1.963 Report:
A Sustainable Transportation Plan for MIT
Campus
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Structure of Presentation

• Introduction/Current State: Tegin Teich

• Proposals/Scenarios: Francesca Napolitan

• Methodology and Results: David Block-Schachter

• Discussion/Questions
Motivation: MIT Energy Initiative and the Role of Transportation

“Walk the Talk”: Meeting the global energy challenge by reducing energy use and greenhouse gas emissions.

Objectives

Multifaceted Objectives:
• Reduce emissions
• Address rapidly increasing costs of providing parking

Method:
• Establish a Unified Transportation Program
  – Parking
  – Transit
  – Shuttles

Outcome:
• Induced shift from drive alone commutes to transit and carpool when feasible
Method of Commuting to MIT, 2006

Note: This information is from a typical Tuesday, scaled to the entire population.

Source: MIT Transportation Survey, 2006

Percentage of Students and Staff at MIT:
Where People Live:
2006 MIT Transportation Survey
Total 5,945 mapped
Where People Live: Students and Staff

3,024 Students

2,917 Staff
Where People Live: Commuting Behavior

- Transit
- Drive Alone
Survey respondents for whom taking transit would be faster or take between 0 and 15 minutes longer:

- 364 Possibilities (Around 900 scaled up to the population)
Comparison of Transportation Use & Expenses

How People Arrive to MIT

- Car: 46%
- MBTA: 25%
- Walk/Bike: 23%
- Other: 6%

MIT Transportation Expenses

- Parking: 68%
- MBTA T Passes: 25%
- Shuttles: 1%
- Other: 6%
MIT Parking & Transportation FY07 Budget

Total Expenditure ($ millions)

- Parking: Users: $3M, MIT: $8M
- T-Pass: Users: $2.2M, MIT: $1.8M
- Commuting Alternatives: MIT: $165K

Monthly Cost Per User ($)

- Users: $3M
  - MIT: $8M
- Users: $2.2M
  - MIT: $1.8M
- Users: $145K
  - MIT: $855K
- Users: $145K
  - MIT: $165K
## FY07 Transportation Subsidy Breakdown

<table>
<thead>
<tr>
<th>Category</th>
<th>Expenses</th>
<th>Revenues</th>
<th>Subsidy</th>
<th>Annual Subsidy Per User</th>
<th>% Subsidy (share of total expense)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking</td>
<td>$11,060,000</td>
<td>$3,090,000</td>
<td>$7,970,000</td>
<td>$1656</td>
<td>72.1%</td>
</tr>
<tr>
<td>T Pass</td>
<td>$3,975,000</td>
<td>$2,150,000</td>
<td>$1,825,000</td>
<td>$347</td>
<td>45.6%</td>
</tr>
<tr>
<td>Shuttles</td>
<td>$1,000,000</td>
<td>$145,000</td>
<td>$855,000</td>
<td>~$285</td>
<td>85.5%</td>
</tr>
<tr>
<td>Commuting Alternatives</td>
<td>$165,000</td>
<td>$0</td>
<td>$165,000</td>
<td>n/a</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$16,225,000</strong></td>
<td><strong>$5,385,000</strong></td>
<td><strong>$10,815,000</strong></td>
<td>~$1000</td>
<td><strong>66.7%</strong></td>
</tr>
</tbody>
</table>
Campus Trends

- Surface lots being replaced by buildings

- Parking spaces replaced 1-for-1 underground
  - Cost of Underground space: $100,000
    - Monthly Cost: $700-$800

- MIT leasing off-campus spaces in interim
  - Average cost of leased space: $235/month

- End result:
What is Sustainable Transportation Policy?

Environment:
• Minimizes the environmental impact of driving to commute to MIT.

Finance:
• Provides significant revenue while lessening the financial burden to MIT of subsidizing parking.

