

Assessment of Greenhouse Gas Analysis Tools



... Helping Washington State Jurisdictions
Meet the Climate Change Challenge

Presentation Outline

- ✓ Relevant State Legislation
- ✓ Project Description
- ✓ Analysis Methodology
- ✓ Greenhouse Gas Analysis Tool Shortlist
- ✓ Selecting the Appropriate Tool
- ✓ Case Study Example



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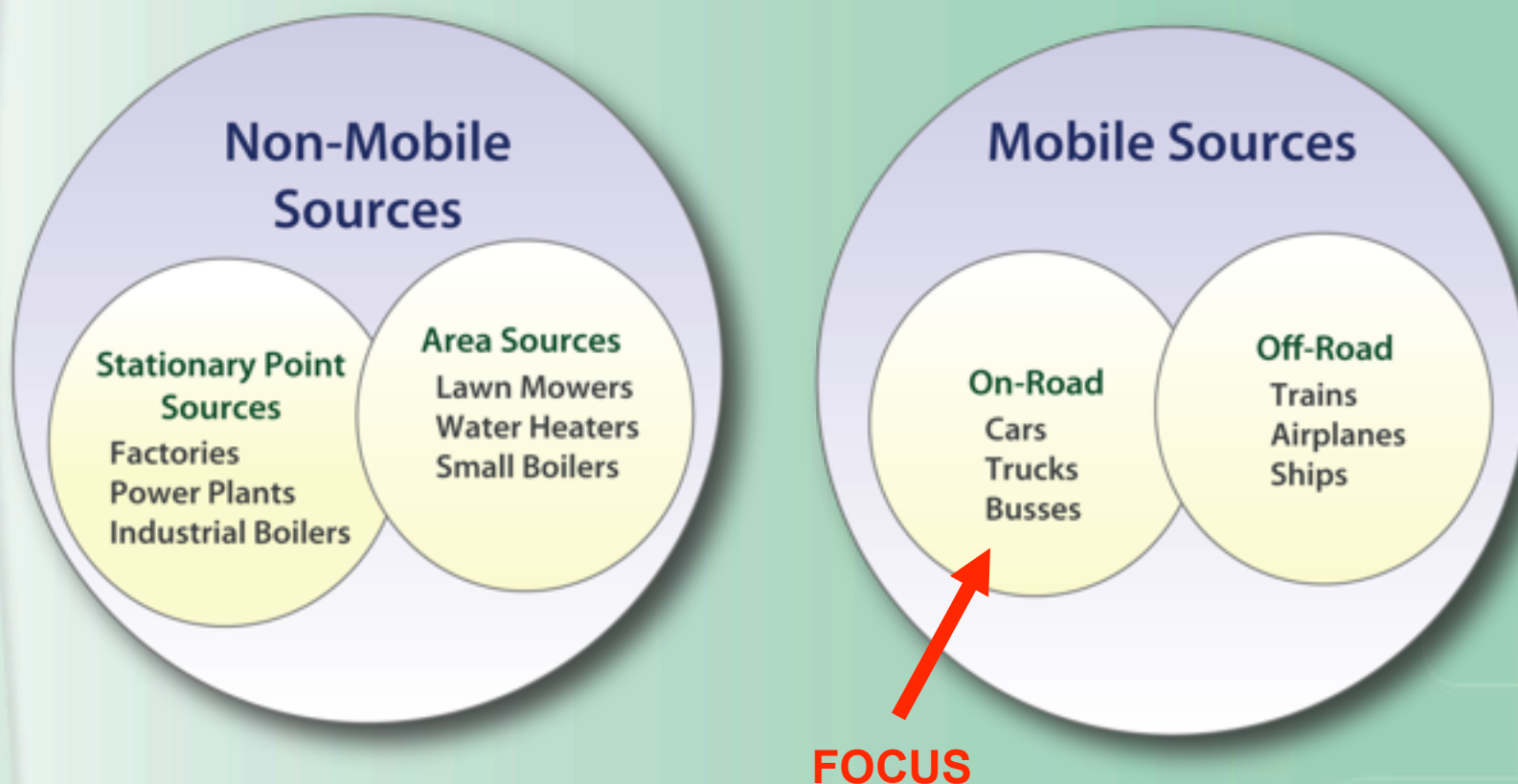
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Focus of GHG Emissions

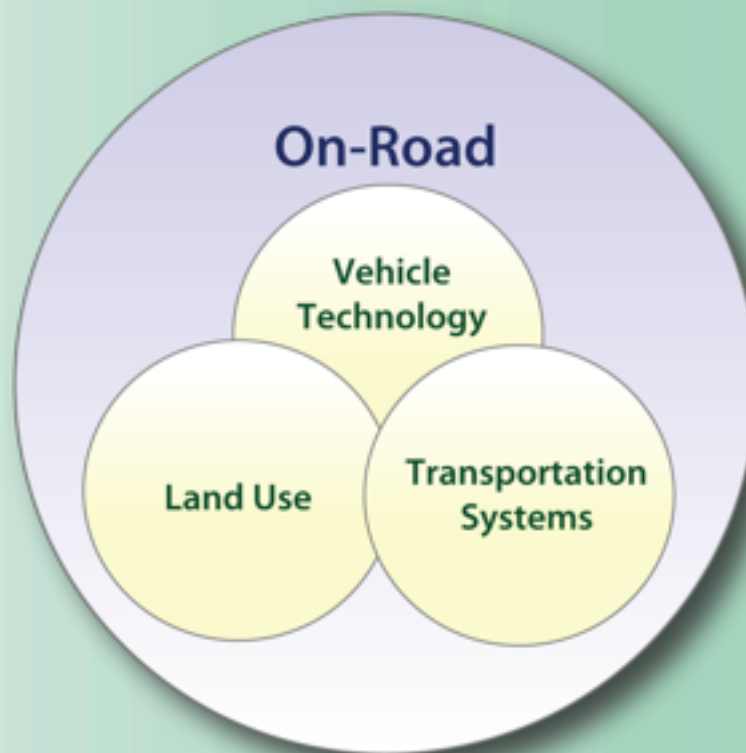


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Focus of GHG Emissions



Factors Affecting On-Road GHG Emissions



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State Legislation Greenhouse Gas Reduction Targets

2020: Same as 1990 emissions level

2035: 25% below 1990 emissions level

2050: 50% below 1990 emissions levels



ESSB 6580 acknowledges...

- ✓ Transportation as the largest GHG source
- ✓ Land use patterns directly influence travel patterns, fuel consumption, transportation -related emissions
- ✓ Washington State must decrease GHG transportation -related emissions to meet State GHG targets



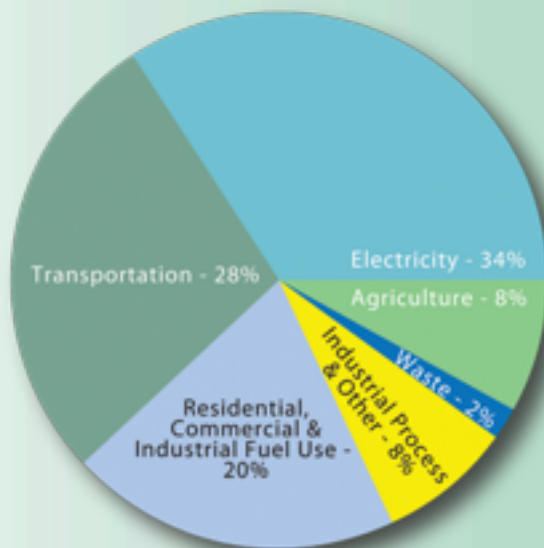
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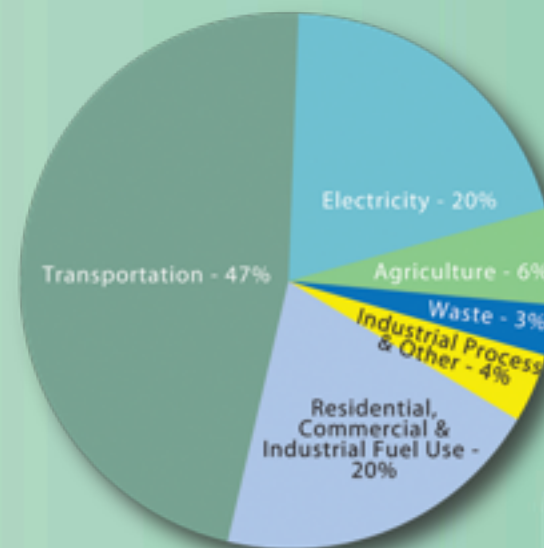
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U.S. Greenhouse Gas Emissions



Washington Greenhouse Gas Emissions



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Department of Commerce Responsibilities for ESSB 6580

- ✓ Provide advisory climate change response methodologies
- ✓ Analyze computer modeling programs of greenhouse gas emissions
- ✓ Provide estimates for implementing certain programs



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Meeting the Requirements of ESSB 6580

- ✓ Summarize the current GHG emissions evaluation efforts in the state
- ✓ Develop a broad list of GHG emissions analysis tools
- ✓ Narrow the list of tools to the most promising candidates
- ✓ Assess the “short-listed” tools across a range of criteria
- ✓ Develop a framework to assist jurisdictions in selecting the appropriate tool



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What is California Up To?

2009/2010: Develop guidelines/Adopt regulations

2010: Reduce to 2000 levels

2012: Statewide cap phased in

2020: Reduce to 1990 levels

2050: Reduce 80% below 1990 levels

Various: SB 375

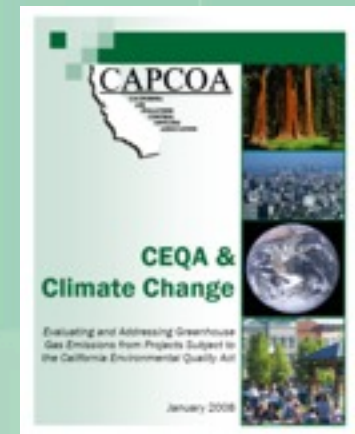


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Role of State and Local Agencies

- ✓ Attorney General
- ✓ California Air Pollution Control Officers Association (CAPCOA)
- ✓ Office of Planning and Research (OPR)
- ✓ California Air Resources Board (ARB)
- ✓ Bay Area Air Quality Management District (BAAQMD)



ARB's Draft Thresholds of Significance

- ✓ Recommended Approaches for Setting Interim Significance Thresholds for GHGs under CEQA (October 2008)
- ✓ Overall Approach
 - Stringent non-zero thresholds
 - Apply sector-by-sector approach
 - ARB recommendation is interim
 - Lead agencies retain authority

