Partnership for AiR Transportation Noise and Emission Reduction

An FAA/NASA/TC/DoD/EPA-sponsored Center of Excellence

APMT Impacts Noise Module

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Based on the work of the Aviation Environmental Portfolio Management Tool (APMT) development team, including Ian Waitz, Chelsea He, and Christoph Wollersheim
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April 19-20, 2011

Briefing Scope

Background on valuing aviation noise was presented by Professor Jon Nelson

This presentation focuses on aviation noise valuation in the

Aviation Environmental Portfolio Management Tool (APMT)

Outline

I. Background

II. Motivation

III. Method Development

IV. Application & Results

V. Conclusions

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I. **Background**

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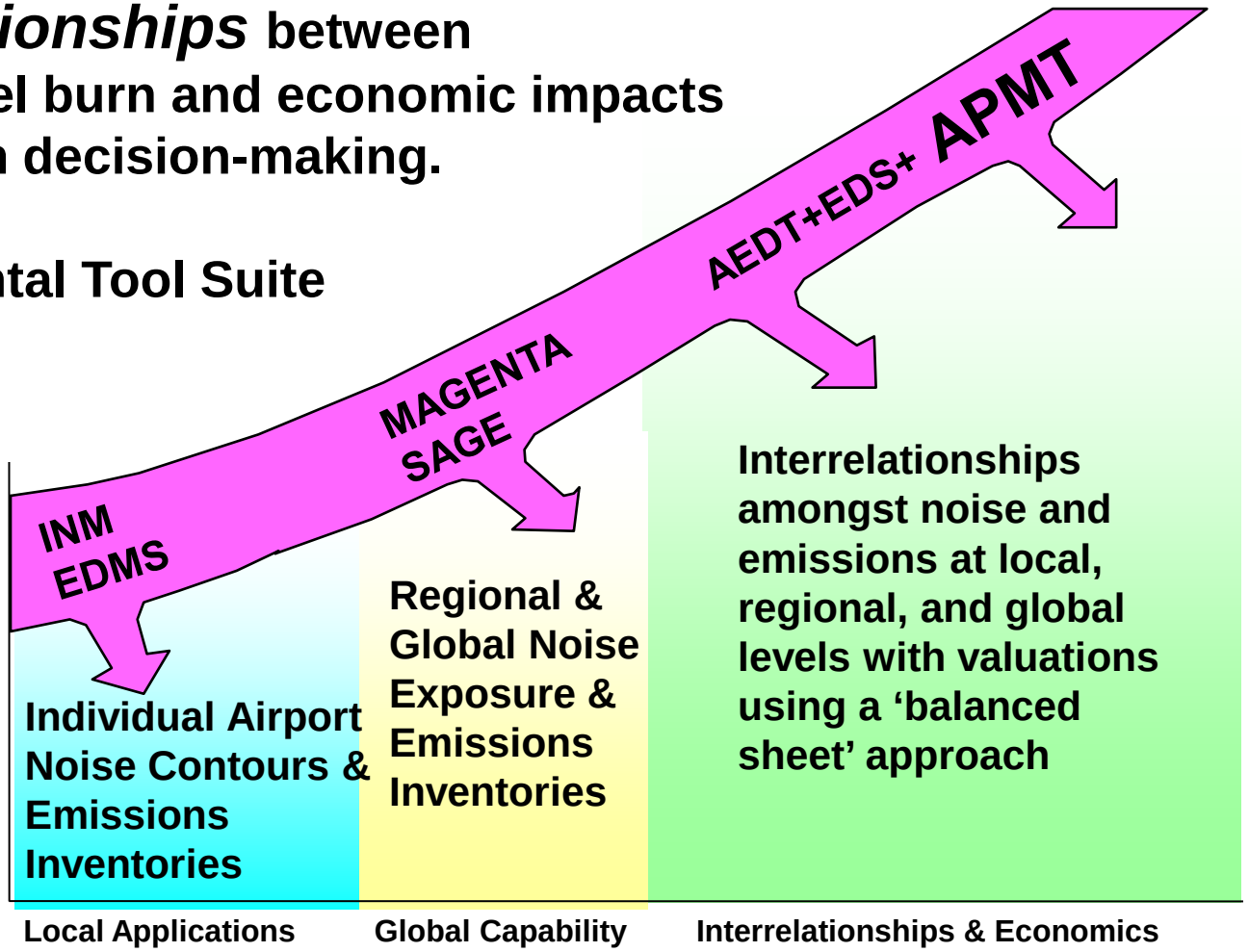
Context

FAA is addressing the need for integrated analytical tools to compute aviation environmental impacts, *identify interrelationships* between noise, emissions, fuel burn and economic impacts to inform data-driven decision-making.

