Developing tools to support multimodal environmental modeling

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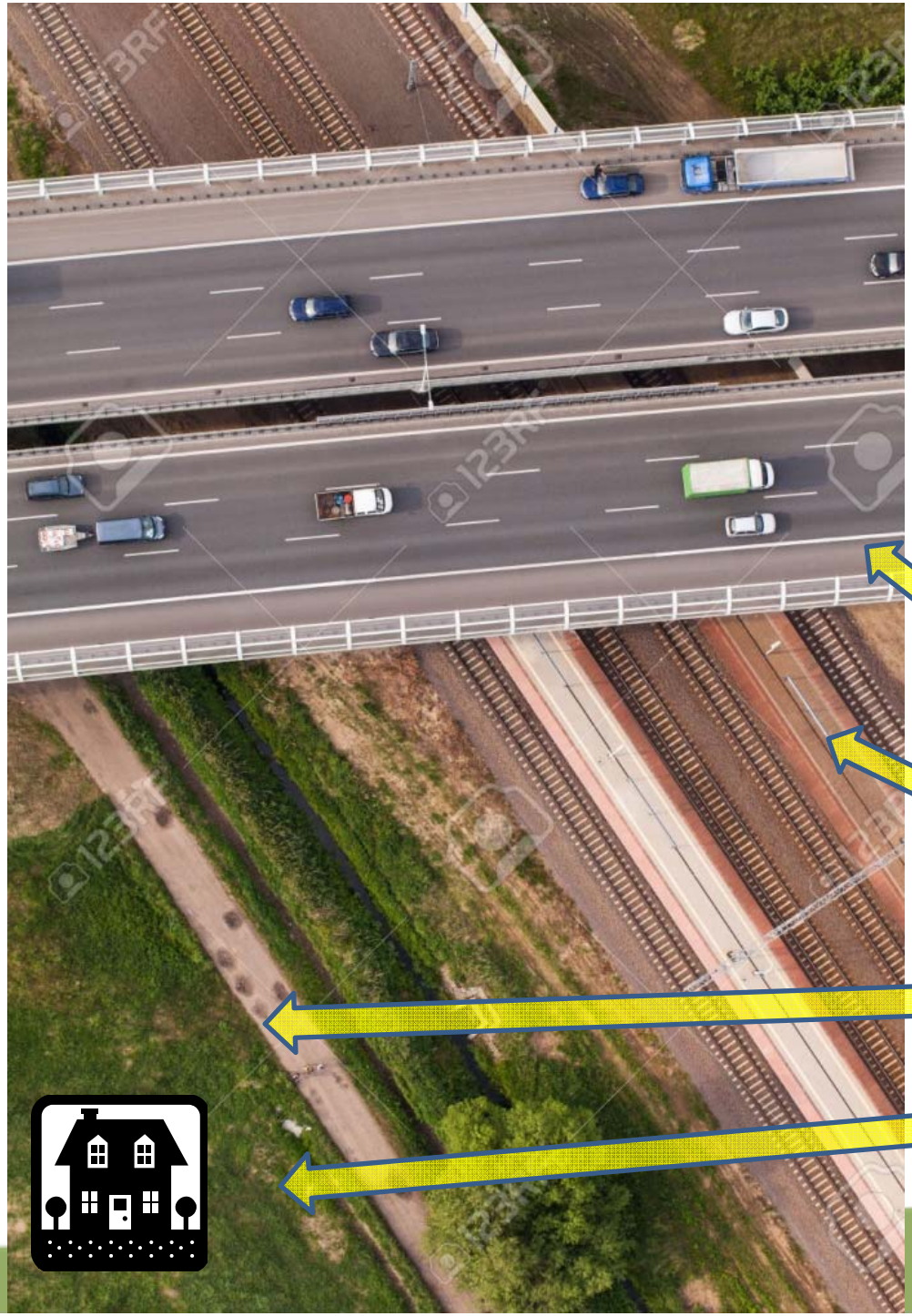
Outline

- What's the need for multi-modal noise modeling?
- ACRP 02-09 - A Comprehensive Development Plan for a Multimodal Noise and Emissions Model (2010)
- What's happened since 2010?



The developed world is multi-modal

Environmental impacts don't occur in a vacuum

Highway

Rail lines

Local road

Residence

Who's in Charge?