Equity:
• Provides incentives for those who can reasonably commute by other means.
• Provides strategic, affordable parking options for those who may not have a choice to drive alone.
• Equalizes the subsidies for parking and transit.
Parking Space Locations

Northwest: 339 Spaces
West: 757 Spaces
Far West: 575 Spaces
East: 594 Spaces
Off-Campus: 651 Spaces *Mostly leased
North: 739 Spaces
Main: 1015 Spaces

On-street: 472 metered spaces; most are two-hour limit for $1.00
132 non-metered on Memorial Drive; free, street cleaning once per month
### MIT Shuttles

#### MIT Shuttles serve about 1500 people per day

<table>
<thead>
<tr>
<th>Service</th>
<th>Hours of Operation</th>
<th>Daily Round-trips</th>
<th># of Buses</th>
<th>Headway</th>
<th>FY06 Riders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tech</td>
<td>7:15 a.m.-7:15 p.m.</td>
<td>42</td>
<td>2</td>
<td>Peak: 10 Min., Off-Peak: 20 Min.</td>
<td>177,000</td>
</tr>
<tr>
<td>NW</td>
<td>7:25 a.m.-6:45 p.m.</td>
<td>40</td>
<td>2</td>
<td>Peak: 10 Min., Off-Peak: 20 Min.</td>
<td>86,000</td>
</tr>
<tr>
<td>Saferide</td>
<td>6:00 p.m.-3:30 a.m.</td>
<td>19</td>
<td>1</td>
<td>30 minutes</td>
<td>247,000</td>
</tr>
<tr>
<td>Boston Daytime</td>
<td>8:00 a.m.-6:00 p.m.</td>
<td>30</td>
<td>1</td>
<td>20 minutes</td>
<td>53,000</td>
</tr>
<tr>
<td>Lincoln Labs</td>
<td>7:00 a.m.-7:00 p.m.</td>
<td>6</td>
<td>1</td>
<td>2 Hours</td>
<td></td>
</tr>
<tr>
<td>Wellesley</td>
<td>7:00 a.m.-2:00 a.m.</td>
<td>15</td>
<td>1</td>
<td>~1 Hour</td>
<td></td>
</tr>
</tbody>
</table>
## Non-MIT Public Transportation

<table>
<thead>
<tr>
<th>Origin-Destination</th>
<th>Daily Round-trips</th>
<th>Headway</th>
<th>Cost</th>
<th>Estimated Daily MIT Boardings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M2 Shuttle</strong> LMA-Harvard via Mass. Ave.</td>
<td>54</td>
<td>Peak: 5 Min., Off-Peak: 1 Hour</td>
<td>$2.30</td>
<td>&lt;100</td>
</tr>
<tr>
<td><strong>EZRide</strong> North Station-Cambridgeport via Kendall Sq. and University Park</td>
<td>47</td>
<td>Peak: 10 Min., Off-Peak: 20 Min.</td>
<td>Free to MIT*</td>
<td>300</td>
</tr>
</tbody>
</table>

*Free to MIT* with *$100K MIT Annual Contribution*

<table>
<thead>
<tr>
<th>Origin-Destination</th>
<th>Daily Round-trips</th>
<th>Headway</th>
<th>Cost</th>
<th>Estimated Daily MIT Boardings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red Line</strong> Alewife-Braintree &amp; Ashmont via Kendall and Central Squares</td>
<td>203</td>
<td>4-7 Minutes</td>
<td>$1.70</td>
<td>4,500</td>
</tr>
<tr>
<td><strong>#1</strong> Harvard Sq.-Dudley Sq.</td>
<td>112</td>
<td>Peak: 7 Min., Off-Peak: 20 Min.</td>
<td>$1.25</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>#CT1</strong> Boston Med. Center-Central Sq.</td>
<td>34</td>
<td>Peak: 20 Min., Off-Peak: 30 Min.</td>
<td>$1.25</td>
<td>180</td>
</tr>
</tbody>
</table>

Other MBTA Bus Routes Serving MIT Vicinity: CT2, 64, 68, 70, 85
Proposals
Transportation Pricing Proposals

Objectives

1. Equalize subsidy between transit and parking

2. Provide tiers of pricing in order to ensure there are options for captive drivers

3. Retain or increase revenue

4. Encourage transit use by increasing transit subsidies
Pricing Option 1 – Annual Permit System

• Maintain existing annual parking permit system

• Raise annual permit prices by the institute standard of 11% per year

• All parkers would be required to buy a MBTA Pass for $15 a month

• The commuter rail subsidy would be increased to 50% or 100%
Options 2, 3, and 4: Differential Pricing

- No annual permits
- Pricing varies by lot
- Mobility Pass
What is a Mobility Pass?

• MBTA monthly pass plus an occasional parking permit

• Would replace annual parking permit

• Monthly cost is $15 after a 3-month free trial for those who currently do not have an MBTA pass or parking permit

• Annual opt-out period for the MIT Community

• May or may not include a commuter rail pass
The Mobility Pass and the MBTA

• MIT purchases transit passes in bulk for all employees and students

• Price paid to MBTA is based on actual or predicted usage, rather than on the face value of a monthly pass
  
  – For 20,000 people, the cost of the passes based on actual usage is $600,000 per month rather than $1.2m (20,000*$60 per month).

