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Feasibility of Regional Air Mobility (RAM) for Intercity Commuters in Beijing: A Discrete Choice Modeling Approach

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Introduction

Beijing and its surrounding cities form one of China's largest metropolitan commuter belts, with workers from cities such as Langfang, and Xiongan spending more than two hours per trip commuting to Beijing's city center. This extensive commuting pattern results in reduced well-being, significant productivity losses, and substantial environmental pressure on the region's transportation infrastructure (Zhi et al., 2024). Traditional ground-based transport modes are reaching capacity limits, creating an urgent need for innovative mobility solutions.

Regional Air Mobility (RAM), enabled by emerging eSTOL (electrical Short Take-Off Landing) technologies and short-distance hybrid aircraft, represents a promising solution to these intercity commuting challenges. RAM offers the potential to dramatically reduce travel times while providing a more sustainable transport alternative. However, the feasibility and social acceptance of RAM remains largely unexplored, particularly regarding commuter preferences and adoption willingness. This research aims to address the critical knowledge gap regarding RAM feasibility through empirical behavioral analysis and discrete choice modeling.

Research Problem

Intercity commuting in Beijing's metropolitan region faces several critical challenges that traditional transportation modes cannot adequately address:

- Excessive commuting times exceeding two hours per trip for many intercity workers
- Capacity constraints and congestion in existing ground transportation networks
- Environmental impact from high-volume commuting patterns
- Limited sustainable alternatives for long-distance daily commuting

While RAM technology shows promise as a solution, its practical implementation requires understanding of user acceptance, preference structures, and adoption factors. Current transportation planning lacks empirical data on commuter willingness to adopt RAM services, making it difficult to assess the viability of such systems or design appropriate policies and infrastructure investment strategies (Guo et al., 2025a; Wu et al., 2025a).

Research Gap

Several critical gaps exist in current RAM and Urban Air Mobility (UAM) research:

1. **Geographic bias**: Most RAM and UAM research focuses on Europe, North America, and Japan, with limited applicability to Chinese commuting patterns, regulatory environments, and cultural contexts (Adamidis et al., 2025).
2. **Lack of behavioral data**: Existing RAM studies predominantly emphasize technical feasibility, scheduling, and route optimization, while neglecting empirical analysis of RAM adoption behaviors.
3. **Insufficient demand modeling**: Current research lacks comprehensive discrete choice models that can quantify commuter preferences and predict market demand for RAM services.
4. **Limited integration with simulation tools**: There is insufficient connection between behavioral choice models and transport simulation platforms, hindering realistic scenario analysis and policy evaluation for RAM.

Research Questions

1. What is the feasibility and market potential of RAM services for intercity commuters in metropolitan regions?
2. What factors significantly influence commuters' willingness to adopt RAM as an alternative transportation mode?
3. How do commuters value trade-offs between travel time, cost, comfort, safety, and environmental impact when considering RAM services?
4. What are the optimal service characteristics (frequency, pricing, accessibility) that maximize RAM adoption among different commuter segments?
5. How can discrete choice model parameters be integrated into MATSim-RAM simulations to enable accuracy demand forecasting and policy analysis?

Methodology

Data Collection

- **Pilot Survey**: Exploratory surveys and informal interviews with intercity commuters to capture current commuting patterns, pain points, and initial attitudes toward RAM.
- **Survey Design**: Development of choice experiments presenting hypothetical RAM service scenarios with varying attributes (travel time, cost, frequency, environmental impact, etc.).
- **Data collection**: Collaboration with professional survey companies to collect reliable and representative data from intercity commuters across Beijing's metropolitan region, targeting a sample of at least 500 respondents.

Model Development

- **Descriptive Analysis**: Comprehensive analysis of commuting patterns, socio-demographic characteristics, and stated preferences to validate policy relevance.
- **Discrete Choice Modeling**: Progressive model estimation using Biogeme software:
  - Multinomial Logit (MNL) models for baseline analysis
  - Mixed Logit models to account for taste heterogeneity and panel effects
  - Hybrid Choice Models to incorporate latent attitudes and perceptions
  - Market segmentation analysis based on commuter characteristics
- **Model Validation**: Cross-validation techniques to ensure model robustness and predictive accuracy.

Expected Contributions

1. **Behavioral Insights**: Quantification of commuter preferences and willingness-to-pay for RAM services, including identification of key adoption factors and barriers.
2. **Simulation Enhancement**: Provision of validated behavioral parameters to enhance MATSim's capability for realistic RAM demand forecasting and scenario analysis (Wu et al., 2025b; Lu et al., 2023).
3. **Policy Recommendations**: Evidence-based guidelines for RAM service design, infrastructure planning (Guo et al., 2025b), and regulatory framework development.

Timeline

Month 1:	Literature review, survey design, and pilot survey implementation
Month 2:	Survey refinement, data collection, and descriptive statistic analysis
Month 3:	Discrete choice modeling, validation
Month 4:	Thesis writing, revision, and defense preparation

Requirements

- Knowledge in statistical analysis and discrete choice modeling
- Experience with Python programming and Biogeme software
- Understanding of transport simulation principles, particularly MATSim
- Knowledge of Chinese transportation systems and policy context

Starting Date

As soon as possible

How to Apply

If you are interested, please email your resume, academic transcripts, and preferred start date to Hao Wu (wu.hao@tum.de). Please include a brief cover letter explaining your interest in the topic and relevant experiences.

References

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