	Noise & Vibration	Emissions	Air Quality
FAA	▪ Same as HUD (Part 150) ▪ 1.5 dB increase ▪ 17% increase in DNL 65 contour area	▪ General conformity thresholds for nonattainment areas ▪ Transportation conformity ▪ NAAQS screening ▪ Indirect source review	▪ EPA NAAQS for the 6 criteria pollutants (CO, Pb, NO_2, O_3, PM, and SO_2)
FHWA	▪ "Worst-hour" $L_{eq(h)}$ during the project's "design year" ▪ "Significant" noise increase	▪ General conformity ▪ Transportation conformity ▪ PM2.5 and PM10 hot spot analysis	
FTA	▪ Change in DNL caused by the transit project.		
FRA	▪ Relative impact in terms of increase in DNL over ambient.		
HUD	▪ DNL 65-75 dB = Normally unacceptable ▪ DNL >75 dB = Unacceptable		
MARAD	▪ No specific guidelines for in-air noise. ▪ For underwater sound, use dBL values linked to guidelines for harassment of marine mammals.	▪ General conformity ▪ Transportation conformity	
DOD	▪ Same as HUD (AICUZ) ▪ CDNL 62 dB (blast noise)		

Environmental Analysis Issues

- Multiple jurisdictions
- Many, many metrics

?...

- Differing analysis timeframes
- Separate input data
- Different analysts
- Varying reporting requirements

Environmental Analysis Issues

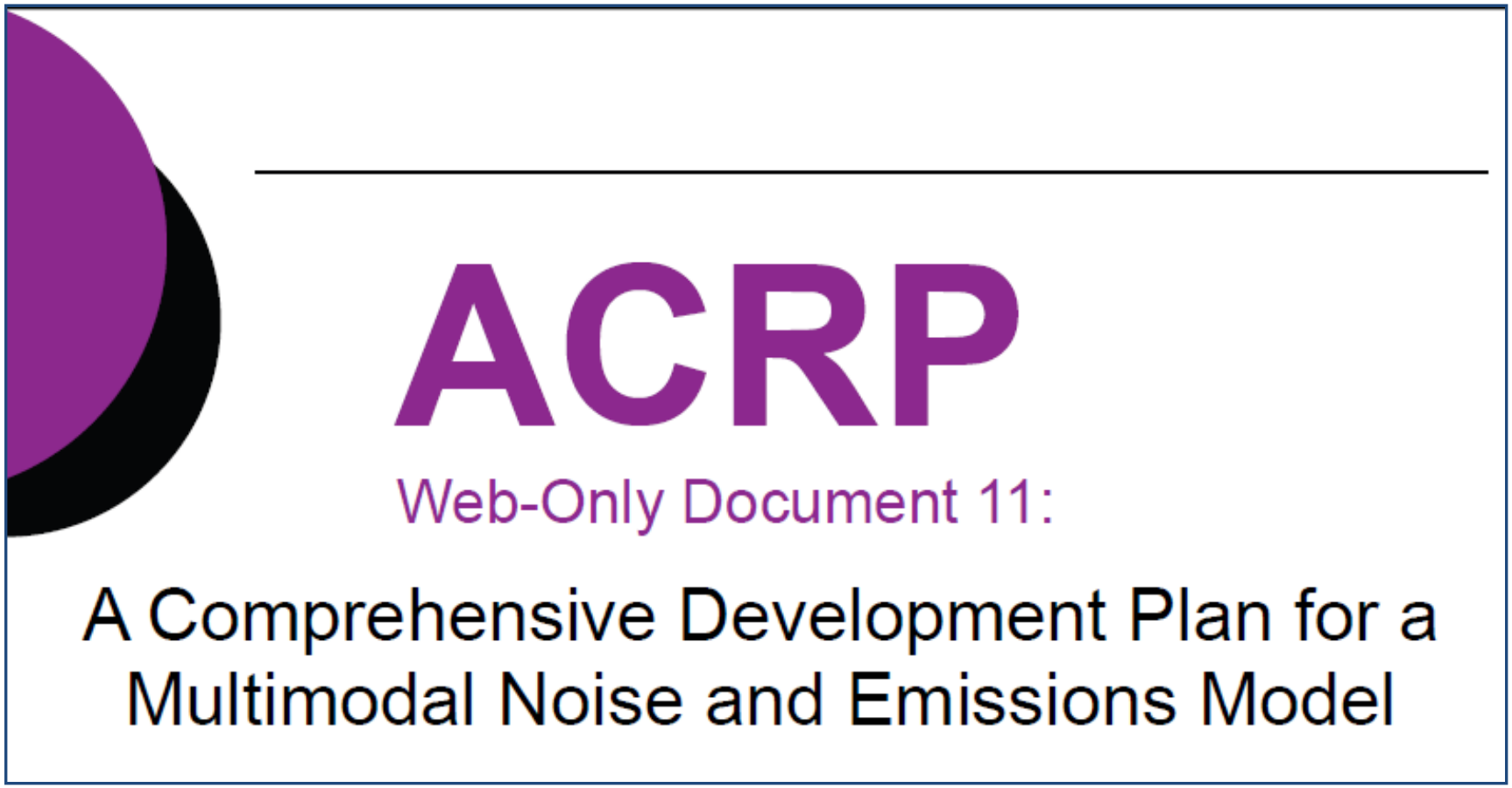
- 1999: DOT Report "Feasibility of a United States Department of Transportation Multi-Modal Noise Model"