• MBTA benefits from increased ridership, for which it is fully compensated.
Base Structure for Differential Pricing by Lot Options

• Instead of purchasing annual passes, drivers will pay a daily rate on the days that they drive.

• The entire MIT community would be eligible for a monthly mobility pass

• The commuter rail subsidy would be increased to 50% or 100%

• Two or three tiers of pricing by lot, classification based on demand, convenience, surface lot or garage

• Student parkers and daily parkers would be generally housed in different lots

• Weekend parking is free
### Annual Passes Under Differential Pricing Options

<table>
<thead>
<tr>
<th>Group</th>
<th>Current cost</th>
<th>Proposed cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student &amp; Staff Residents</td>
<td>$657, $638</td>
<td>$910</td>
</tr>
<tr>
<td>Carpools</td>
<td>$320 (per car)</td>
<td>$180 (per person)</td>
</tr>
<tr>
<td>Motorcycles</td>
<td>$100</td>
<td>$300</td>
</tr>
</tbody>
</table>

- Mobility pass is included in the annual pass price
- Annual pass price reflects annual 11% increase
Differential Pricing Options 2, 3, & 4

<table>
<thead>
<tr>
<th>Tiers of Pricing</th>
<th>Zone 3 – Low</th>
<th>Zone 2 - Medium</th>
<th>Zone 1 - Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2</td>
<td>3</td>
<td>$2</td>
<td>$4</td>
</tr>
<tr>
<td>Option 3</td>
<td>3</td>
<td>$2</td>
<td>$6</td>
</tr>
<tr>
<td>Option 4</td>
<td>2</td>
<td>$2.25</td>
<td>$2.25</td>
</tr>
</tbody>
</table>

- The current average daily rate is $2.77
- $2.25 plus $15/mo is equivalent to the current annual pass price plus the standard 11% translated to daily rate (46 work weeks, 5 days a week)
- Guaranteed parking spots at selected garages for additional annual fee ($200 - $400/yr)
Parking Lots by Price

<table>
<thead>
<tr>
<th></th>
<th>Student</th>
<th>Low</th>
<th>Medium</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Spaces</td>
<td>640</td>
<td>980</td>
<td>1994</td>
<td>1084</td>
</tr>
<tr>
<td>% of Total</td>
<td>14%</td>
<td>21%</td>
<td>42%</td>
<td>23%</td>
</tr>
</tbody>
</table>
Methodology/Results
Methodology

• Based on October 2006 Transportation Survey:
  – Expanded and corrected for response bias

• Predict # of people switching to transit and carpool under each scenario based on:
  – Number of people parking on campus each day
    • Access to transit vs. no viable transit access
    – Conservative elasticities for transit and carpools

• Predict # of people opting out of program based on:
  – Distribution of individual spending on mass transit

• Predict total cost of program based on:
  – Demand for lots under each pricing regime
  – Expected reduction of drivers to campus
Inputs: Parking And Passes

• 18,248 people on main campus who qualify for benefits

• 3,324 people drive to campus (and park in MIT spots) each weekday
  – Most pay ~$2.70 per day on an annual basis
  – 359 of these have an occasional pass
    • Pay $3.50 per day plus $30/yr
  – About 900 have viable access to transit (<15 minutes travel time difference)

• 5,011 people participate in subsidized transit pass program
  – 609 of these are commuter rail users
Costs and Revenue

• Parking recovers $2.1m of costs

• Transit Subsidy Costs
  – MIT contributes $1.9m per year
  – Participants contribute $2.2m
    • Spend additional $250k on non-qualified transportation
  – Non-participants spend $2.8m per year
  – Overall MBTA receives about $7m from people who qualify for subsidized transit program

Note:
• If all non-parking non-passholders signed up for LinkPass would cost MIT additional $3.3m
Cost to Provide Parking and Mobility Pass:

Cost
- Cost of providing parking
- Payment to MBTA for Mobility Pass
- Cost for additional gate equipment

Revenue
- Parking revenue from new fee structure
  - Minus Mode Switch
- Parking revenue from visitors and exempt users
- Mobility Pass charges
  - Minus opt-outs
## Estimated Impacts of Alternatives
(50% subsidy)

