Revamping Regional Transportation Modeling and Planning to Address Unprecedented Community Needs during the Mobility Revolution

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Feature	Current Planning Paradigm	Future Planning Paradigm
Networks	Expand infrastructure	Manage, integrate systems
Forecasts	Predict & Provide	Evaluate & Manage
Technology	Supply-oriented	Demand-oriented
Policy	Sectoral	Integrated
Time	Reduce travel time	Increase reliability
Environment	Site, corridor, region	Country, global, regional
Information	Static	Dynamic

Societal Challenges in Urban Transport

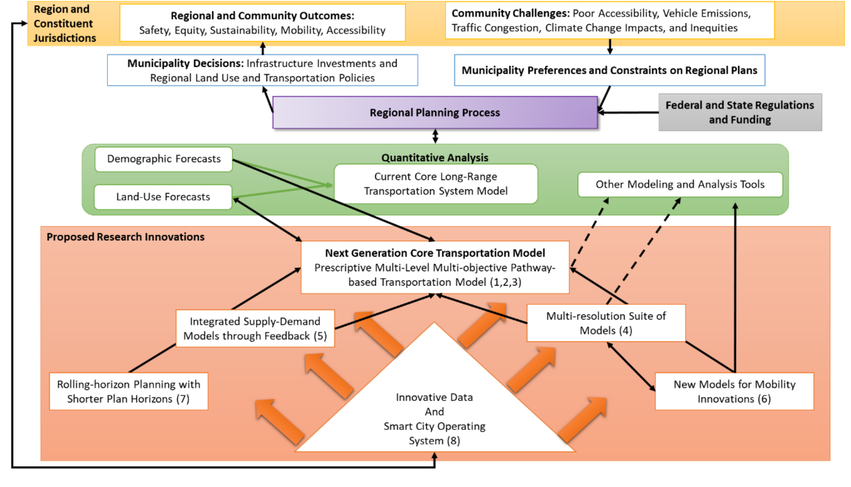
- Inequitable access to opportunity
- Environmental unsustainability
- Traffic congestion
- Adapting to Climate Change

Technical Shortcomings of Urban Transport Planning Practice

- Over-reliance on travel demand models
- Predictive rather than prescriptive models
- Failure to capture long-run dynamics and path dependencies
- Lacking models for future mobility tech

Project Goals

- Revamping of Regional Transport System Models
  - High-resolution → Multi-resolution and multi-paradigm
  - Predictive → Prescriptive (Multi-objective)
  - Static → Dynamic (Capturing Path Dependence)
- Holistic Analytical Framework for Equitable Transport
- Multi-resolution models of MOD services
  - Agent-based and Systems Dynamics models



Community Needs

- Modal/travel options for persons without a personal vehicle
- 19% reduction in greenhouse gas reductions
- Improved speed and reliability on roadways

Activities

- Regular Meetings with SANDAG modelers
- Discussions with SANDAG planners
- Modeling and analysis framework development
  - Prototyping, testing, verification, integration, calibration, validation
  - Land-use, travel demand, network, shared mobility, equity

Outcomes

- Downscaling synthetic population reduces run times and has minor impact on metrics
- Systems dynamics model of ride-hailing captures key dynamics of vehicles and users
- Equity Analysis in Practice is Lacking
  - 0/11 agencies perform state-of-the-art equity analyses
  - 4/11 do not evaluate plan's equity impacts

Broader Impact – Immediate Beneficiaries

- San Diego shared mobility users
  - New microtransit mode and better regulation of ride-hailing
- Under-served persons and communities
  - Equity analysis ensures benefits and harms of transport plans are clearly identified across population

Broader Impact – Sustainability

- Regional planning decisions inherently long term
  - Transport policies and infrastructure investments (more so) have a long life
- Proposed regional planning model paradigm designed for planning agencies nationwide

Planned Activities

- Model Calibration: activity-based travel demand; land-use; traffic and transit assignment
- Mobility-on-Demand Model Development: systems dynamics model and its integration and cross-calibration with agent-based model
- Prototype a policy optimization module for the multi-resolution MOD model system using reinforcement learning and Bayesian optimization

Planned Outcomes

- Recommendations (and journal article) for improving the state-of-the-practice related to equity metrics and analysis techniques
- Integrated agent-based and systems dynamics models of MOD ride-hailing services

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