Application of 3D Viewers and Visualization in Transportation

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Visualization
So easy a caveman can do it.
Definition of Visualization?

To strengthen public participation in the planning and project delivery process and specifically to aid the public in understanding proposed plans, SAFETEA-LU calls for States and MPOs to use visualization techniques. Through visual imagery, the complex character of proposed transportation plans, policies and programs can be portrayed at appropriate scales -- state, region, local area, project architecture, etc. and from different points of view.

"The effective presentation of projects’ impacts to the public has become an increasingly essential part of the planning and design of transportation" system. Examples of visualization techniques include sketches, drawings, artist renderings, physical models and maps, simulated photos, videos, computer modeled images, interactive GIS systems, GIS based scenario planning tools, photo manipulation and computer simulation.

FHWA Visualization website
Purpose of Visualization

- To facilitate and clarify the understanding of complex spatial or technical information.
- To convey the differing characteristics of existing conditions and proposed alternatives.
- To enable a common understanding of the existing or proposed facility, both how it appears and how it operates.
- To facilitate more comprehensive evaluation of the various functions, impacts, and benefits of existing vs. proposed designs or improvements.
SAFETEA-LU

Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
P. L. 109-59
Changes to §5304 (f)(3) Long-Range Statewide Transportation Plan, Participation by Interested Parties...

- § 5304(f)(3)(B) Methods “… the State shall, to the maximum extent practicable”
  - §5304(f)(3)(B)(ii) “employ visualization techniques to describe plans”
Changes §5303 Metropolitan transportation planning under the development of transportation plan, “Each Metropolitan Planning Organization shall provide citizens...reasonable opportunity to comment...”

- §5303(g)(3)(i)(5)(C) Methods “... Metropolitan Planning Organizations shall to the maximum extent practicable”
- §5303(g)(3)(i)(5)(C)(ii) “employ visualization techniques to describe plans”
Statewide & Metropolitan Planning Regulations

- Published in the Federal Register
  February 14, 2007

- FHWA 23 CFR Parts 450, 500

- FTA 49 CFR Part 613 references
  FHWA sections
Visualization Techniques means methods employed by States and MPOS in the development of transportation plans and programs with the public, elected and appointed officials, and other stakeholders in a clear and easily accessible format such as maps, pictures, and/or displays, to promote improved understanding of existing transportation plans and programs.
23 CFR §450.210(a)  
Statewide Planning Section

- The State’s Public Involvement Process at a minimum:

  - (v) To the maximum extent practical, use visualization techniques to describe the proposed long-range statewide transportation plan and supporting studies.
23 CFR §450.210(a)
Statewide Planning Section

- The State’s Public Involvement Process at a minimum:
  - (vi) To the maximum extent practical, make public information available in electronically accessible information and means, such as the World Wide Web, as appropriate to afford reasonable opportunity for consideration of public information.
23 CFR §450.316
Metropolitan Planning Section

“(a) The MPO shall develop and use a documented participation plan....”

“(a)(1) The participation plan ... shall at a minimum, describe explicit procedures, strategies and desired outcomes for:

“(a)(1)(iii) Employing visualization techniques to describe metropolitan plans and TIPS.”
What is 2D, 3D & 4D?
2D Photosimulation

Source: NYSDOT
Pikes Peak Area COG

- Adding Long Range Plan & Alternatives with surrounding environmental important sites to Google.
Corridor Studies

OKI Intersection Simulation

Minneapolis I-494

San Antonio Toll Road Studies
US DOT Assistance

- FTA Public Transportation Participation Pilot Program Project:
  “Using 3D Interactive Visualization Tools for Public Participation”

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Profile of Respondents (n=393, as of 1/10/08)
Familiarity with 3 D Techniques

In 2007

- Hand-drawn Renderings
- 2-D and 3-D Graphics
- Photo-simulation
- 3-D Computer Animation
- VR Simulation
- Other
- None

Legend:
- I have used
- Used in my organization
2009 AASHTO Survey of State DOTs

39) Is your agency using or considering the use of any of the following tools?

- **WebMap**
  - Currently Using: 0.0%
  - Considering: 14.1%
  - Supported by Agency's GIS: 19.6%
  - Not Supported by Agency's GIS: 58.5%

- **ArcGIS Server**
  - Currently Using: 4.9%
  - Considering: 19.6%
  - Supported by Agency's GIS: 50.1%
  - Not Supported by Agency's GIS: 58.5%

- **ArcIMS**
  - Currently Using: 2.4%
  - Considering: 12.2%
  - Supported by Agency's GIS: 48.3%
  - Not Supported by Agency's GIS: 58.5%

- **Yahoo Maps**
  - Currently Using: 2.4%
  - Considering: 12.2%
  - Supported by Agency's GIS: 26.8%
  - Not Supported by Agency's GIS: 34.1%

- **Microsoft Virtual Earth**
  - Currently Using: 2.4%
  - Considering: 12.2%
  - Supported by Agency's GIS: 31.7%
  - Not Supported by Agency's GIS: 31.7%

- **Google Maps**
  - Currently Using: 9.8%
  - Considering: 17.1%
  - Supported by Agency's GIS: 24.4%
  - Not Supported by Agency's GIS: 48.8%

- **Google Earth**
  - Currently Using: 12.2%
  - Considering: 17.1%
  - Supported by Agency's GIS: 31.7%
  - Not Supported by Agency's GIS: 38.8%
Are 3D Tools Useful?

IN 2007
- Very useful: 28%
- Somewhat useful: 32%
- Neutral: 31%
- Not very useful: 6%
- Not useful at all: 3%

ANTICIPATED FOR 2012
- Essential: 47%
- Nice, preferable enhancement: 34%
- Unknown: 18%
- Diminishing, transitory trend: 1%
FHWA Activities

Resource Center
½ day Visualization & Planning Workshop

Office of Environment
Case Studies Report  see FHWA visualization website:
http://www.fhwa.dot.gov/planning/vip/index.htm

Future Webinar / 1 ½ Day workshop
Alaskan Way Viaduct - Seattle
YouTube videos

- Tunnel Alternative
  [Video Link](http://www.youtube.com/watch?v=P91Hl9QCfU&feature=related)

- Elevated Structure Alternative
  [Video Link](http://www.youtube.com/watch?v=sj3kvLgQwkM&feature=related)

- Bored Tunnel Alternative
  [Video Link](http://www.youtube.com/watch?v=FYCrH6XteP0)
Project Level Case Studies

HOT Lane Operation

I – 35 BRT Operations
Case Study Findings

- Outreach activities can be improved by using computerized visualizations.
- Visualization do not replace ongoing coordination.
- State DOT job descriptions for visualization specialists may not attract candidates with requisite skills.
Peer Exchange

- Office of Interstate & Border Planning/ Resource Center Peer Exchange
- Volpe Center Assistance
- Scheduled for this summer – probably in Raleigh, NC
Peer Exchange

- State DOTs and MPOs with noteworthy applications of GIS / 3D viewers and visualization in transportation,

- Among the discussions will be how to effectively make use of these tools and their relationships with historic GIS, visualization or enterprise GIS programs.
Currently set to participate

- Minnesota DOT,
- CalTrans,
- Baltimore Regional Council, and
- North Carolina DOT
Possible Discussion Topics

- Coordinate the needs of various groups, Public Involvement, design, engineering & IT/ GIS groups for resources.
- How do you justify internal resources?
- Internal vs consultant programs?
- Trade offs of these programs with other GIS, webmap or visualization methods?
- How do we nurture the growth within transportation community?
What do we want from you?

- Other examples to share with Peer Exchange?
- What would your Agency like learn from the Exchange?