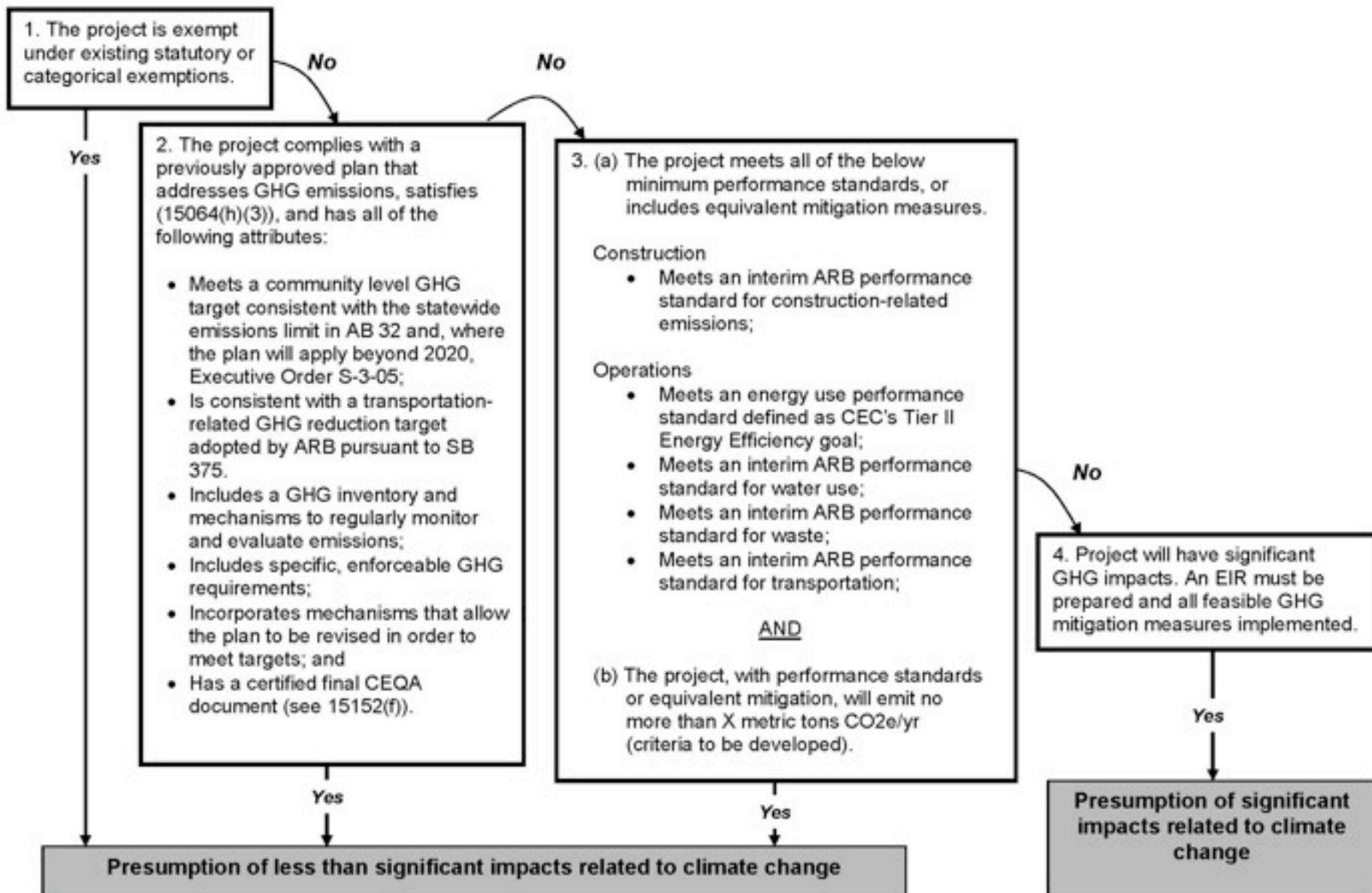


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ATTACHMENT B

Preliminary Draft Proposal for Residential and Commercial Projects



BAAQMD's Draft Thresholds of Significance

Project Type	Proposed Thresholds
Land Use Projects	Compliance with Qualified Climate Action Plan OR 1,100 MT of CO₂e/yr OR 4.6 MT CO₂e/SP/yr* (residents + employees)
General Plans	Compliance with Qualified Climate Action Plan (or similar criteria included in a General Plan) OR 6.6 MT CO₂e/SP/yr (residents + employees)



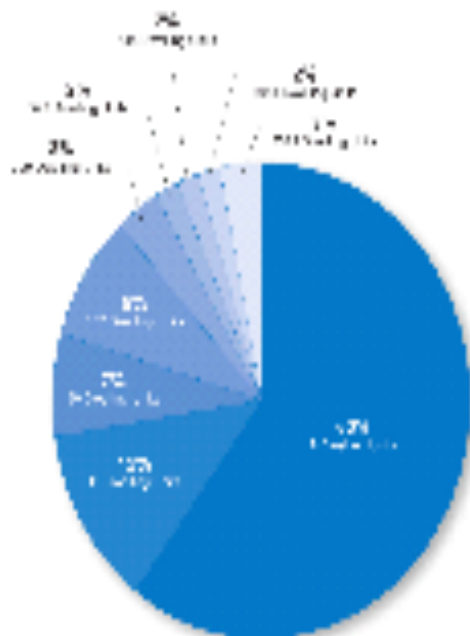
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Gap Based Threshold

BAAQMD Single Family Residential Development Projections:

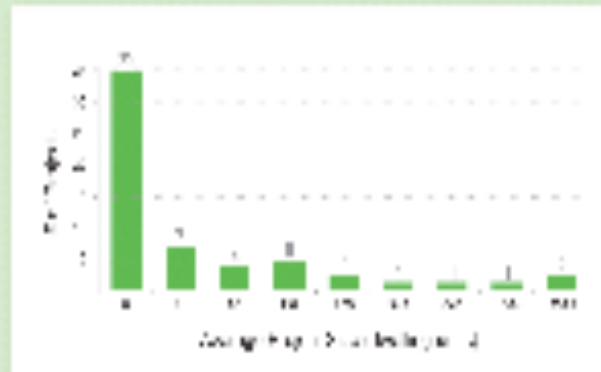
Define the Gap as
 $2100 = 1^* \text{ BDC}$



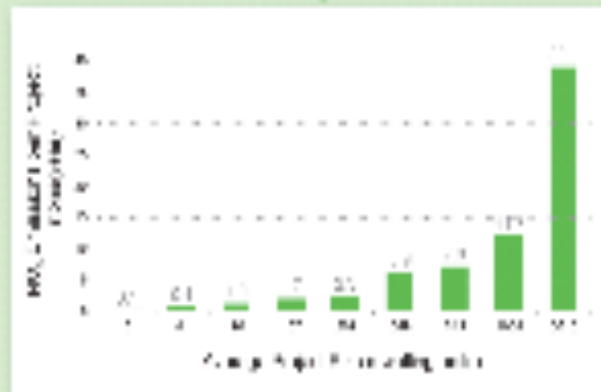
CEQA Projects Database

Source: BAAQMD Single Family Residential Development Projections

Operational Year 2020 Projections



BAAQMD Projected Projects



URBEMIS Operational Emissions Modeling Example

Notes:

1. The data shown in this chart is based on the BAAQMD Single Family Residential Development Projections. The data is based on the BAAQMD Single Family Residential Development Projections. The data is based on the BAAQMD Single Family Residential Development Projections.
2. The data shown in this chart is based on the BAAQMD Single Family Residential Development Projections. The data is based on the BAAQMD Single Family Residential Development Projections. The data is based on the BAAQMD Single Family Residential Development Projections.

BAAQMD Projected Land Use Development Emissions Inventory (Single Family Residential Projects < 2,000 sq ft)

Year 2020 = 124.2 tons/year BDC

Perform Sensitivity Analysis

Compare the data in the BAAQMD Single Family Residential Development Projections to the data in the URBEMIS Operational Emissions Modeling Example.

How Do Agencies Currently Evaluate GHG Emissions?

The Project team interviewed RTPO agencies and jurisdictions in urban and rural areas across the state



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What Did We Hear?

- ✓ Most jurisdictions monitoring air pollution but not greenhouse gas emissions.
- ✓ Wide range of analysis tools being used.
- ✓ Not all cities had transportation models.
- ✓ RTPOs said they would need more staff to perform adequate greenhouse gas analyses.



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Evaluation Methodology

Over 60 tools were evaluated including . . .

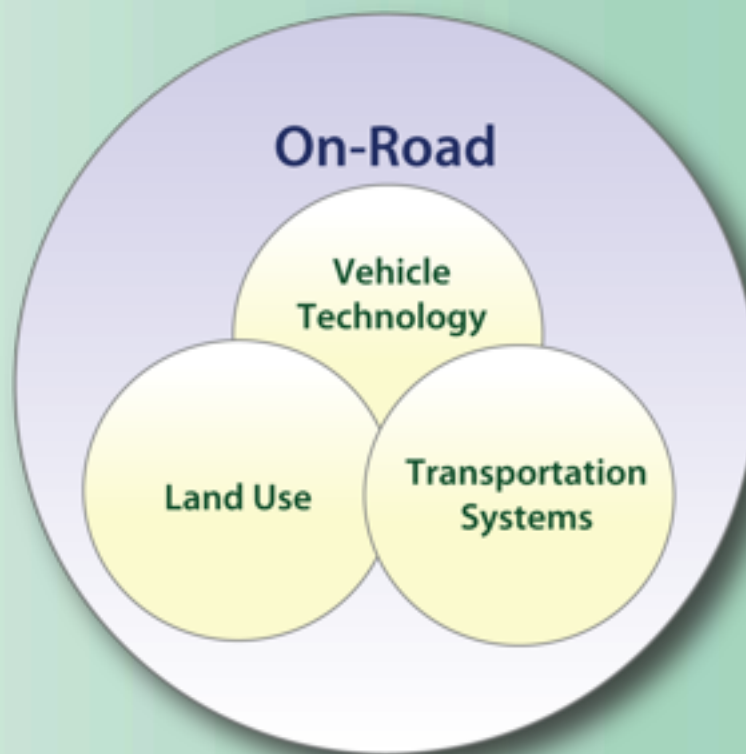
ITE Trip Generation, 8 th Edition	CTG Energetic Sustainable Communities
VMT Spreadsheet	EDAW Sustainable Systems Integrated Model (SSIM)
King County GHG Emissions Worksheet	EPA COMMUTER Model
CCAP Guidebook/CCAP Calculator	CCAP Guidebook/CCAP Modeling Software
The Environment Agency Carbon Calculator	URBEMIS 2007
The Edinburgh Centre for Carbon Management Calculator	California Climate Action Registry General Protocol
ICLEI Density VMT Calculator	The Climate Registry General Reporting Protocol
EPA LandGEM Model	IPCC Emission Calculation Guidelines
Athena Eco-Calculator	INDEX
4Ds Spreadsheets	EPA Motor Vehicle Emissions Simulator (MOVES)
HPMS	California ARB's EMFAC2007 Model
CommunityVIZ	Greenhouse gases, Regulated Emissions, and Energy use in Transportation (GREET)
GreenSTEP	PLACE ³ S



