefit to Consumers
  - Owners
    - Homeowners know how noise affects their property values
    - Informed of affect on tax assessments
  - Buyers
    - Know what discount they should get
    - Caveat emptor

Why do we care?

- Benefit to Local Officials
  - Taxes, Taxes, Taxes
    - Better property tax assessments
    - May increase or reduce tax revenues
  - Land use planning decisions
- Establishing local policy
  - Noise zoning overlay
  - Developer provided mitigation requirements

Why do we care?

- Benefit to Developers
  - To build or not to build?
    - When does noise abatement help the developer make money?
    - What type of noise abatement helps the developer make money?

Why do we care?

- Benefit to State DOTs
  - Cost reasonableness criteria
    - Is the criteria really reasonable?
    - What is the criteria based on – other than the 1995 FHWA policy and guidance?
    - Does the criteria make any sense?
  - Broader benefits of noise barrier construction
    - Can Type II be economic development?
  - Knowing beats ignorance
    - May help to convince developers/local officials that developer provided mitigation is a positive
    - Will help state DOT to address public concerns
- Would facilitate a CBA for noise barrier construction

What do we know?

- Hedonic pricing
  - Values environmental features
  - Contingent valuation – willingness to pay/stated preference
  - P=f(S,N,A)(S=structural characteristics, N=Neighborhood characteristics, A=Amenities
  - Often modified through consideration of externalities (noise, air quality, power lines, landfill etc.)
- Noise Barrier Valuation
  - How is it valued?
    - Base amount for each dB of reduction
    - Percentage value of home

What do we know?

- Noise valuation research
  - A lot of information is out there
  - Many are European studies
    - Example Scotland: 0.2% decrease in value per change in dB increase after one year
    - Example Sweden: Compensation for noise inside and outside based on noise level over 54 dB at face of residence
  - Noise barrier valuation research
    - Few studies available
    - One is inconclusive

What do we know?

- Hall and Welland (1987)
  - Valued noise as dollar/decibel
  - Compared dollar/decibel value for sites without a noise barrier to sites with a noise barrier
  - Used a baseline of $250-$300/dB based on previous study (Taylor 1982)
  - Coarse data from H & W study correlates well to previous study
  - Refined data analysis had widely varying results
  - Study is inconclusive
    - Shows slight benefit at two sites, but not at third site
    - Uses values for "typical" house rather than exact matches

What do we know?

- Julien and Lanoie (2002)
  - Used repeat sale analysis method
  - Studied sales transactions for 134 homes between 1980 and 2000
  - A noise barrier was constructed for the neighborhood in 1990
  - Variables focused on physical attributes of the residence and socioeconomic variables of the owner: Examples…
    - Distance from barrier
    - Presence of swimming pool
    - Owner income
    - Owner gender
  - Determined that a noise barrier adds 10% to the value of a protected residence

What do we know?

- Allen (1981)
  - Looks at two locations
    - I-495 in Northern Virginia (206 residences)
    - Urban streets in Tidewater (207 residences)
  - Estimated economic benefit of noise barrier construction
  - Determined noise abatement costs "far exceed" economic benefit

What don't we know?

- The factors that matter most
- Is dollars/decibel better than percentage of housing value?
- How noise valuation affects policy
- Should noise valuation affect policy?
- How do barrier aesthetics affect value?

Simple Case Study

- Review of all Ohio noise analysis 2000-2006
- Breaks proposed barriers down into three estimated cost per residence categories
  - Low - < $10,000
  - Medium - $10,000 – $20,000
  - High - > $20,000
- Assumes
  - Average home value of $103,000 (2000 dollars per US Census Bureau
  - Noise barrier adds 10% to value of typical residence (Julien & Benoit)
- Noise barrier construction for Low category results in a gain of $19.1 million
- Noise barrier construction for Med/High results in a loss of $15.3 million
- The latter is in effect a subsidy of $15.3 million to impacted residents – the value paid for noise abatement results in a total value that exceeds the PV plus the added value
- On a program level the net benefit is $3.8 million

Table 5: Economic Benefit Evaluation

Residence	Present Value	Cost of Abatement	Added Value	Value with Abatement	Economic Benefit	Subsidy to Homeowner	# of Residences	Total Subsidy by Category	Total
Low	103,700	6,402	10,370	114,070	3,968	0	4,828	0	19,156,078
Med	103,700	14,152	10,370	114,070	-3,782	3,782	1,913	7,234,963	-7,234,963
High	103,700	23,106	10,370	114,070	-12,736	12,736	636	8,100,098	-8,100,098
								Economic Benefit	3,821,017

Where do we go from here?

- Obviously, more research
- A comprehensive valuation model
- Tie cost reasonableness to added value
  - Positives
    - Moves cost reasonableness away from cost of abatement
    - May make sense economically
    - Some states already use a scaled approach
    - European Commission Uses Cost Benefit Analysis – SILVIA Method
  - Negatives
    - May result in inequities
    - Difficult to regulate
    - Determining housing values
- Potential use with Type II program for economic development

Reality Check

Questions?