?...

- 2014: Transportation Planning Capacity Building Program - Cross-Modal Project Prioritization: A TPCB Peer Exchange
  - Legislative mandate to NCDOT: Develop an unbiased mechanism for comparing projects from different modes using quantitative data and a common set of criteria; host peer exchange; gain knowledge of national best practices to be incorporated into NCDOT's Strategic Prioritization Process

http://ntl.bts.gov/lib/55000/55000/55082/NCDOT_cross-modal_12-16-14.pdf?utm_source=GovDelivery&utm_medium=email&utm_campaign=july_newsletter

ACRP 02-09 *(initiated 2008)*



ACRP Team

- Wyle Laboratories (Tom Connor, Principle Investigator)
- Volpe National Transportation Systems Center
- Penn State University
- Private Consultants
  - Dr. Ian Waitz (MIT)
  - Grant Anderson
- *Oversight Panel: Consultants, FAA, FHWA, HUD, TRB*

ACRP Objective

Goal:

Develop a comprehensive Model Development Plan (MDP) to guide future development of a model to facilitate integrated quantification of multimodal noise and emissions, as well as economic analysis of alternative scenarios.

Address databases, input/output processes, algorithms, etc.

ACRP Process

- Utilize team's technical expertise & knowledge
- Stakeholder outreach
  - Survey
  - User community engagement
    - Federal Interagency Committee on Aviation Noise (FICAN)
    - Transportation Research Board (TRB)
    - U.C. Davis Air and Noise Symposium
- Lessons Learned from IMAGINE (European project)