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Factors Affecting On-Road GHG Emissions



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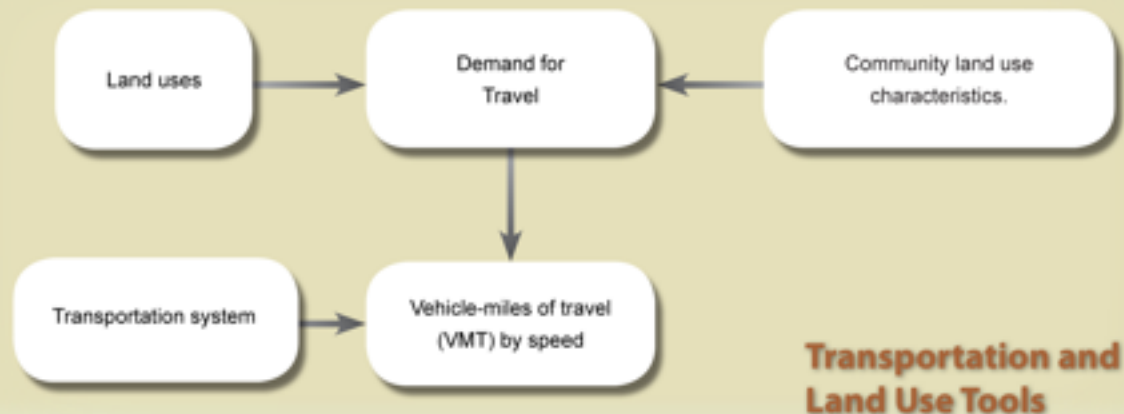
Relationships between Land Use, Transportation, and Mobile-Source



**Transportation and
Land Use Tools**

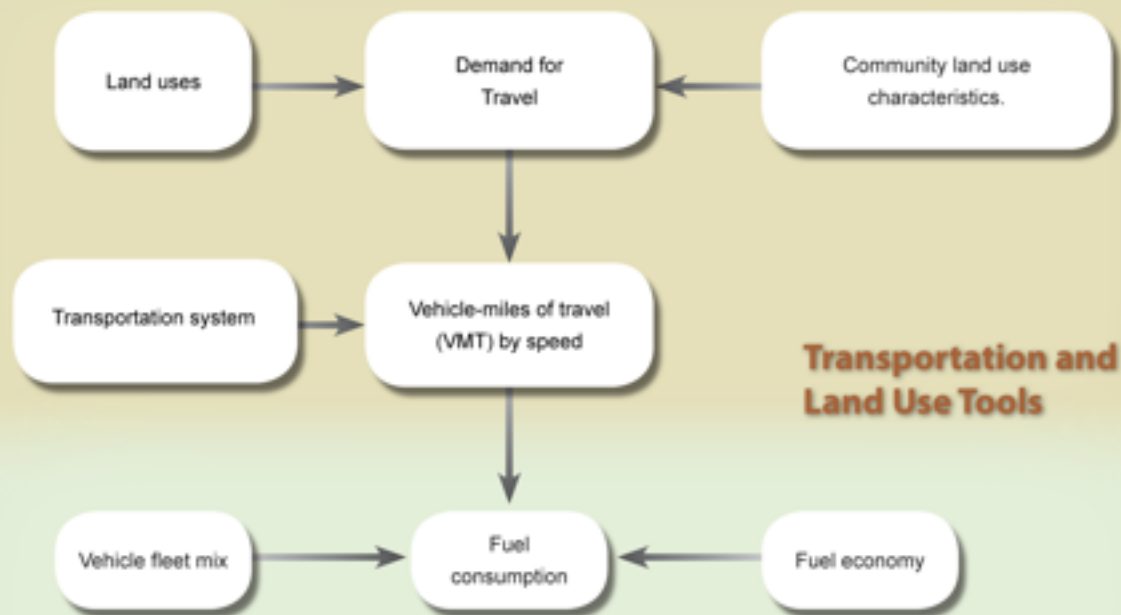
Air Quality Tools

Relationships between Land Use, Transportation, and Mobile-Source



Air Quality Tools

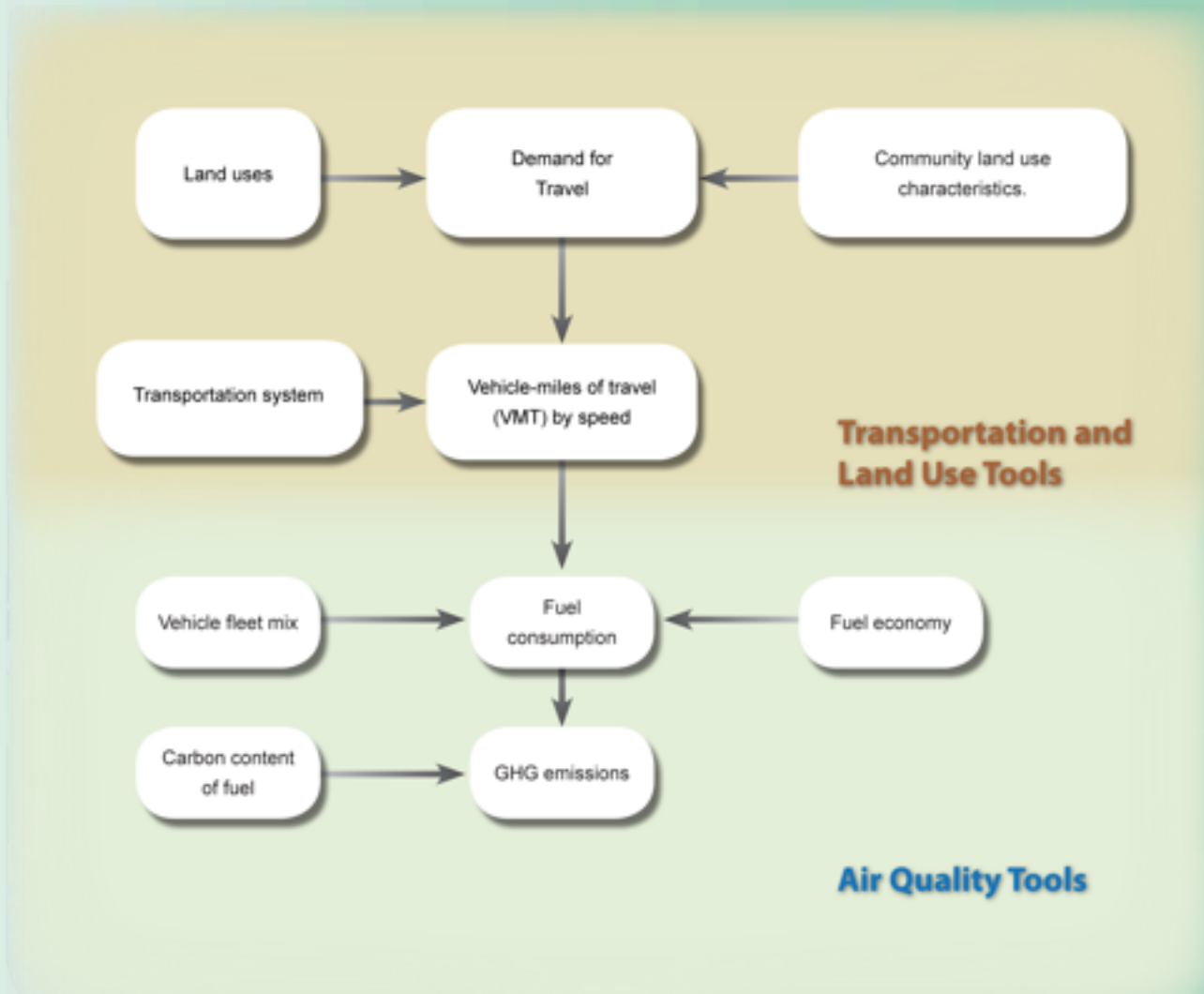
Relationships between Land Use, Transportation, and Mobile-Source



**Transportation and
Land Use Tools**

Air Quality Tools

Relationships between Land Use, Transportation, and Mobile-Source



GHG Evaluation Tools can be Applied to

- ✓ Regional Plans
- ✓ City or Countywide Plans
- ✓ Subarea Plans
- ✓ Site-Level Plans
- ✓ Corridor Plan



1st Level Criteria

- Applicable for community plans and project analyses
- Available to Public Agencies
- Sensitive to land use changes
- Sensitive to transportation system changes
- Adaptable to Washington State conditions Uses available data
- Uses available hardware
- Accuracy



Short List of Tools

- ✓ VMT Spreadsheet with emissions factors
- ✓ VMT Spreadsheet with 4D Smart Growth adjustments with emissions factors
- ✓ Travel Demand Forecasting (TDF) Models with emissions factors
- ✓ Enhanced TDF Models with emissions factors
- ✓ ICLEI CACP Software
- ✓ URBEMIS
- ✓ PLACE3S
- ✓ INDEX

..... each tool was further investigated

2nd Level Criteria

Tools on the short-list were screened against their ability to evaluate a range of land use, travel reduction, and transportation system operations strategies.

Evaluation Criterion	Tool							
	VMT Spreadsheet	VMT Spreadsheet with Smart Growth Adjustments	Travel Demand Forecasting Models	Enhanced Travel Demand Forecasting Models	URBEMIS	ICLEI CACP	PLACE's	INDEX
Sensitivity to land use changes								
Sensitivity to transportation changes								
Sensitivity to policy changes								
Adaptability to different conditions								
Support availability and maintenance requirements								
Cost								
Ease of use								
Accuracy								