<table>
<thead>
<tr>
<th>Program</th>
<th>11% increase</th>
<th>$2 / $4 / $6</th>
<th>$2 / $6 / $10</th>
<th>$2.25 / $7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch to Transit</td>
<td>64</td>
<td>131</td>
<td>270</td>
<td>89</td>
</tr>
<tr>
<td>Switch to Carpool</td>
<td>13</td>
<td>55</td>
<td>144</td>
<td>29</td>
</tr>
<tr>
<td>Total Spaces Saved</td>
<td>77</td>
<td>186</td>
<td>414</td>
<td>118</td>
</tr>
<tr>
<td>% of Current Daily Drivers</td>
<td>2%</td>
<td>6%</td>
<td>12%</td>
<td>4%</td>
</tr>
</tbody>
</table>

| Additional subsidy from current | $1,057,776 | $466,239 | -$1,106,900 | $975,103 |

| MIT’s savings from ending leased parking *Included in subsidy | $177,136 | $425,408 | $946,059 | $271,409 |

- Total subsidy currently $10m
- 11% of staff and students opt-out
Other Estimated Impacts

- $1.3m above current for Mobility Pass only with 50% commuter rail subsidy
- 50% --> 100% commuter rail subsidy
  - Increase cost by $1m
  - Saves an additional 30 parking spaces
- < $70k to provide free carpool spaces

<table>
<thead>
<tr>
<th>Tiered Costs to Park per day</th>
<th>Revenue vs. 11% annual increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2 / $4 / $6</td>
<td>$450k</td>
</tr>
<tr>
<td>$2 / $6 / $10</td>
<td>$1.6m</td>
</tr>
<tr>
<td>$2.25 / $7</td>
<td>-</td>
</tr>
</tbody>
</table>
# Program Comparison

All programs include mobility pass

<table>
<thead>
<tr>
<th>Cost to Park (Commuter Rail Subsidy)</th>
<th>Mode Switch</th>
<th>Cost to MIT</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>11% Annual Increase (50%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11% Annual Increase (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier: $2 / $4 / $6 (50%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier: $2 / $4 / $6 (100%)</td>
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</tr>
<tr>
<td>Tier: $2.25 / $7 (50%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier: $2.25 / $7 (100%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Impact on Different Groups

↑ **Transit Commuters:** More service options; lower price
↑ **Walk or Bike Commuters:** New low-cost transit option with opt-out
↑ **Carpoolers:** Lower-cost parking with new transit options

**Drive Alone**

↑ Lower 25%: Same cost with new transit option
↑ Middle 50%: Slightly higher cost with new transit option
⇔ Top 25%: Higher cost with new transit option and premium location spaces
Impact on Institution

All Staff and students
↑ Free use of MBTA for non-commute trips and option to park at any time

MIT as institution
↑ Major new benefit for both students and staff
↑ Recognition as a regional leader
↑ Moderates a very expensive trend towards underground parking
Can current transportation policies support an additional 1,000 employees?

- At 37% mode share, requires parking for an additional 370 people
- Since lots and garages exist on the most desirable buildable space, would require further decreasing the parking supply (estimate: 400)
- MIT will likely only build underground spaces, at a cost of more than $100,000 per space (~$10,000 per year at 8% over 30 years)
  - Must build spaces to replace those lost to construction (400)
  - And spaces to house new employees (370)
- There is a cap on the number of spaces MIT can provide without need to negotiate with Cambridge

**Total Cost: $7,700,000 per year**

Plus: Increased Congestion, Issues with Cambridge
An alternate future

- Option 3b (Tiered Pricing of $2, $6, $10 plus Mobility Pass that includes Commuter Rail)
- Decreased demand from new employees (33% drive alone or less)
- 280 Additional Underground Spaces required
  - Replacement of surface or structured parking (estimate: 400)
  - Plus additional demand (estimate: 330)
  - Minus spaces saved for current employees (estimate: 450)
- Increased costs for Mobility Pass
- Increased Revenue from Parking Prices

Total cost: $2,800,000 per year

Plus: Decreased congestion, long-term residential switch to transit, no issues with Cambridge
Where does MIT want to be in 10 years?
Given growth and switch to underground parking

**No Changes**
- Increased congestion
- Conflict with Cambridge Planning

**Proposed Changes**
- More employees with shorter commutes
- No conflict with Cambridge Planning
- Flexibility to change prices equitably