MEASURING ACCESSIBILITY TO JOBS FOR THE URBAN POOR
CASE-STUDY AHMEDABAD, INDIA

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INTRODUCTION
THE WORLD WE LIVE IN
BRIDGING THE URBAN DIVIDE

Dynamics of the Urban **Slum** Problem

- **Population**
  - Rural
  - Urban Slums
  - Urban Other

- **Solutions**
  - A Regional development
  - B Slum upgrading
  - C Urban development

- **Total Pop.**
- **Urban Pop.**
- **100 million slum dwellers**

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THE ROLE OF TRANSPORT

BACKGROUND

• Transport plays an important role in the levels of mobility and socio-economic participation in any given society.
• Social exclusion results from both a lack of opportunities as well as a lack of access to these opportunities.
• Low-income dwellers in cities such as Ahmedabad are those that experience high levels of social exclusion.
• Integrated urban development and transport can prevent that these groups are locked out of the activities that are essential to support a good quality of life.
• Accessibility metrics can quantify this level of integration as it measures the end benefit of the integrated land use and transport (LUTI) system.
The ultimate goal of transport policy is to improve accessibility: 

*The transport system should allow people to travel and participate in activities, and firms to transport goods between locations* 

*(van Wee and Geurs, 2011)*

- **Policy instruments** to improve accessibility, i.e. transport and infrastructure development, compact urban development, smart growth etc. have been considered widely.

- However, concerns are raised over:
  - *Who benefits from improved accessibility?*
  - **Equity and distributional effects**
The ability and ease of people to overcome the friction of distance in order to utilize opportunities (or services) at fixed points in space.
ACCESSIBILITY MEASURES

- **Contour measures** (cumulative opportunity) – measures the cumulative number of job opportunities that can be reached in a given time or at certain threshold distance from a specified origin.

- **Potential measures** (activity based) – discounts the number of job opportunities that can be reached from a specified origin.
ACCESSIBILITY MEASURES – CONT’D

- Indicator for the effectiveness of the transport system
  - ability to reach employment areas, service locations, center areas etc.

  and

- Indicator for the availability of facilities and services
  - securing a geographical match between resource allocation and resource needs
CASE STUDY AHMEDABAD, INDIA
AHMEDABAD

- Ahmedabad is the largest city of Gujarat state on the banks of Sabarmati river and the seventh largest city in India [total area = 190 km²].
- Current population Ahmedabad district is 7.2 million & city agglomeration area is 6.3 million.
- Ahmedabad is connected to all important cities in the country by rail, roads and airways.
- The percentage of housing categorized as slum increased from 17.2% in 1961 to 25.6% in 1991.
- Ahmedabad is extending its current AMTS public transport system with a Bus Rapid Transit (BRTS) as well as Metro system (MRT).
- **How will the urban poor (potentially) benefit of these public transport systems?**
... AND ANSWER TYPICAL POLICY QUESTIONS

1. Where is the best place to locate new jobs from the perspective of accessibility to jobs for the urban poor?

2. How do the planned BRTS and MRT projects enhance levels of accessibility for the urban poor as compared to the existing AMTS public bus system?

3. Where to provide new public transport infrastructure capacity to improve levels of accessibility, particularly for the urban poor?

4. What portion of the city benefits most from the new public transport options?

5. Which urban poor groups and job types are best served with the current and planned public transport options?

6. Where to provide low income housing to ensure their access to jobs?

7. How is cycling access and egress (e.g. through public bicycle schemes) improving levels of accessibility to jobs?

8. What number of urban poor have easy access to the new MRT?
CASE STUDY AHMEDABAD
CONCEPTUAL FRAMEWORK

Urban poor
- Income
- Education level

Physical condition of housing

Employment
- Location of jobs
- Job type

Transport
- Modes
- Networks
INTEGRATED MULTI-MODAL PT NETWORK
CURRENT AND FUTURE PUBLIC TRANSPORT MODES
3D MULTI-MODAL TRANSPORT NETWORK
AHMEDABAD

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LOCATIONS OF THE URBAN POOR AND THEIR JOBS
DENSITY OF POTENTIAL WORKERS
SLUMS AND CHAWLS COMBINED, WORKER DENSITY PER 0.25HA