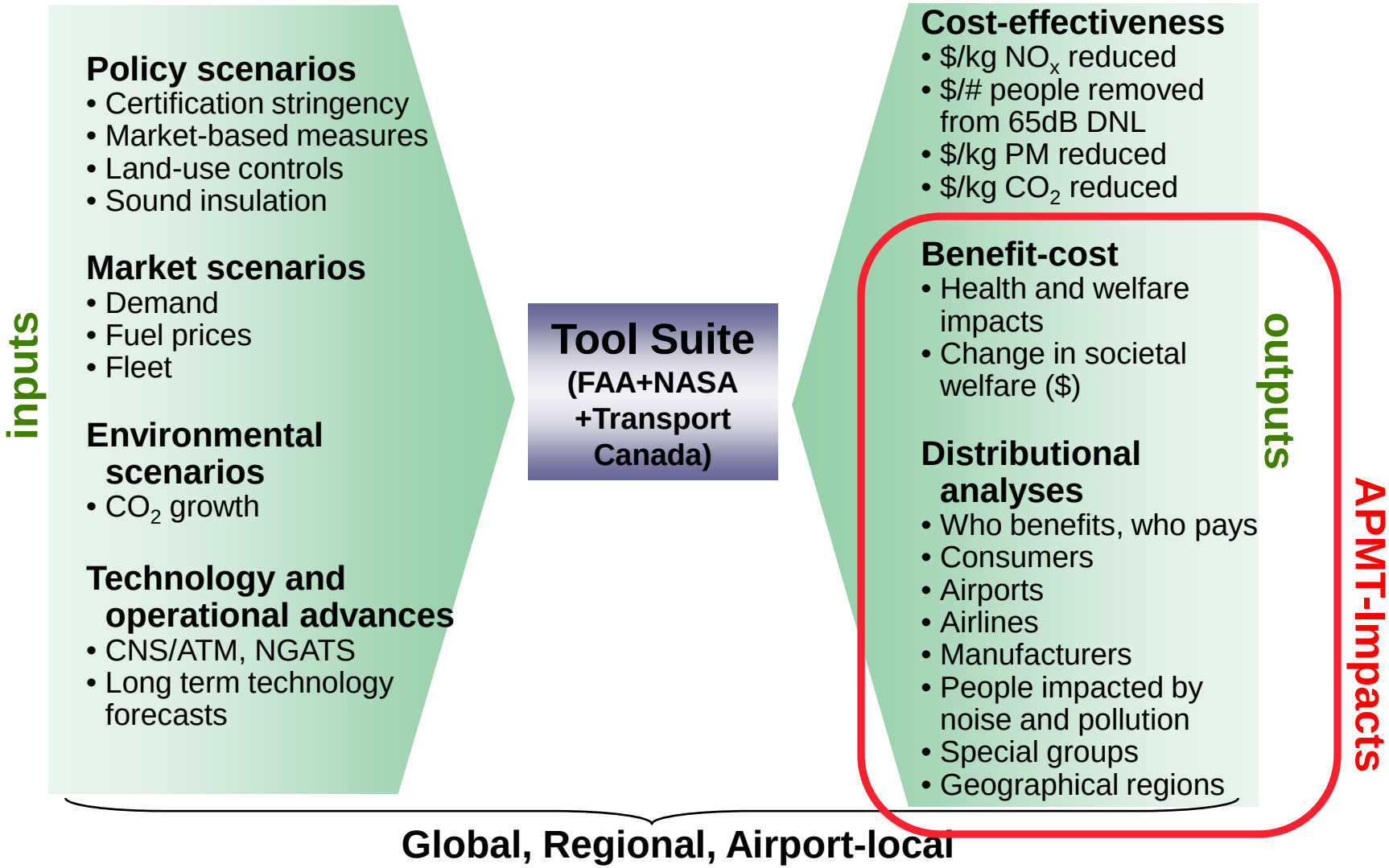
Development of the Aviation Environmental Tool Suite has incorporated the *best scientific understanding* to advance legacy tool capabilities



