

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

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## Societal Challenges in Urban Transport

- Inequitable access to jobs, healthcare
- Inequitable exposure to air pollution
- Environmental unsustainability of cars
- Traffic congestion

## Technical Shortcomings of Urban Transport Planning Practice

- Over-reliance on travel demand models
- Predictive rather than prescriptive models
- Static rather than dynamic models
- Failure to consider shared mobility innovations

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

## Community Needs

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

## Activities

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

## Outcomes

- State-space-model of urban dynamics for training reinforcement learning agent to solve strategic long-range transport planning problem
- Systems dynamics model of ride-hailing captures key dynamics of vehicles & users
- Finding: Downscaling synthetic population in travel forecasting models reduces run times with minor impact on output uncertainty
- Finding: Equity analysis in practice is lacking
  - 4 of 10 largest planning agencies in US do not evaluate the equity impacts of their regional plan

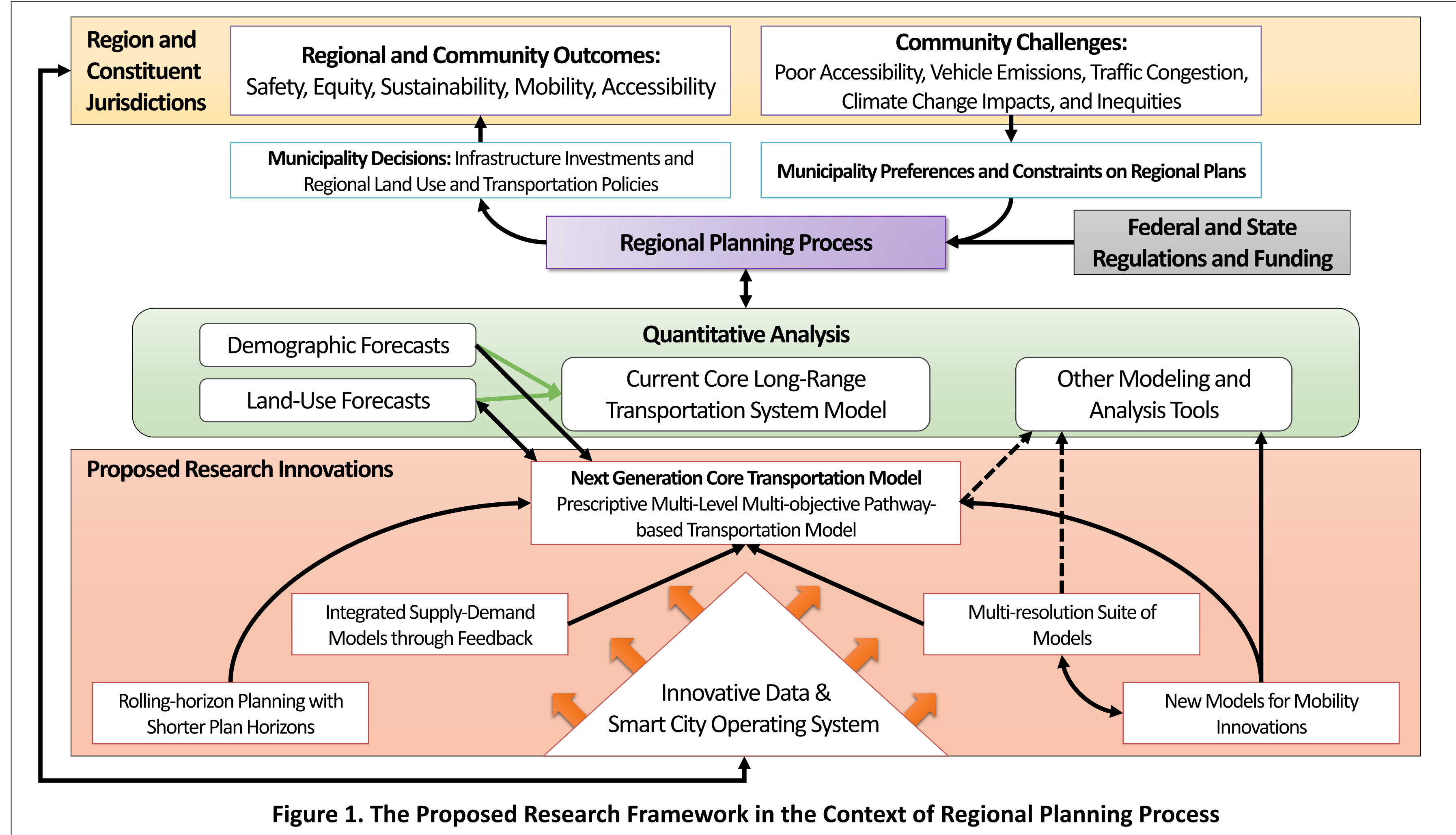


Figure 1. The Proposed Research Framework in the Context of Regional Planning Process

## Broader Impact – Immediate Beneficiaries

- Shared mobility users in SANDAG region
  - New microtransit mode and better regulation of ride-hailing
- Under-served persons and communities
  - Equity analysis ensures beneficiaries and underserved individuals of proposed transport plans are clearly identified

## Broader Impact – Sustainability

- Improve people’s lives in SANDAG region, particularly low-income ethno-racial minorities
- Improve regional transport planning decisions that are inherently long-term
- Enhance decision support tools at planning agencies nationwide

## Project Goals

- Revamping regional transport system models
  - High-resolution → Multi-resolution and -paradigm
  - Predictive → Prescriptive (Multi-objective)
  - Static → Dynamic (Capturing path dependence)
- Holistic analytical framework for equitable transport
- Multi-resolution models of shared mobility
  - Agent-based and systems dynamics models

## Planned Activities

- Software integration: disaggregate travel forecasting software and network assignment software
- Simulation-optimization techniques for regional transportation planning problem
- Systems dynamics model of activity participation, travel, and congestion

## Planned Outcomes

- Test low-resolution urban dynamics models with planners at SANDAG
- Recommend transport policies, land use polices, and infrastructure investments for SANDAG region