ACRP Process

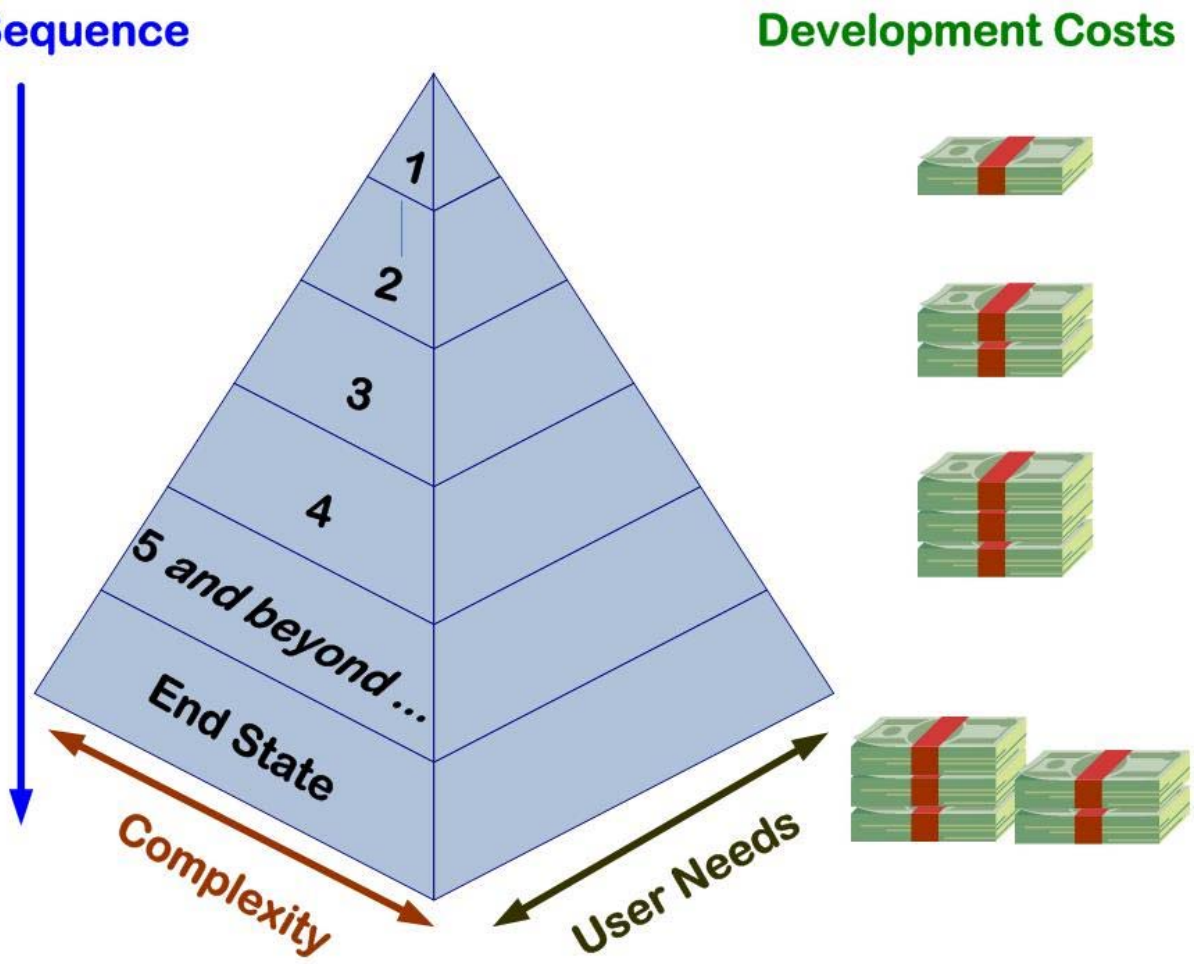
- Market Research
  - Assess current state of the art
  - Stakeholder outreach
  - Consider case studies / applications
  - Report out
- Model Design Candidates
- Determine Preferred Model Design
- Interim Report
- *draft* Model Development Plan (MDP)
- *final* MDP & Report