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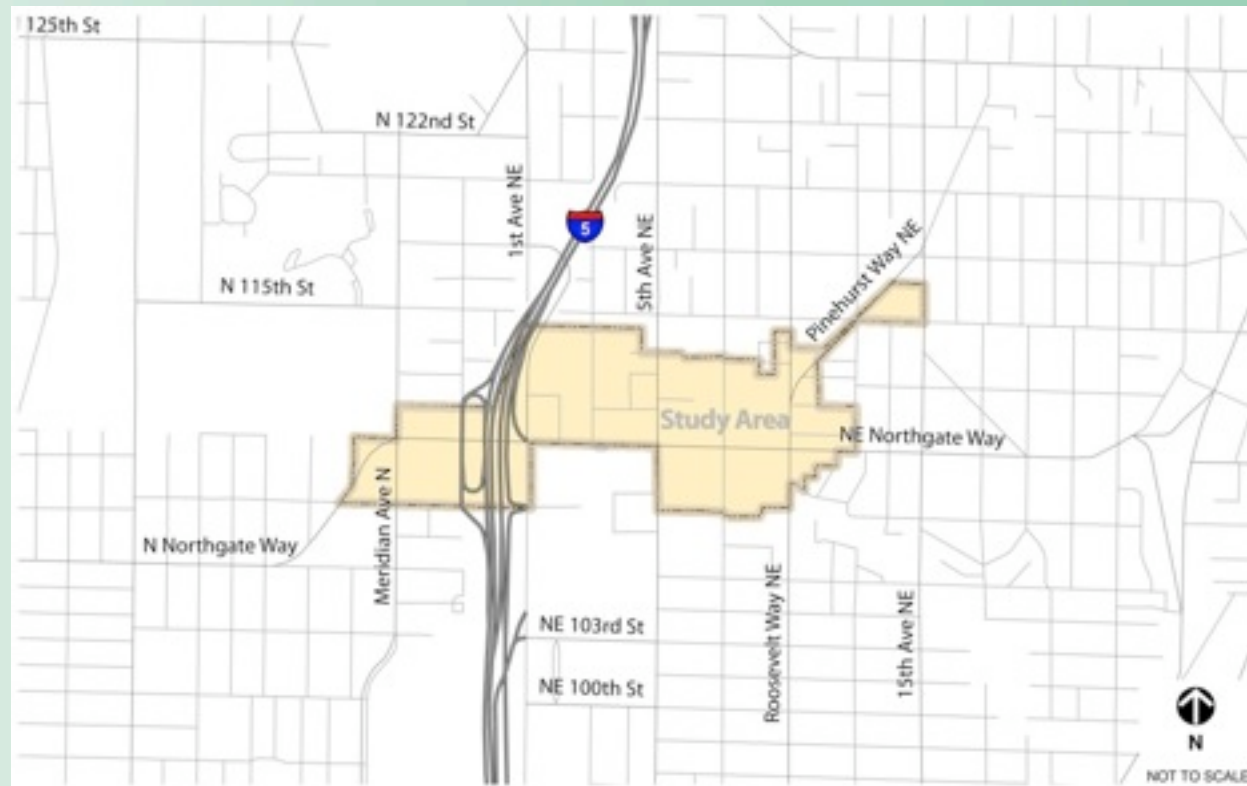
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Choosing the Right Tool

- ✓ Each tool on the short-list has benefits and limitations
- ✓ No “one size fits all” tool
- ✓ Select a tool based on:
 - The level of detail needed
 - The expected level of scrutiny
 - Community interest
 - Resources available --In terms of staff time;
In terms of funding
- ✓ Case Study Example

Case Study

- Northgate Sub-Area Rezone Project in Seattle



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Case Study

- Northgate Sub-Area Rezone Project in Seattle



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Northgate Sub-Area Rezone Project in Seattle

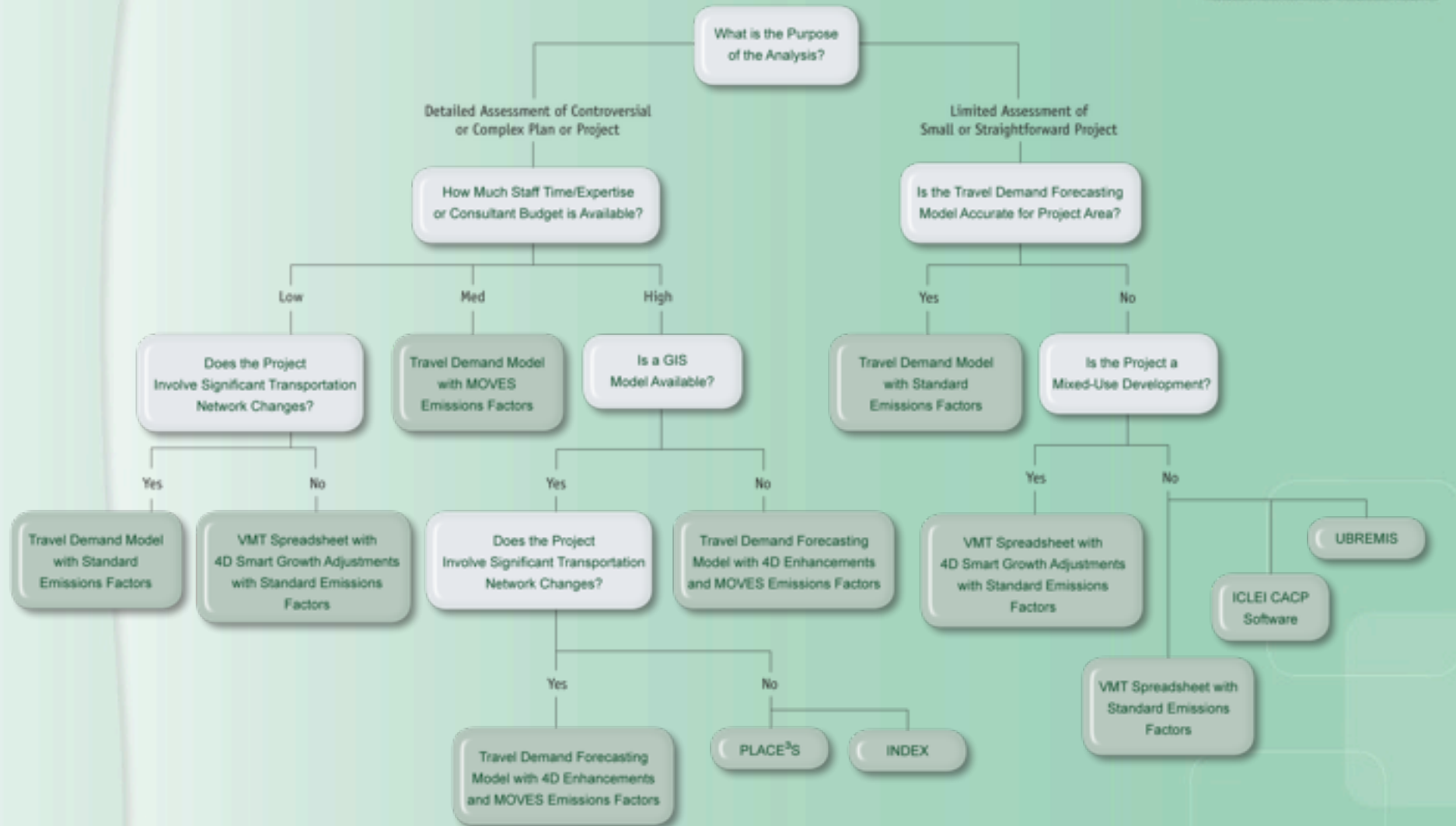
New Use	Amount
Multi-Family Residential	1,604 Units
Retail	108,900 sq. ft.
Office	551,600 sq. ft.



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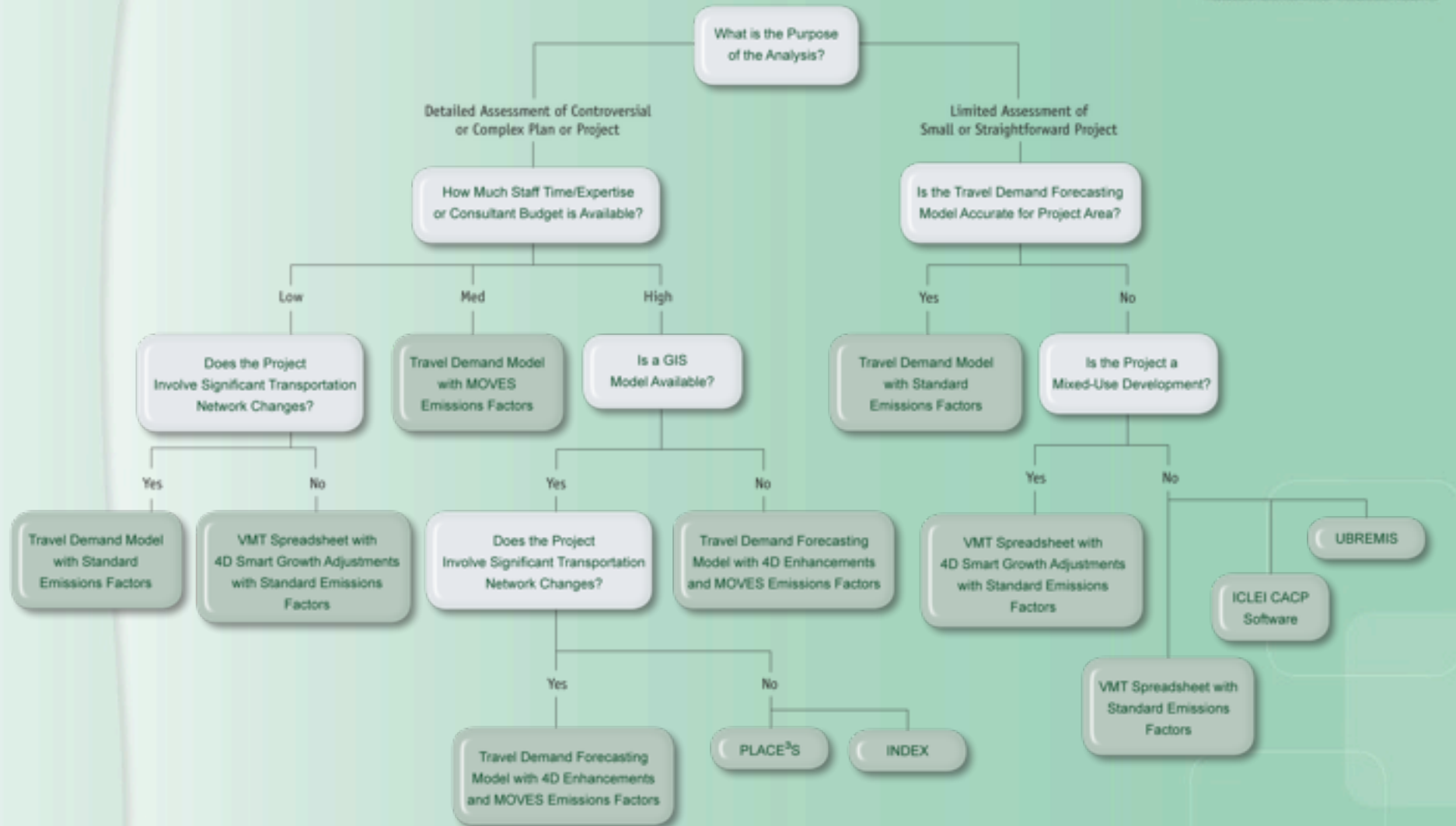
How to Choose the Right Tool?