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LOCATIONS OF EMPLOYMENT
ALL JOB SECTORS COMBINED, 100 X 100M. GRID

Job sectors:
• Industrial
• Retail
• Government
• Education
• Transport and logistics
• Office and commercial jobs
• All jobs combined (shown here)

Grouped as:
• Casual labour jobs
• Salaried jobs
• Self employment jobs

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Prioritized combinations (based on local knowledge – Ray (2010))
DISTRIBUTION OF URBAN POOR CLASSES AND EMPLOYMENT CATEGORIES

N=526,500 potential workers

- Middle-poor: 67%
- Very poor: 22%
- Least-poor: 11%

N=1,112,500 potential jobs

- Casual labour: 43%
- Self employed: 33%
- Salaried: 24%
SOCIALLY & ECONOMICALLY WEAKER SECTION HOUSING (SEWSH)
ON-GOING PROJECT UNDER JNNURM

- JnNURM, Basic Services to Urban Poor (BSUP) program
- The total number of buildings in this location is 976 and expected to relocate 78,080 poor.

- 21 locations are allocated for SEWSH.
- Used as a scenario

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METRIC 1
COUNTING JOB OPPORTUNITIES TO AND FROM SEWSH LOCATIONS

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Bars per location: walking (left),
walking + AMTS (middle)
all modes (right)

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METRIC 1 – CONT’D
COUNTING JOB OPPORTUNITIES TO AND FROM SEWSH LOCATIONS

Looking at locations:
1, 13, 14, 15, 16

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The potential of opportunities for interaction

\[ A_i = \sum_j W_j f(c_{ij}) = \sum_j W_j \exp(-\beta c_{ij}) \]

with \( W_j \) the number of jobs in location \( j \), \( c_{ij} \) the generalized cost of travelling between \( i \) and \( j \), and \( f(c_{ij}) \) the distance decay function

Distance decay function Ahmedabad (\( \beta=0.03838 \)): 

![Graph showing the decay of \( \exp(\beta c_{ij}) \) over travel time in minutes.]
METRIC 2: EXAMPLE 1
CITY-WIDE POTENTIAL ACCESSIBILITY ANALYSIS (LEAST POOR TO SALARIED JOBS)
METRIC 2: EXAMPLE 2
CITY-WIDE POTENTIAL ACCESSIBILITY ANALYSIS (ALL POOR TO ALL JOBS)

Ratio of job-based potential accessibility for all potential workers comparing all public transport options with walking and AMTS only.
Overall the level of potential accessibility for the locations improves by 135% on average for the 21 locations.
METRIC 2: EXAMPLE 4
EFFECT OF BRTS AND MRT ON CITY-WIDE POTENTIAL ACCESSIBILITY
KEY POLICY IMPLICATIONS

- BRT systems can make a substantial contribution to accessibility of the urban poor provided that they form a network covering a large spatial extent. Individual corridors contribute only marginally.
- Investing in cycling infrastructure to enable feederings to the BRT will enhance its potential and provides enormous gains in potential job accessibility for all poor sections of society.
- In this way BRT systems are able to compete with regular bus systems that operate throughout the city. BRT becomes a viable alternative to link the poor’s home locations with their employment locations.
- Integrating land use and transport planning offers clear benefits in reducing travel time and enhancing potential accessibility.
NEXT STEPS

- In the field:
  - Ground truthing of results
  - Survey travel behaviour of the urban poor
  - Collect data on matching of urban poor class with employment opportunity type
  - Estimate sensitivity to cost and travel time (value of time, time value of transport cost)
- In the model
  - Fare based / generalized cost based accessibility calculations
  - Competition to jobs model
  - Use open source data sources
- Other Indian applications
CONCLUSIONS

- There is variation between accessibility to jobs for different urban forms as well as social-economic groups.

- Accessibility metrics provide valuable insight to decision makers on key issues that concern levels of accessibility for different income groups, different transport modes (and feeder systems) and urban form.

- These studies show that local planning effort should concentrate on public transport improvement, the NMT feeder function as well as integrated urban land use and transport development strategies, acknowledging the home and job locations of the urban poor.
PROJECT TEAM
FOR AHMEDABAD (ONGOING) PROJECT

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