1978 2003 2007-2013

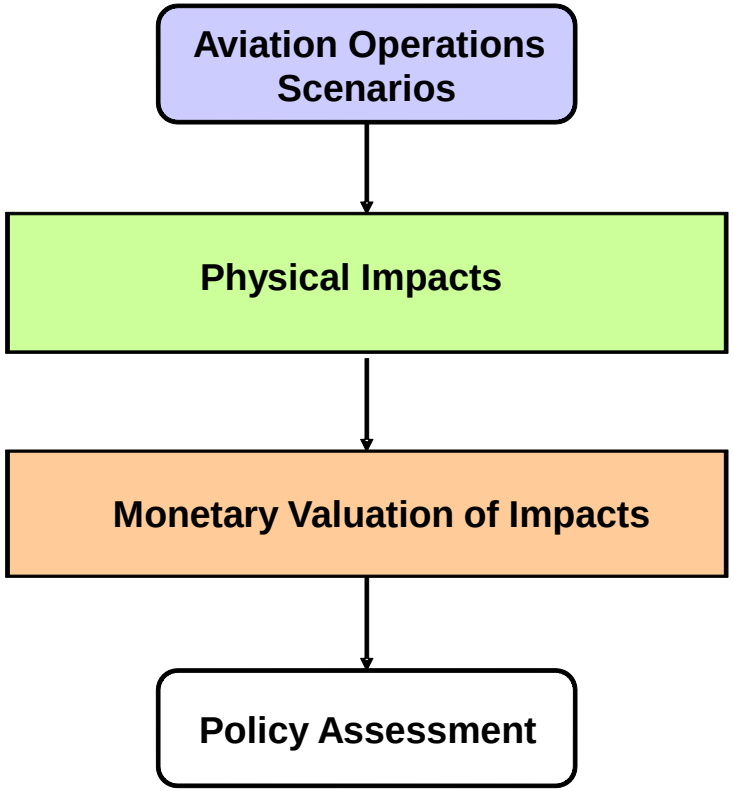
Background → Motivation → Method Development → Application & Results → Conclusions

Aviation Environmental Tool Suite



APMT-Impacts:

estimates the environmental impacts of aircraft operations through changes in health & welfare endpoints for ***climate, air quality and noise***



APMT-Impacts modules are simplified models that provide:

- estimates of aviation-induced impacts through a portfolio of physical and monetary units
- quantified uncertainties in the estimated impacts