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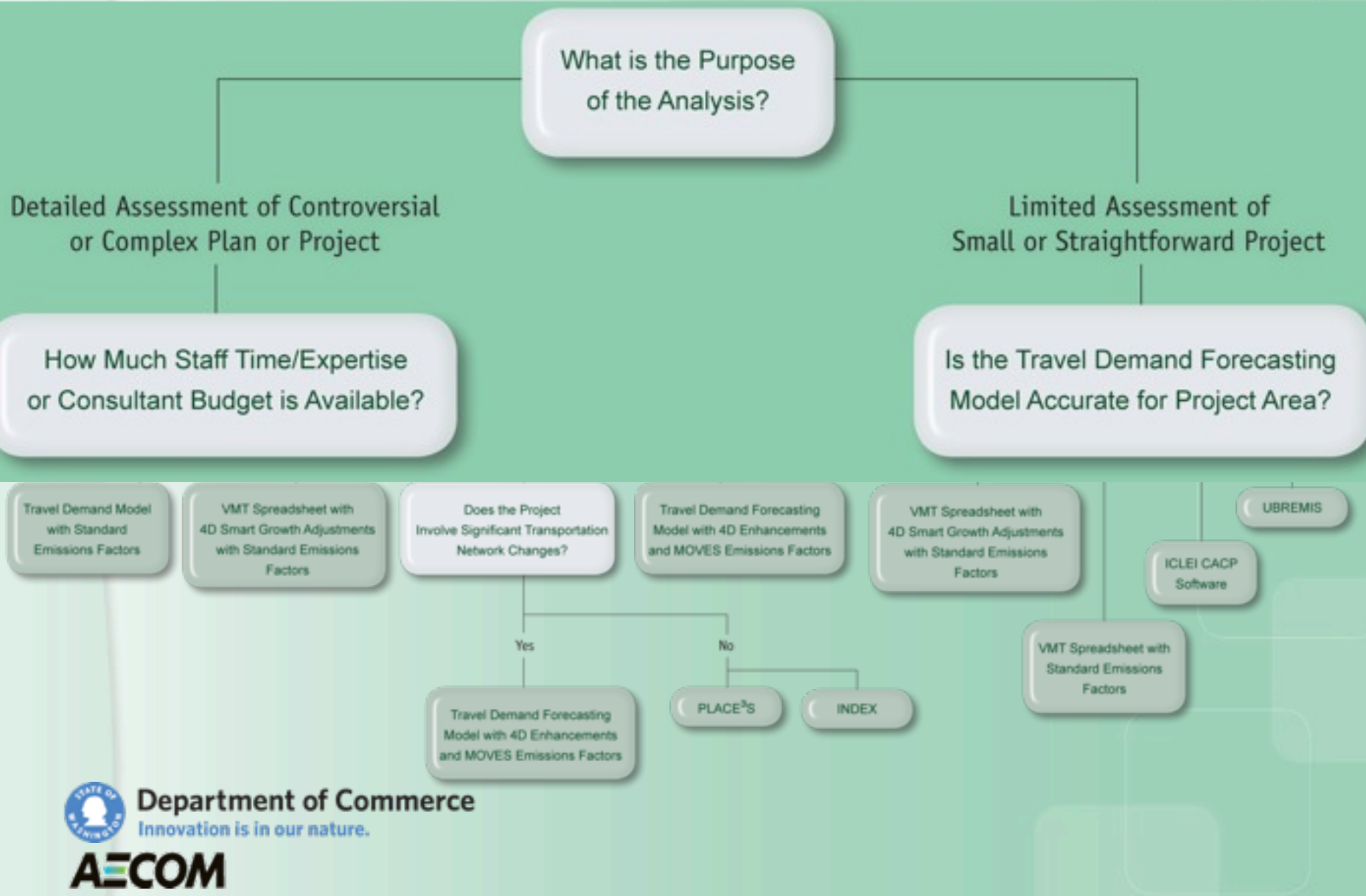
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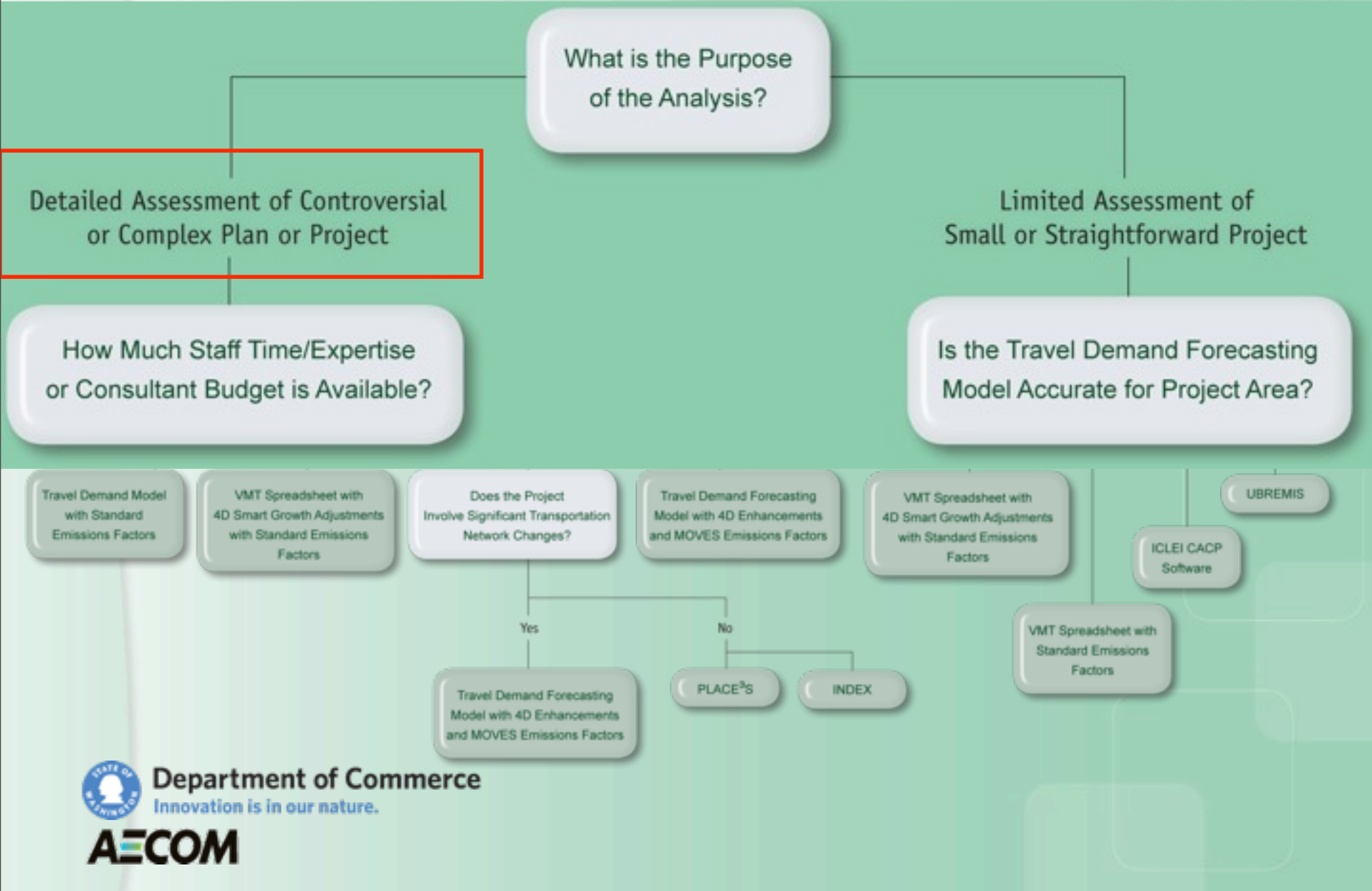
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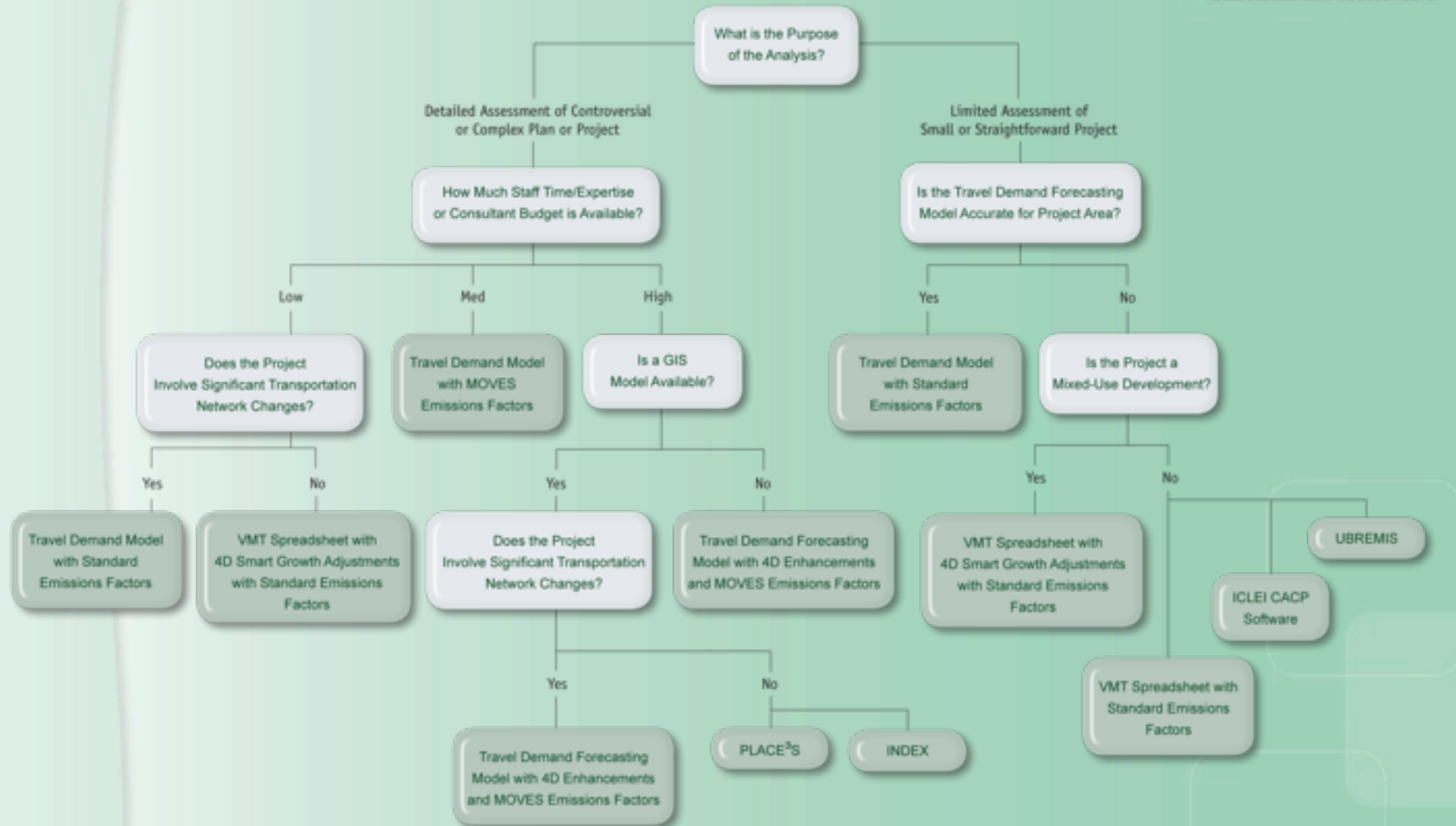
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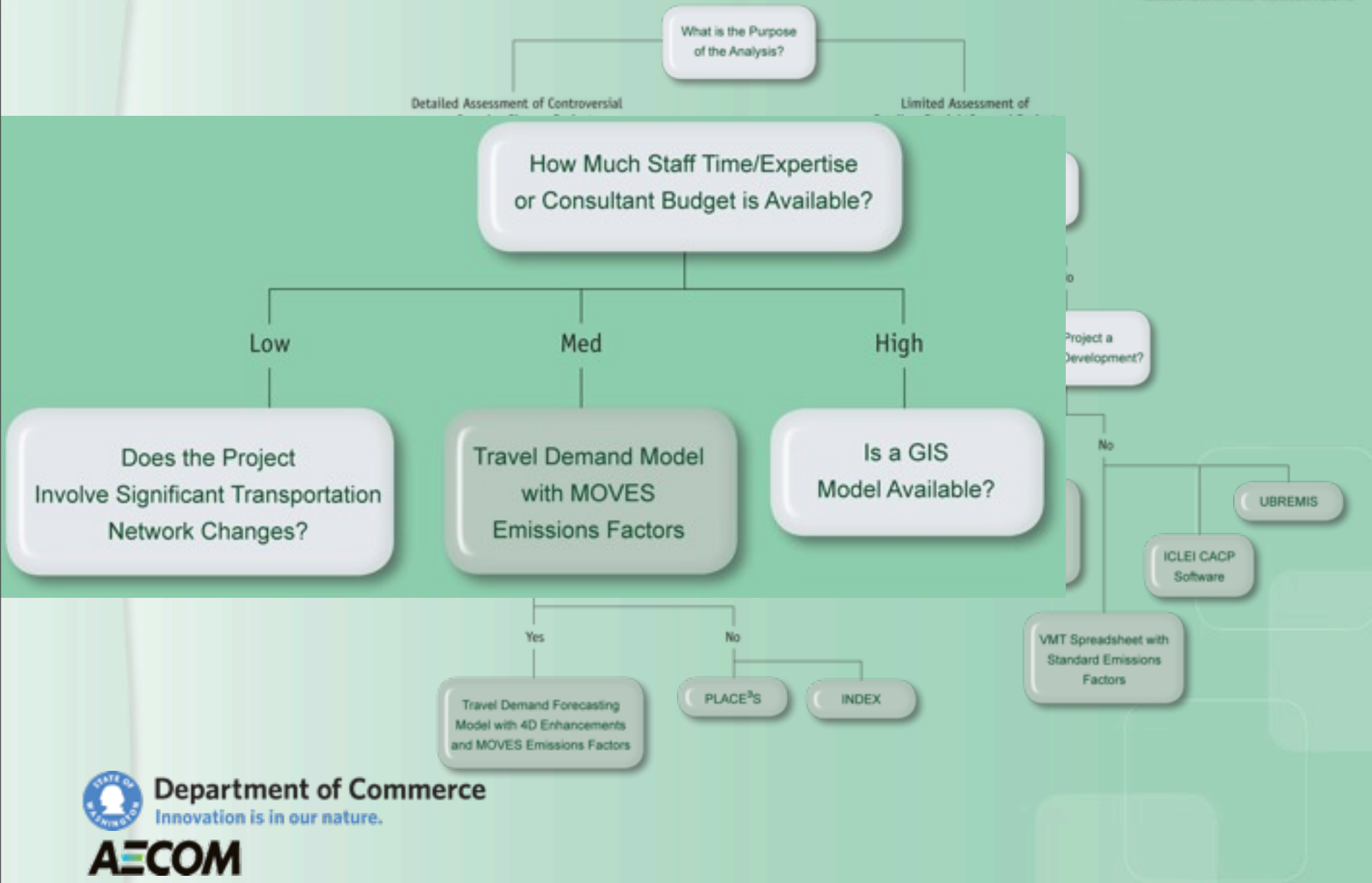