Models Considered in ACRP

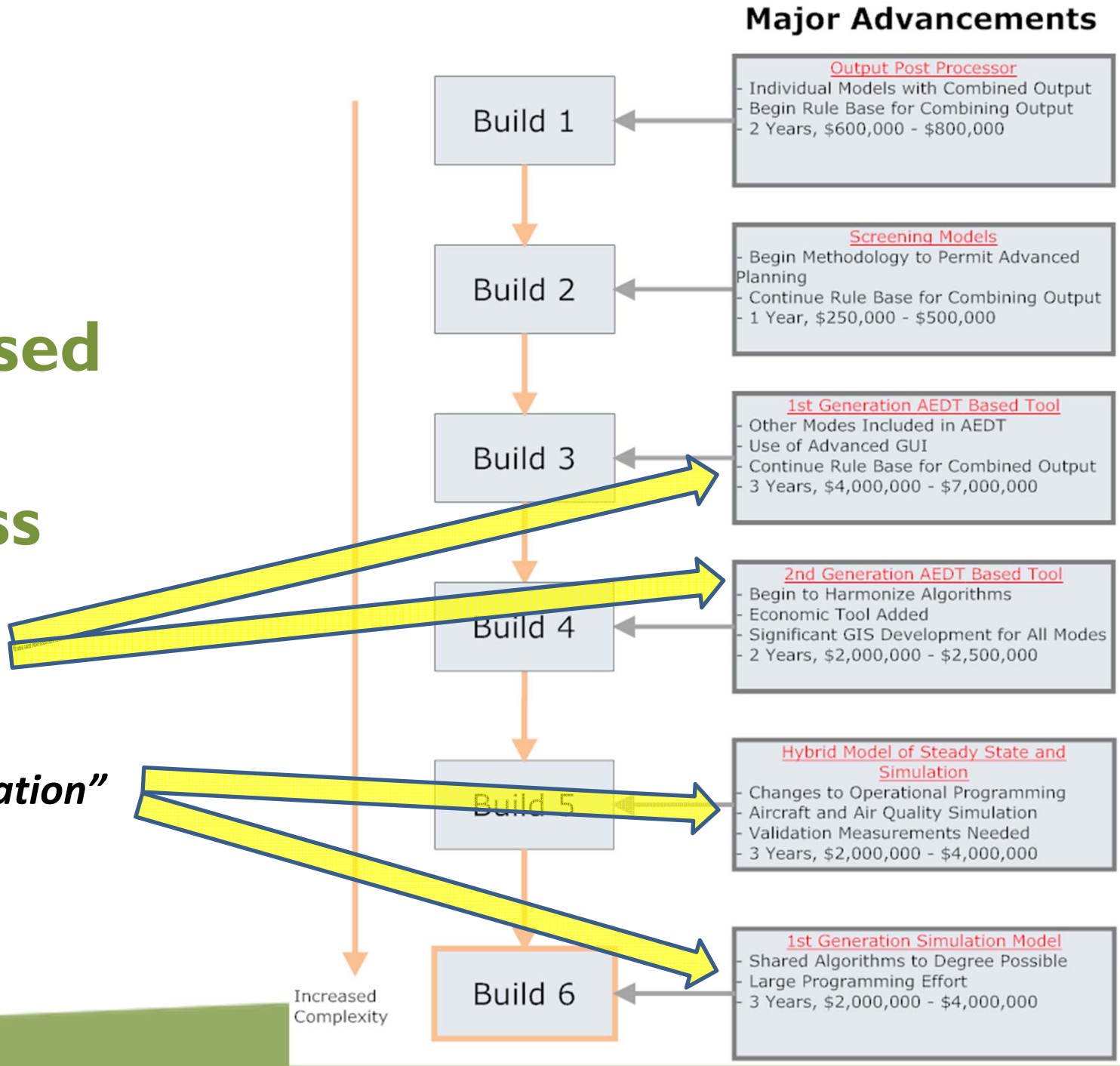
	Transportation Mode		
	Air	**Ground**	**Water**
Noise	AAM (NMSIM + RNM) **AEDT** HNM INM NIRS NOISEMAP	CREATE HICNM Horn Model HSRNOISE RCNM TNM	
Emissions	**AEDT** *EDMS*	**AEDT** *EDMS* EMIT MOBILE6 MOVES NONROAD2005	EPA AP-42 Emission Factors
Atmospheric Dispersion	**AEDT** *EDMS (AERMOD)*	CALINE3 CALINE4 CAL3QHC (CALPUFF AERMOD)	OCD Gaussian Puff-based models (e.g., CALPUFF)
Impact Valuation	APMT		
	BenMAP		