More information is available at ***http://www.apmt.aero***

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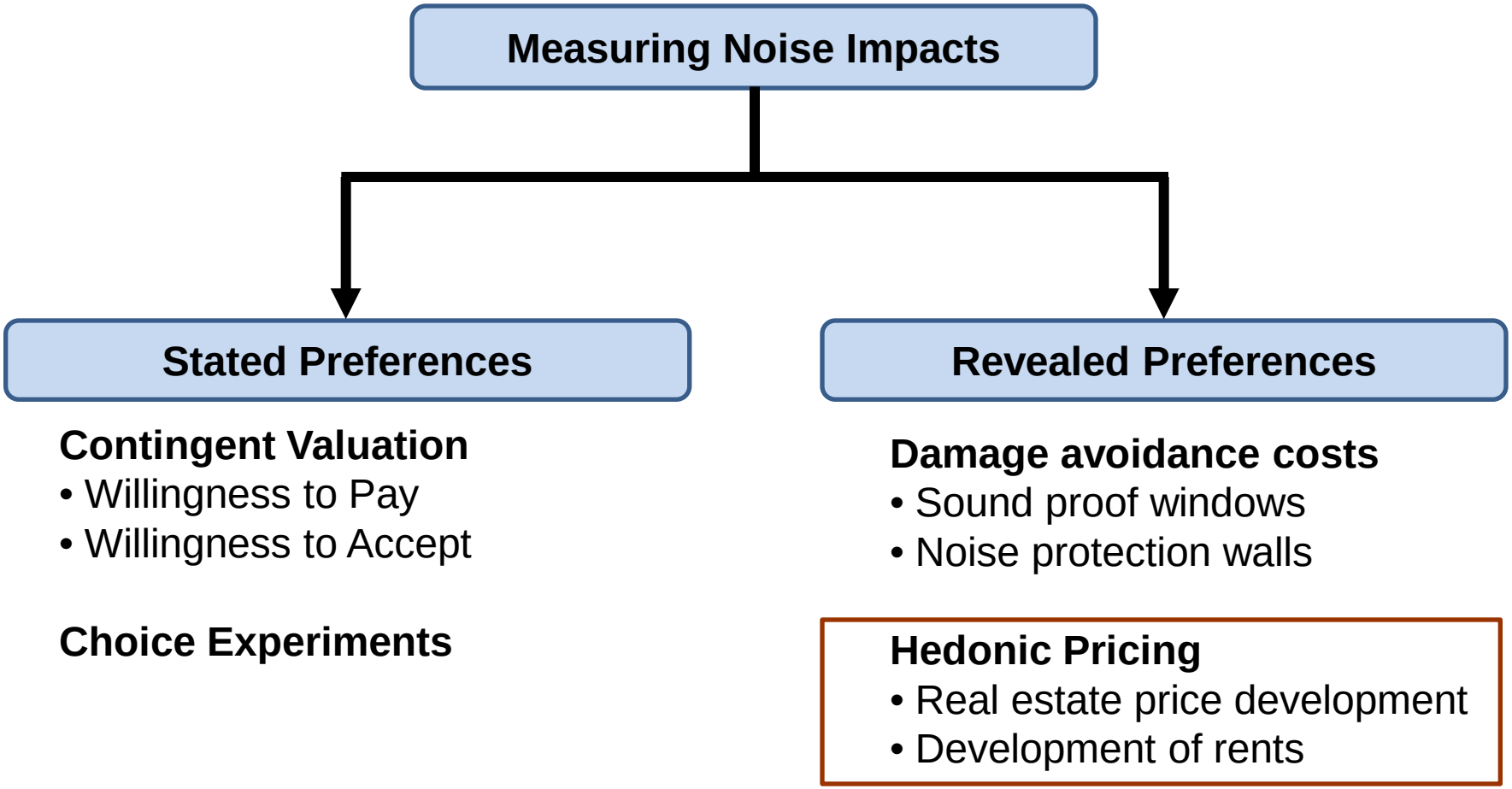
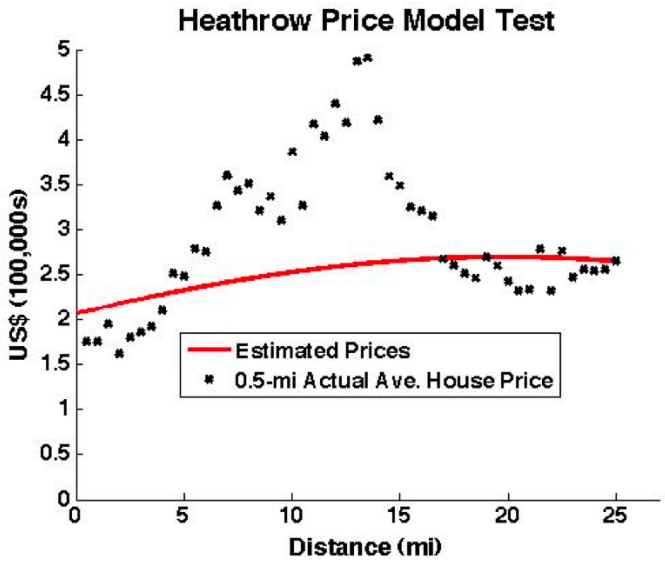
Monetization Methods



Initial APMT Approach

- Hedonic pricing method that used housing and rental value loss to estimate aviation-related noise impacts
- Noise Depreciation Index (NDI) = 0.6651% per dB [Nelson (2004)]
- Estimated global impacts based on 2005 noise contours [Kish (2008)]:
  - 181 airport regions
  - 14 million people exposed to at least 55 dBA (DNL)
  - $21 billion in housing value depreciation
  - $800 million rental loss per year
  - Actual housing values for US and UK only
  - Use of the ICF model to estimate property values for other countries



Motivation for New Monetization Method

- Drawbacks of previous APMT approach
  - Requires detailed housing value data
  - ICF model is based on US property values

Objective: *Develop a new method to estimate the global monetary impacts due to aviation noise that does not require property value data.*

- Expanded upon 2008 expert review of economic valuation methods used for noise [Nelson & Palmquist (2008)]
- Derived a Willingness to Pay (WTP) for noise abatement based on city-level income
- Advantages
  - Income data more widely available than housing value data
  - Only 1 income value needed for each city
  - **Easier to implement**