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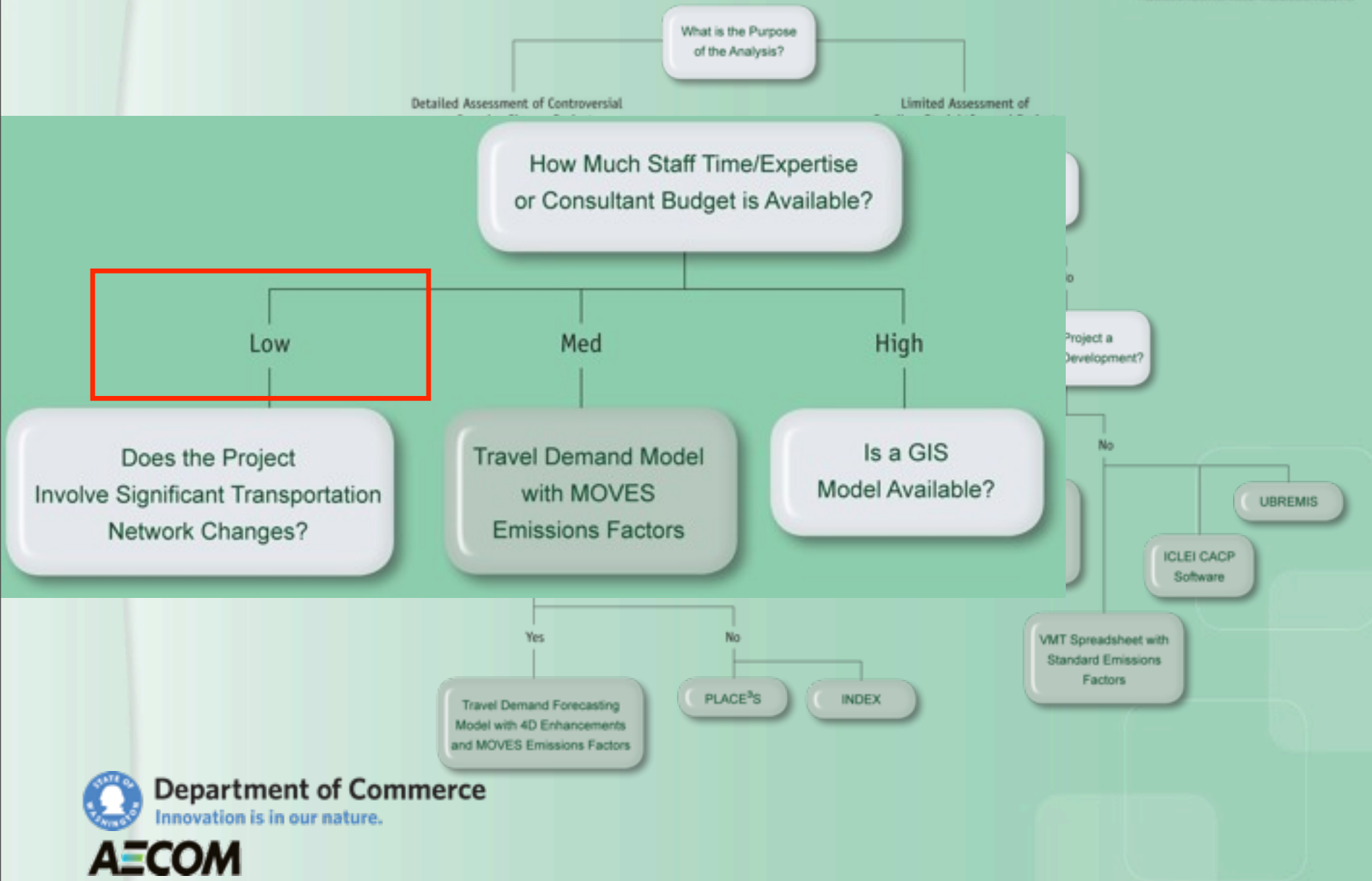
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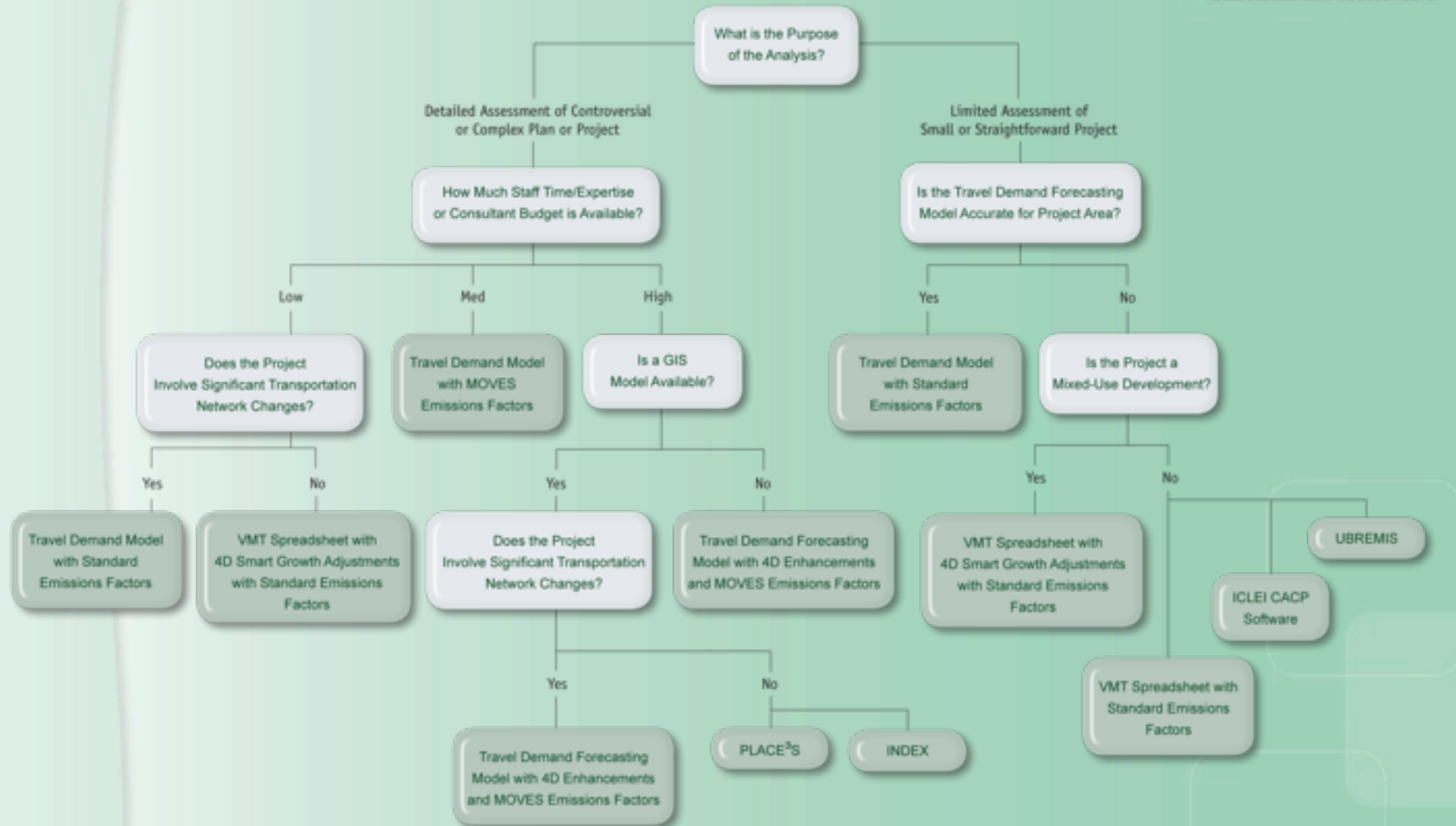
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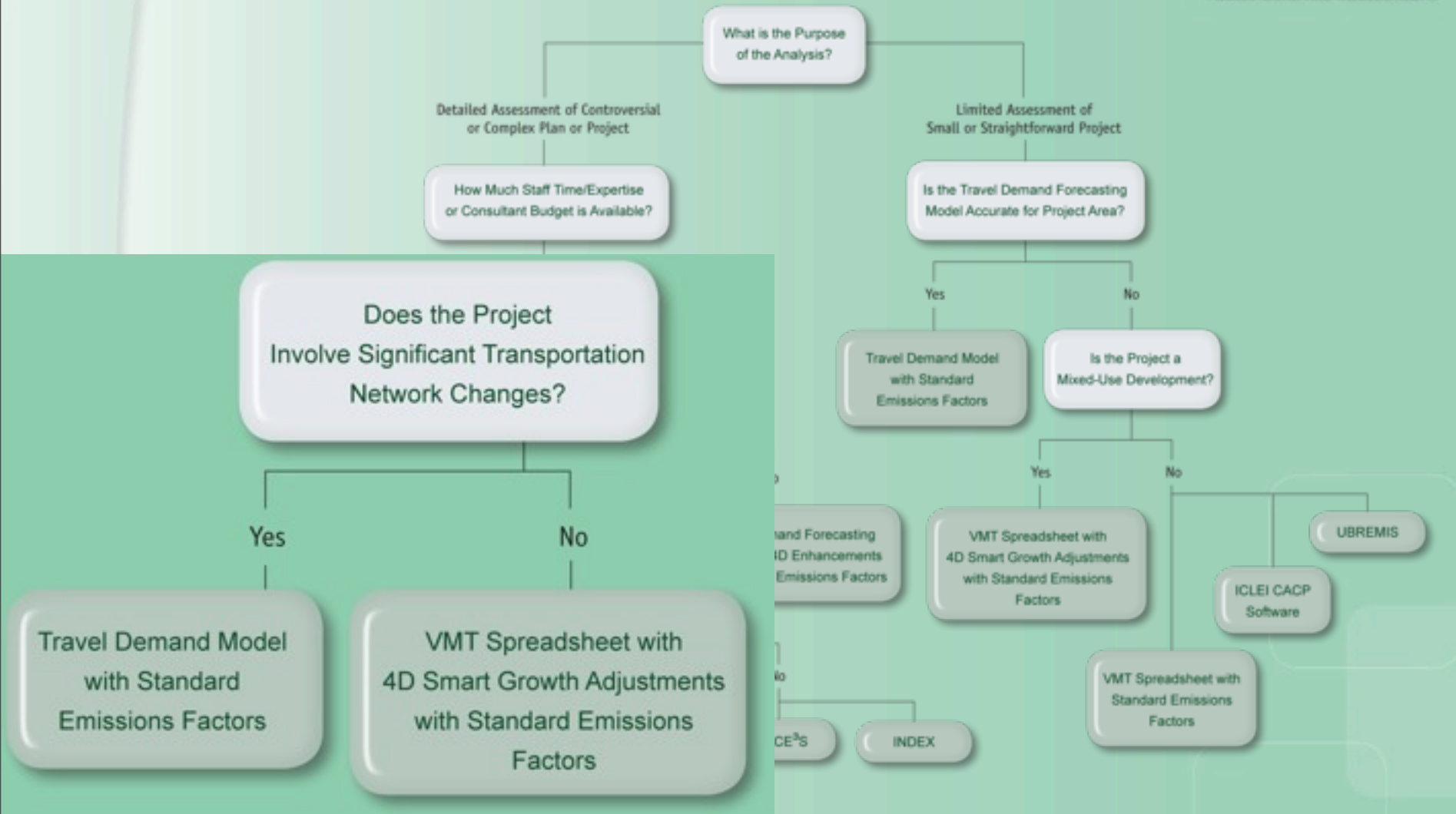
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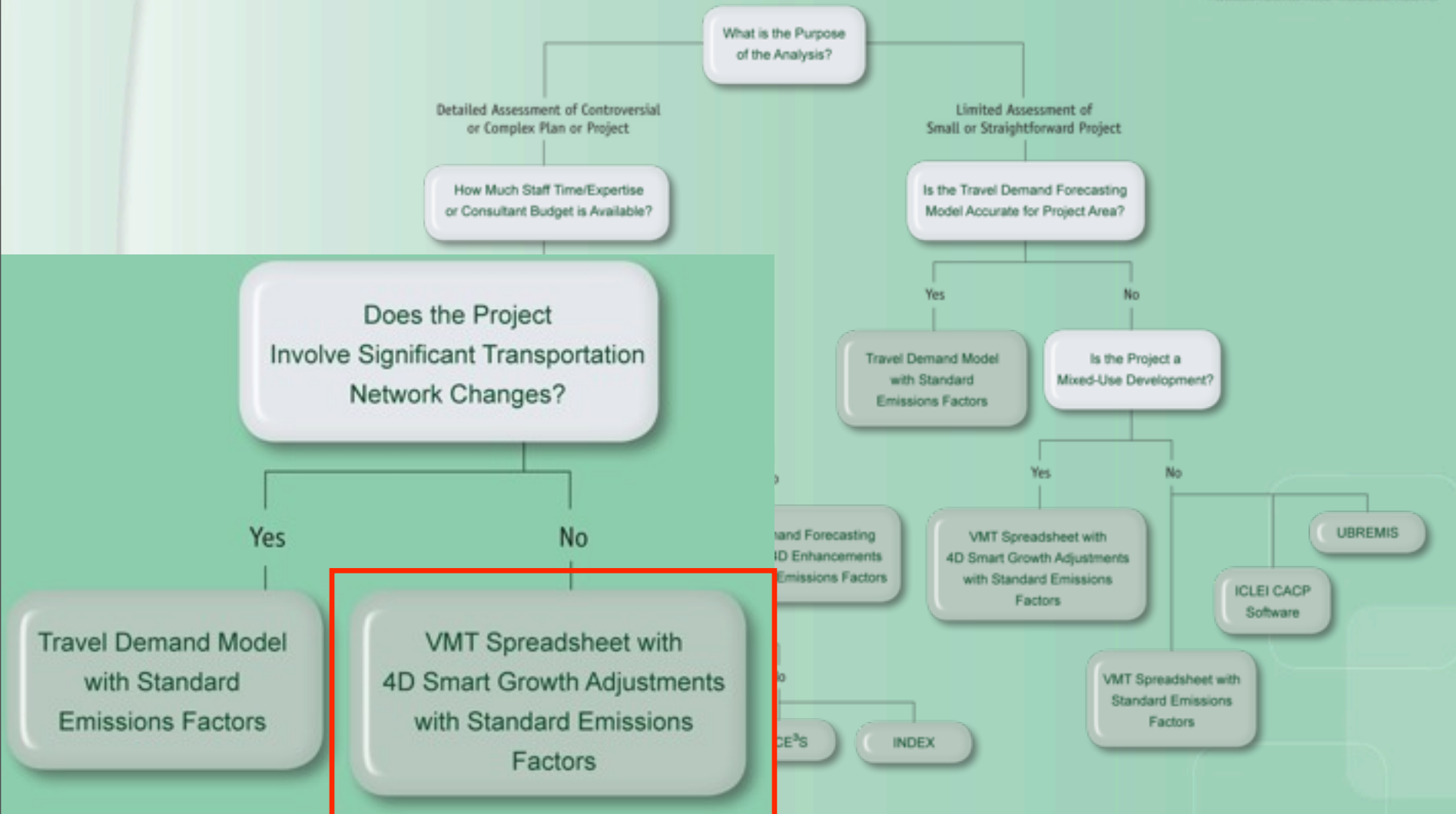
How to Choose the Right Tool?