ACRP Proposed Steps

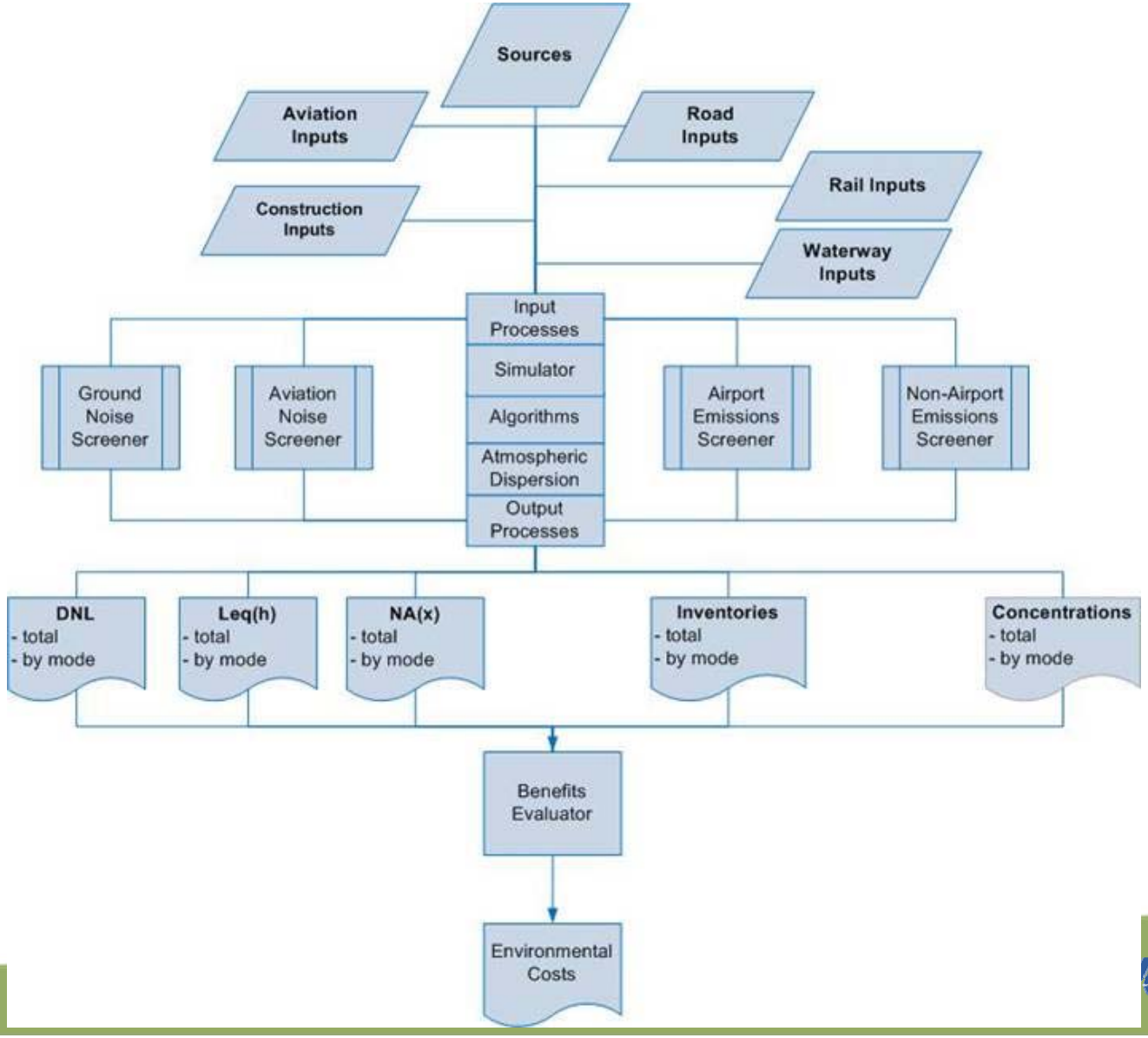
"Think Big
- Start Small
- Act Now"



ACRP Proposed Build Process



Proposed End State



What's happened since the ACRP?

- Aviation: FAA released AEDT Version 2b (May 2015)
  - Geospatial capabilities
  - Integrated noise and emissions computations
  - Ties with EPA's MOVES model
  - Relational database structure
  - Integrated model, yet accounts for time
  - Modular architecture
  - Scalable: Analysis of single runway -> airport -> metroplex -> National Airspace System -> global operations

- Highway: FHWA nearing public release of TNM Version 3.0
  - Geospatial Capabilities

What's happened since the ACRP?

- Transit: FTA Noise and Vibration Manual update near completion
  - During public outreach, significant feedback re combined transit & highway projects, including metrics
- Only more focus on greenhouse gas emissions
- Reinvigorated awareness of environmental justice

What's happened since the ACRP?

- No development of a multimodal noise and emissions model…
  - Federal agencies
    - Significantly restricted due to sequestration & and other budget constraints
    - Sticking to core business
    - Stove-piped in terms of impact criteria, metrics, funding, etc.
  - DNL 65 dB for aviation – example of "known" issue, but also one that needs to be handled methodically based on good science

How can the community help facilitate developing a multimodal noise and emissions model?

Questions & Discussion

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Backup Slides

Acronyms (I)

AAM	Advanced Acoustics Model
ACRP	Airport Cooperative Research Program
AEDT	Aviation Environmental Design Tool
APMT	Aviation environmental Portfolio Management Tool
DNL	Day-Night Average Sound Level
EDMS	Emissions and Dispersion Modeling System
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HNM	Heliport Noise Model
HSRNOISE	High Speed Research Noise Prediction Code
HUD	Housing and Urban Development Agency

Acronyms (2)

HUD	Housing and Urban Development Agency
IMAGINE	Improved Methods for the Assessment of the Generic Impact of Noise in the Environment
INM	Integrated Noise Model
MDP	Model Development Plan
MIT	Massachusetts Institute of Technology
MOVES	MOtor Vehicle Emission Simulator
NAAQS	National Ambient Air Quality Standards
NMSIM	Noisemap Simulation Model
RCNM	Roadway Construction Noise Model
RNM	Rotorcraft Noise Model
TNM	Traffic Noise Model
TRB	Transportation Research Board