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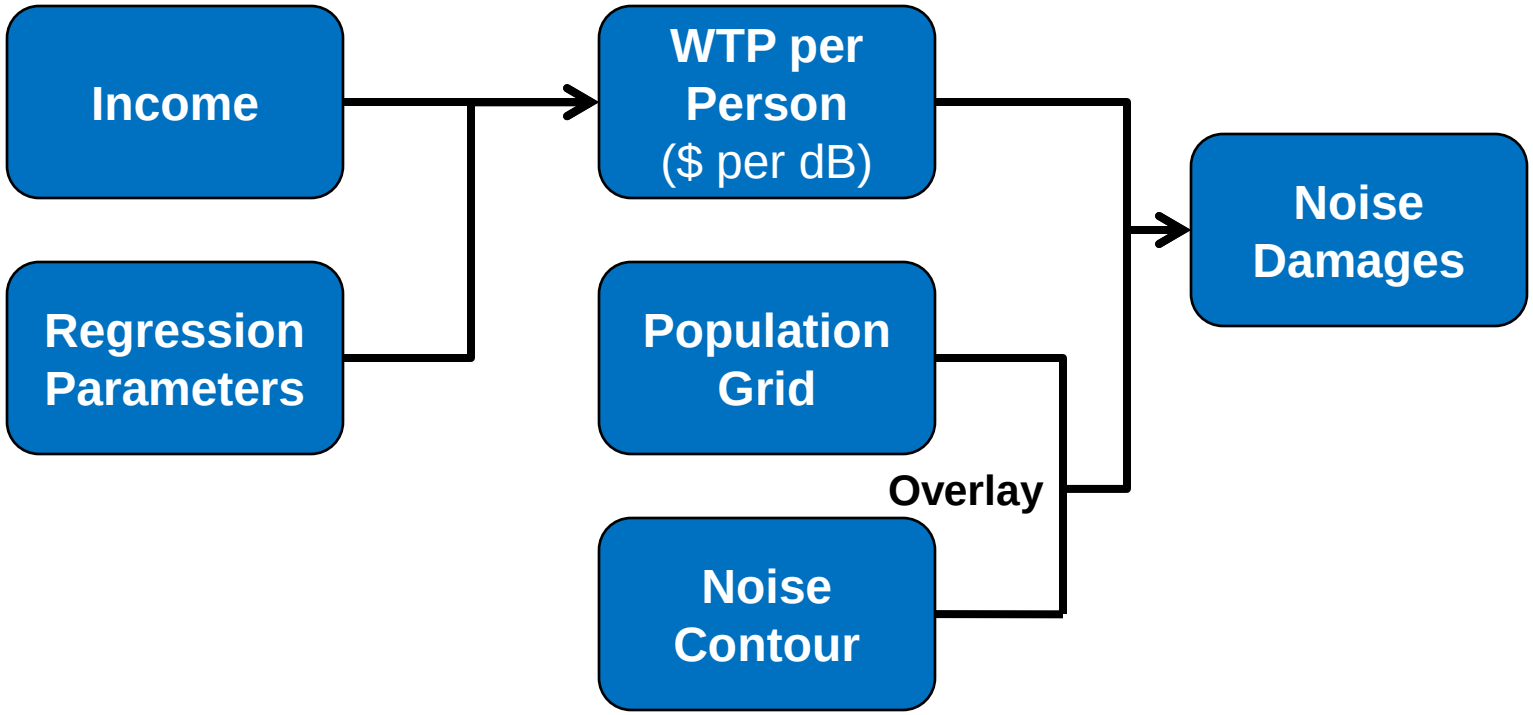
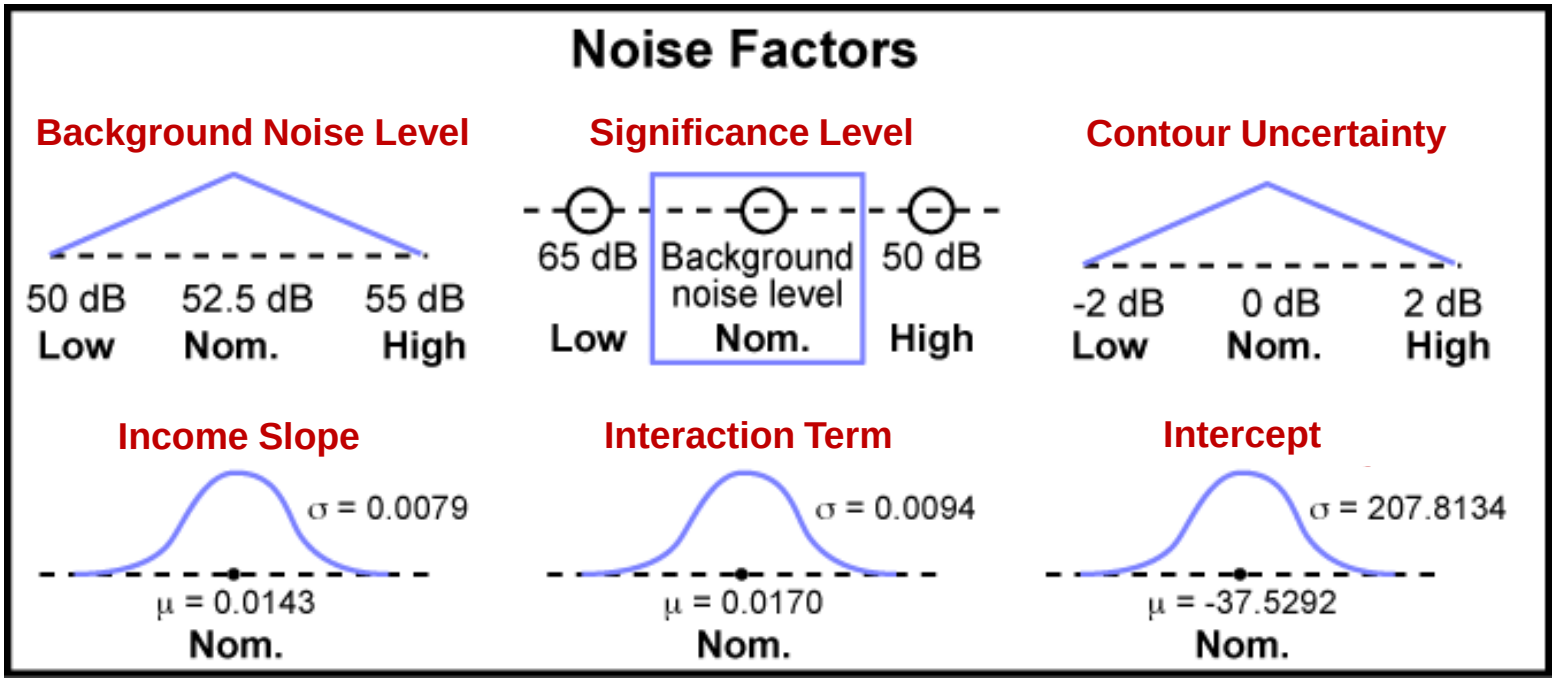
Income-Based Noise Algorithm