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How to Choose the Right Tool?



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- Contracts Administration Unit
- Growth Management Services**
- Capital Facilities
- Contact Us
- Climate Change**
- Greenhouse Gas Emission Planning Tools**

Greenhouse Gas Emissions Planning Tools

Many local governments are taking action to address climate change – either through mitigation, adaptation, or both – in their operational or comprehensive plans. While addressing climate change in comprehensive plans is not a specific requirement of the Growth Management Act, many counties and cities are addressing climate change through land use and transportation planning, or by adding optional elements to their plans.

In April of 2008, the Growth Management Act was amended to require the Washington State Department of Commerce (formerly the Department of Community, Trade and Economic Development) to "...develop and provide to counties and cities a range of advisory climate change response methodologies, a computer modeling program, and estimates of greenhouse gas emissions resulting from specific measures." These tools are to reflect regional and local variations and the diversity of counties and cities planning under the GMA.

Commerce's Growth Management Services staff has been working with a consulting team and a technical advisory team to review existing modeling tools and programs, identify those most appropriate for use in Washington State, and to identify the strengths and weaknesses of the tools. A draft report is now available for review and comment.

[Summary](#)
[Report](#)
[Appendices](#)

Comments will be accepted on the draft through October 15, 2009. Please provide public comments on the draft report to Joyce Phillips at Joyce.Phillips@commerce.wa.gov. The final report will be available by December 1, 2009.

Case Study

VMT SPREADSHEET WITH 4D SMART GROWTH ADJUSTMENTS

The Vehicle Miles Traveled (VMT) Spreadsheet with 4D Smart Growth Adjustments takes land use data and calculates trip generation using data from the Institute of Transportation Engineers *Trip Generation* report (total trip generation can also be entered manually). The trip generation is then adjusted to account for smart growth development characteristics (density, diversity, design, and destination accessibility). Detailed data about land use (e.g., density, diversity) and transportation (e.g., pedestrian design) characteristics are required to estimate the trip generation reduction. Mobile-source GHG emissions are estimated using average trip length data and an aggregate emissions factor from local or national sources.

The smart growth adjustments can also be applied as a preprocessing step to other tools like travel demand forecasting models, URBEMIS¹, and the ICLEI CACP² Software. Additional information about the VMT Spreadsheet with 4D Smart Growth Adjustments is provided at www.coolconnections.org/4ds.

