

# **Measuring public transport accessibility to fixed activities and discretionary opportunities: a space–time approach**

## **Background and Objective:**

The research addresses the need for a refined model to measure public transport accessibility that not only captures general accessibility but also distinguishes between accessibility to fixed activities (like work and education) and discretionary opportunities (like shopping and leisure). The objective is to propose an adjusted Space-Time Accessibility (STA) model, specifically for public transport (PT), which they term PT-STA, to provide a more detailed assessment of how public transport interventions affect individual accessibility.

## **Model Development:**

The PT-STA model is an enhancement of the traditional STA models that are usually person-based and consider the space-time constraints of individuals. The modifications include:

1. **Public Transport Specificity:** The model is adjusted to measure accessibility specifically through public transport.
2. **Dual Accessibility Measurement:** It measures accessibility to both fixed activities and discretionary opportunities, unlike traditional models that focus on one aspect.
3. **Travel-Time Thresholds:** The model integrates travel-time thresholds to realistically assess accessibility based on actual transport times.

## **Methodological Approach:**

The study employed a case study in Mühlwald, South Tyrol, involving 118 residents to test the new model. This area was chosen due to its rural characteristics and reliance on public transport. The model assesses:

- **Space-Time Path by Public Transport (STPAPT):** It determines the feasibility of traveling between activity pairs using public transport within the available timeframes.
- **Potential Path Area by Public Transport (PPAPT):** It identifies discretionary locations that can be accessed via public transport given the constraints of start and end times of fixed activities.
- **Feasible Opportunity Set by Public Transport (FOSPT):** It quantifies the opportunities available within the PPAPT and applies a Reachability Index to weight these opportunities based on actual transport system performance.

## **Findings:**

**Limited Correlation:** The study found that accessibility to fixed activities and discretionary opportunities are not strongly correlated, indicating varied impacts of public transport on different aspects of daily life.

**Identifying Accessibility Gaps:** The model helped identify demographic groups with specific accessibility issues, such as pensioners with high accessibility to fixed activities but low access to discretionary opportunities.

Model Validation: The PT-STA model proved effective in differentiating the impacts of public transport on accessibility to fixed versus discretionary activities, providing nuanced insights that can inform targeted improvements in public transport services.

**Implications for Policy and Planning:**

The PT-STA model's ability to separate the accessibility impacts on fixed and discretionary activities provides valuable insights for urban planners and policymakers. It allows for more targeted transport interventions that can address specific accessibility needs of different population segments, improving overall public transport utility and satisfaction.

**Conclusion:**

The research by Dianin et al. offers a significant contribution to urban transport planning by introducing a model that not only measures the general accessibility provided by public transport but also distinguishes between types of activities accessed. This dual approach provides a comprehensive tool for assessing and planning public transport interventions, ensuring they meet the diverse needs of the community effectively.

This detailed exploration of the PT-STA model demonstrates its potential as a tool for enhancing public transport policy and planning, particularly in areas where transport accessibility is critical to quality of life and economic opportunity.

Reference:

Dianin, Alberto, et al. "Measuring public transport accessibility to fixed activities and discretionary opportunities: a space–time approach." *European Transport Research Review* 16.1 (2024): 9.

LLM & Prompt Details:

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|---------------|---|
| LLM used:     | GPT-4   |
| Prompts used: | <ul style="list-style-type: none"><li>• Give me a comprehensive summary of the attached research article with all important details</li><li>• you need to explain more than this and give me a better summary with a good content</li><li>• are they developing any model or just using any calculations? if so what kind of model is it?</li></ul> |

## The PT-STA model and its components:

Dianin et al., introduced a modified version of the traditional Space-Time Accessibility (STA) model, which they refer to as the Public Transport Space-Time Accessibility (PT-STA) model. This model is specifically designed to evaluate public transport accessibility by incorporating new elements that cater to a more comprehensive assessment of accessibility dynamics in urban and rural settings.

Here's a closer look at the PT-STA model and its components:

### PT-STA Model Overview

The PT-STA model is an innovative adaptation of the existing STA models, which typically measure accessibility based on the spatial and temporal constraints experienced by individuals. The primary enhancements in the PT-STA model include:

1. **Public Transport Focus:** The model is specifically tailored to assess accessibility in terms of public transport use, rather than general accessibility which might include other forms of transport like private cars, walking, or cycling.
2. **Dual Accessibility Dimensions:** It measures accessibility to two distinct types of activities:
  - **Fixed Activities:** These are non-discretionary activities that have rigid time and location requirements, such as work or school.
  - **Discretionary Opportunities:** These are activities that individuals can choose to engage in if they have the time and access, such as shopping, leisure activities, or visiting friends.
3. **Integration of Travel-Time Thresholds:** Unlike traditional STA models that may not consider the actual travel times, the PT-STA model integrates specific travel-time thresholds. These thresholds help determine whether the public transport services available are sufficient to meet the accessibility needs for both fixed and discretionary activities within reasonable time frames.

### Key Components of the Model

The model operates through several computational steps, each designed to address different aspects of accessibility:

- **Space-Time Path by Public Transport (STPAPT):** It constructs a daily path based on fixed activities and assesses whether each activity pair (e.g., home to work and back) can be feasibly connected by public transport within available time frames.
- **Potential Path Area by Public Transport (PPAPT):** This component identifies all possible discretionary locations that can be visited between fixed activities based on public transport schedules and travel times.
- **Feasible Opportunity Set by Public Transport (FOSPT):** It quantifies the actual opportunities available within the PPAPT. A unique feature here is the use of a "Reachability Index," which weights each opportunity based on the efficiency and practicality of reaching it via public transport.

## **Model Implementation and Testing**

The model was tested using a case study approach involving residents of Mühlwald, a rural municipality in South Tyrol, Italy. This setting provided a context with specific challenges in public transport, making it suitable for testing the new model's effectiveness in capturing nuanced accessibility issues.

## **Conclusion**

The PT-STA model developed by Dianin et al. represents a significant advancement in the field of transport planning and policy-making. By focusing on public transport and integrating travel-time thresholds, the model offers a more realistic and nuanced assessment of accessibility, especially in regions where public transport is a critical component of daily mobility. This model allows for detailed analyses that can inform more targeted and effective public transport interventions, ultimately improving accessibility outcomes for various user groups.