- Noise contours:
  - Actual data for reference year and forecast for some future year
  - Baseline and policy scenarios

Input Factors and Monte Carlo Simulation



- No population growth assumed
- Sample Case
  - 2005 baseline noise contours for 181 airports
  - Comparison with Kish (2008) results

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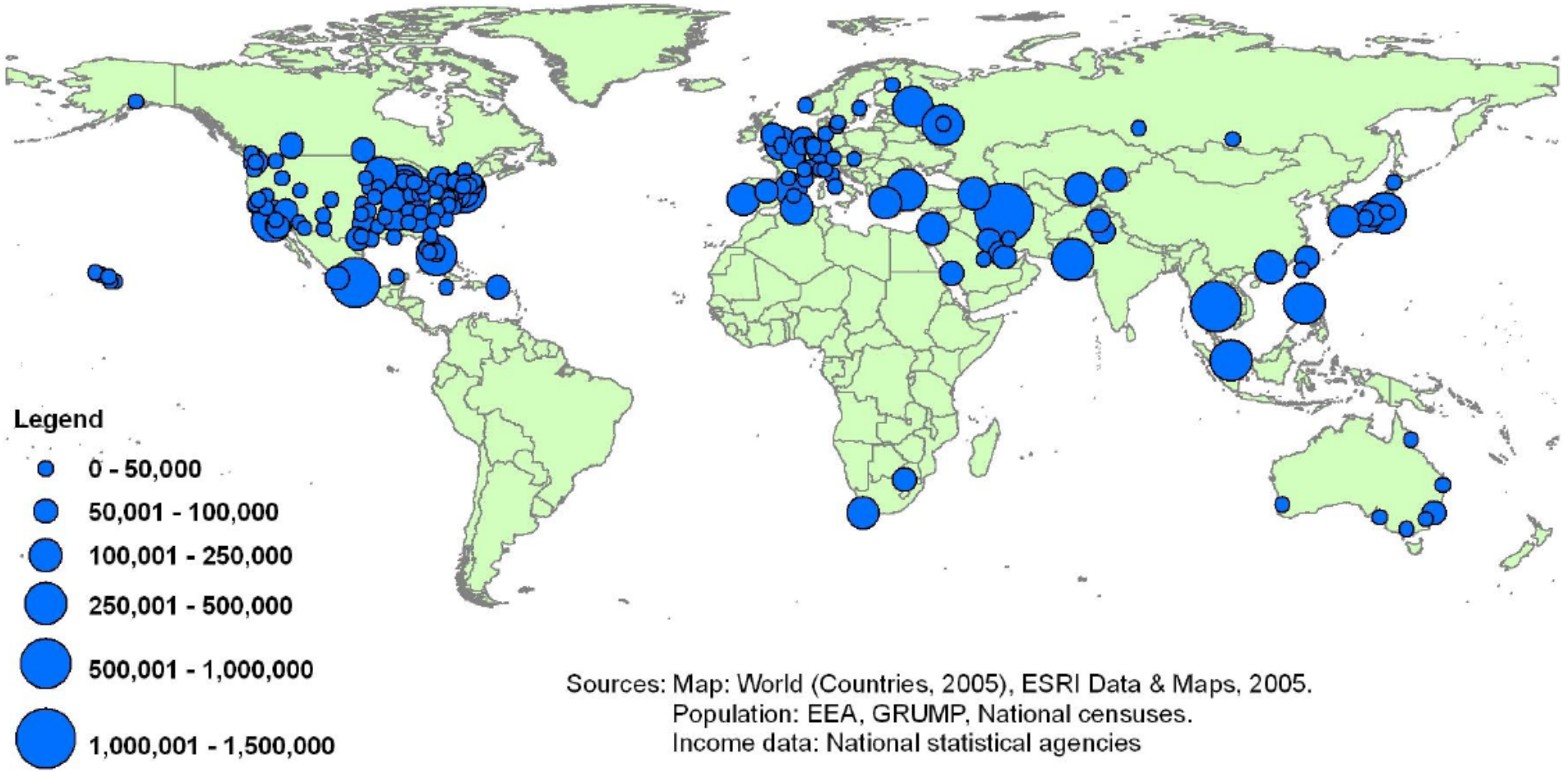
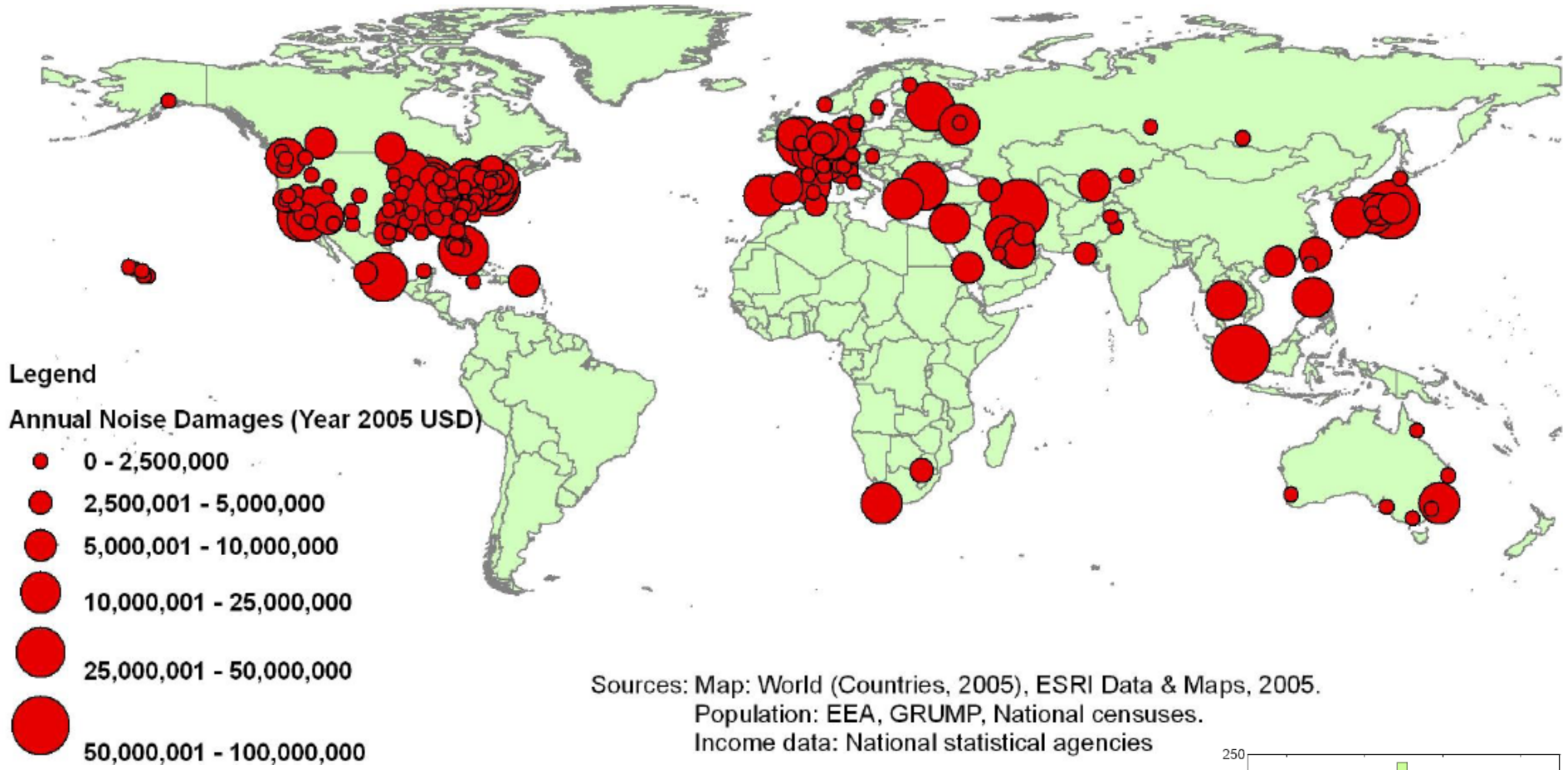
Results: Population Exposure