Sample Output Data from Smart Growth Model

D Variable	Project Value	Benchmark Value (Typical ITE Site)	Percent Difference
Density - Single Family Residential	4.3	5	-14.30%
Density - Multi-Family Residential	14.1	15	-6.07%
Density - Employment	23.3	16.58	40.54%
Diversity - Jobs / Housing	0.80	0.1	500.00%
Design - Sidewalk Coverage	75%	0.75	0.00%
Design - Route Directness	50%	0.5	0.00%
Design - Average Blockface (miles)	0.22	0.22	0.00%
Design - Street Density	9.09	9.09	0.00%
Design - Final Parameter	2.88	2.88	0.00%
Destinations - Commute Length (mins)	22.00	28.00	21.43%
OVERALL EXTERNAL VMT REDUCTION			25.00%

Quick Evaluation	
Sensitivity to land use changes	
Sensitivity to transportation system changes	
Sensitivity to policy changes	
Adaptability to different conditions	



Strengths

- Sensitive to smart growth development characteristics
- Freely available
- Does not require geographic information systems (GIS) or travel demand modeling software

Weaknesses

- Not applicable for large-scale plans or projects less than 200 acres.
- Not sensitive to traffic congestion or transit service
- May require an expert for complex or nonstandard projects
- Less accurate than other tools



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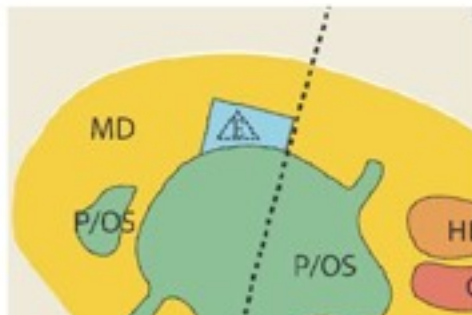
COOLconnections
Climate, Energy, & Quality of Life

Overview | Discussions | FAQs | Solutions | Editors

■ VMT Spreadsheet with Smart Growth Adjustments

The VMT Spreadsheet with 4D Smart Growth Adjustments is a tool that allows users to estimate the greenhouse gas (GHG) emissions of mixed-use/smart growth projects or plans. The tool is limited to analyzing projects and plans that are larger than 200 acres in size as the 4D data is not valid for smaller projects. The trip generation rates, average 4D variables, trip lengths, and greenhouse gas emissions factors are based on national and regional data, which can be replaced with local data for increased accuracy.

[Click here to download the VMT Spreadsheet with 4D Smart Growth Adjustments Tool.](#)



DISCUSSION TOPICS

- The Value of Walkability
- Practicing Planner Features "A New Transportation Planning Paradigm"
- Fehr & Peers Participates in California RTP Guidelines Update for SB 375
- Industry Accepting VMT Threshold Approach
- New Smart Growth and GHG Emissions Study

RECENT COMMENTS

- Avrett on A New Transportation Planning Paradigm: Constraints-Based Planning in Response to the Continuing Decline in Transportation Funds
- Anonymous on A New Transportation Planning Paradigm: Constraints-Based Planning in Response to the



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Step 1: This worksheet uses Institute of Transportation Engineers Trip Generation, 8th Edition data to calculate trip generation for given residential, retail, office, industrial, school, and other land uses. Users can also separately enter land use data (units of residential development and daily trip generation) for land uses that are not included in this sheet. If the ITE data are used, specify the average, linear, or logarithmic trip generation rate. If one of the trip generation rates is not available for a given land use, this sheet will return a "Method Not Valid" error (the average rate is always valid). A separate calculation estimates the number of jobs related to the non-residential uses. The job information is used in calculating the 4D adjustment. The jobs are calculated using floor area to employment information that can be updated in the "Step 2 - D Variables" worksheet. If more accurate job information is available, enter it in the Jobs column.

Land Use Type	Units	Trip Equation Method	Daily Trips	Jobs
Number of Dwelling Units				
Single Family (ITE 210)	857	Average Rate	8,201	
Multi-Family (ITE 220)	4227	Average Rate	28,405	
High Rise Condo (ITE 232)		Average Rate	-	
Other Multi-Family Residential (enter number of units and daily trips)			-	
Retail Floor Space (ksf)				
General Retail other than those listed below (ITE 820)	284,222	Average Rate	12,204	568,444
Supermarket (ITE 850)		Average Rate	-	
Bank (ITE 912)		Average Rate	-	
Health Club (ITE 492)		Average Rate	-	
Restaurant (non-fast food - ITE 932)		Average Rate	-	
Fast-Food Restaurant (ITE 934)		Average Rate	-	
Gas Station (ITE 945)		Average Rate	-	
Auto Repair (ITE 942)		Average Rate	-	
Other Retail (enter number of ksf and daily trips)			-	
Office Floor Space (ksf)				
Non-Medical (ITE 710)		Average Rate	-	
Medical (ITE 720)		Average Rate	-	
Other Office (enter number of ksf and daily trips)			-	
Industrial Floor Space (ksf)				
Light Industrial (ITE 110)	2471.42	Average Rate	17,225	4942.84
Manufacturing (ITE 140)	1544.638	Average Rate	5,901	1544.638
Warehousing (ITE 150)	2162.493	Average Rate	5,406	1081.246

Ready



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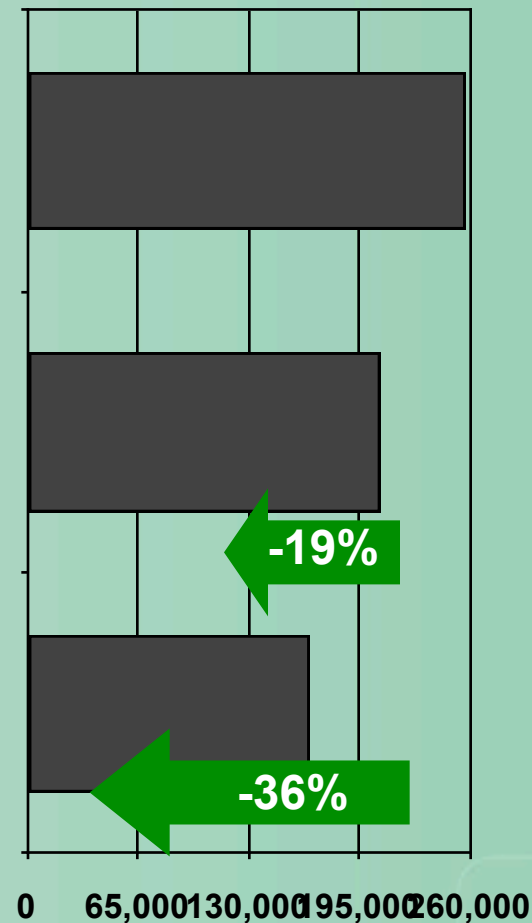
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Project VMT

Suburban Style Development

Proposed Project No 4Ds

Proposed Project with 4Ds



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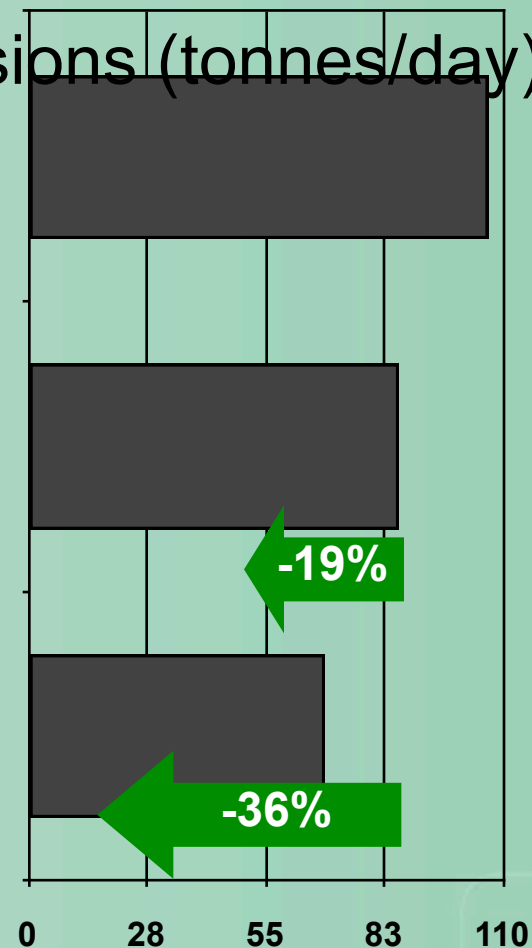
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Project Greenhouse Gas Emissions (tonnes/day)

Suburban Style Development

Proposed Project No 4Ds

Proposed Project with 4Ds



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✓ Conclusions

- Recognizing the mixed-use nature of the area and choosing the appropriate tool is important
- Without the 4D analysis, VMT and Greenhouse Gas Emissions overstated by 33 percent
- Tool shows benefit over comparable scale development in single-use, suburban setting



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Next Steps

- ✓ Department of Commerce will seek funding for case study applications of the tools
- ✓ Develop approach for non-mobile source analysis
- ✓ Promote development of standard emissions factors



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Questions?



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URBEMIS

Urbemis 2007 9.2.2

Assistant, New (not yet saved) Project is: Example Project On-Road Motor Vehicle Exhaust

File ? Bring all Floating Panels In

Land Use Details

Residential Educational Recreational Large Retail Retail Commercial Industrial Blank

To reset all values, click one of these buttons ==> Restore Defaults Restore from File

Enter Land Uses for your project

Unit Amt	Land Use Type	Trip Rate (per day*)	Unit Type	Acres*	Trip % Primary	Trip % Diverted	Trip % Pass-By
250.00	Single family housing	9.57	dwelling units	83.33	85.0	10.0	5.0
0.00	Apartments low rise	0.00	dwelling units	0.00	85.0	10.0	5.0
0.00	Apartments mid rise	0.00	dwelling units	0.00	85.0	10.0	5.0
0.00	Apartments high rise	0.00	dwelling units	0.00	85.0	10.0	5.0
0.00	Condo/townhouse general	0.00	dwelling units	0.00	85.0	10.0	5.0
0.00	Condo/townhouse high rise	0.00	dwelling units	0.00	85.0	10.0	5.0
0.00	Mobile home park	0.00	dwelling units	0.00	85.0	10.0	5.0
0.00	Retirement community	0.00	dwelling units	0.00	85.0	10.0	5.0
0.00	Congregate care (Assisted Living) Facility	0.00	dwelling units	0.00	85.0	10.0	5.0

Operational Emission Sources

- Year & Vehicle Fleet
- Trip Characteristics
- Temperature Data
- Variable Starts
 - Road Dust
 - Pass-by Trips
 - Double-Counting Correction
- Mitigation Measures
 - Mix of Uses
 - Local Serving Retail
 - Transit Service
 - Bike & Pedestrian
 - Affordable Housing
 - Trans Demand Mgmt
 - Parking Supply
 - On Road Trucks



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