Number of Persons Exposed to ≥ Background Noise Level in 2005



Total: 14.2 million (181 airports)

Results: Mean Annual Noise Damages

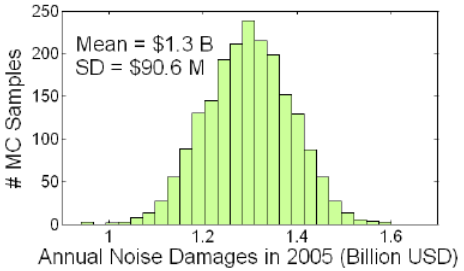


Sources: Map: World (Countries, 2005), ESRI Data & Maps, 2005.
Population: EEA, GRUMP, National censuses.
Income data: National statistical agencies

Mean Total: $1.3 billion (181 airports)

US-only: $0.53 billion (41%, 95 airports)

Based on 3% Discount Rate, 30-year policy period



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Issues and Outlook

- **Issues for Consideration**:
  - Fidelity of population & income data varies globally
  - Underlying primary studies limited to 63
  - Relationship between income and WTP has not been studied in low-income countries
- **Looking Forward**:
  - Article for the Journal of Transport Policy is under review
  - Continue to follow and interface on research to advance the understanding of noise valuation, including linking aviation noise to health impacts

Summary

- **Traditional valuation of aircraft noise impacts uses hedonic pricing methods that estimate change in housing value with aviation noise**
  - Implemented in the original APMT-Impacts Noise module, but data limited use to primarily US
- **APMT-Impacts developed a derived relationship between income and willingness-to-pay for reduced noise**
  - In consultation with Jon Nelson (PSU) and Ray Palmquist (UNC)
  - Reanalysis of the hedonic pricing data
- **Application of new income-based monetization method yields similar results as hedonic pricing**
- **New method in APMT-Impacts Noise module provides better global coverage to inform data-driven decision-making.**
- **Need to follow research developments to inform future modeling**

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