THE CROSS-BRONX EXPRESSWAY

Outline

1. History of the Cross-Bronx
2. Robert Moses
3. Problems: Construction, Social
4. Interchange: Highbridge and Bruckner
5. Ramifications
6. Evaluation: Who was Right?
7. How to Build Urban Freeways
NYC Expressways and Parkways: Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>Bronx River Parkway opens: first surviving limited-access highway, first NYC-area parkway</td>
</tr>
<tr>
<td>1936</td>
<td>Regional Plan Association proposes NY/NJ/CT freeway network</td>
</tr>
</tbody>
</table>
| Late 1945 | Robert Moses proposes limited-access highways for all vehicles  
- Existing parkways only open to cars  
- Largest highway undertaking by far (100+ freeway miles) |
| 1955 | Triborough Bridge and Tunnel Authority introduces yet another freeway plan |

Regional Importance of The Cross-Bronx

Next Hudson Crossing for I-95:  
I-87 at Nyack, 12 miles to the North
Robert Moses — Why the Highway System?

- NY State Head of Parks (1924)
- NYC Parks Commissioner, Head of Triborough Bridge & Tunnel Authority (1933)
- Notable (and hated) for pushing plans through without prior approval

- Philosophy
  - Beautiful parkways, state parks
  - Economic development: Shea Stadium, UN Building, 1960 World’s Fair

- Hated ‘ghetto’ slums
  - Subways = waste of money
  - Downtown = dead without expressways

History of the Cross-Bronx

- Connect George Washington Bridge with proposed Bronx-Whitestone Bridge
  - Only East-West connection through Bronx

- Construction Issues
  - Topology: blasted trench to viaduct instantly
  - High real estate values
  - Population density = 34,548 /sq. mile (1950)
    Somerville = 19,715 pax/sq. mile, 1990
### Stages

- **1954**
  - “East” (between Bronx River Pkwy and Bruckner Circle)
  - “West” (between Harlem River and Jerome Avenue)

- **1961**
  - “Extension” (Bruckner Circle to Throgs Neck Bridge)
  - Now I-295 spur (also I-895)

- **1962**
  - “Middle” (between east and west)

- **1964**
  - Highbridge interchange with I-87, Alexander Hamilton Bridge

- **1972**
  - Bruckner Interchange (I-95 complete)

### Problems: Construction

- **Highway to Nowhere**
  - First section is less than a mile long
  - Western and Eastern sections done first
    - Possibility the middle never gets built
    - Traffic problems through the center of the Bronx

- **Accidents**
  - 1959: retaining wall collapses (rain weakened hillside), one died
  - 1962: crane buckles, two died

- **Materials**
  - Unionport Bridge delayed – competition for materials with other highway projects
  - Inferior drying method used on Highbridge pavement = 70% cost overrun

- **Existing Infrastructure**
  - Tunnels under a subway line (!)
  - IRT subway station raised to fit highway underneath – service not disrupted
Problems: Social

- Many people displaced along corridor
  - First contract was for relocating tenants
  - 1,530 families moved in above stretch
    - 5,000 total for highway
  - $7 million to move people
  - Neighbourhood(s) destroyed permanently

- Moses v.s. Bronx Borough President James Lyons
  - Lyons wanted alignment through Crotona Park
    - 1-2% of the damage (19 families moved)
  - Moses threatened to stop construction
    - Interstate engineering standards; Corruption

Highbridge Interchange

- Washington Bridge is not Interstate-standard
  - Ends in traffic light
  - Narrow lanes, no shoulders
- New interchange with Washington Bridge and Harlem River Drive
- Washington Bridge built in 1888 for $2.65 million
  - Improve to six lanes, remove trolley tracks (1949)
  - Replaced by Alexander Hamilton Bridge (1959-64)
- Connect Cross-Bronx and Deegan Expwy
  - 18 months overrun
- Ultimate Cost = $60 million (1969)
Bruckner Interchange

- Traffic Circle is inadequate for traffic
  - Not freeway standard
- Built with Bruckner Expressway (new traffic source)
- $67.8 million (largest single contract ever)
  - Entire Bruckner Expressway was $137 million
- Brings four freeways together
- Delayed almost 20 years
  - Community opposition to elevated freeway
  - Money and land acquisition were problems
  - Redesign for building around existing drawbridges

Ramifications

- Robert Moses forced out of New York
  - Resigned from city to head World’s Fair (1959)
  - Lost NY State jobs under Rockefeller, then retired (1968)
- No more construction through cities
  - Planned NYC expressways (Bushwick, Lower- and Mid- Manhattan, Nassau) stopped
    - Nassau half-built
  - Embarcadero, Central Artery, other elevated highways now being torn down
- Boston
  - Inner Belt (I-695) cancelled
  - Route 2 (Northwest Expressway) replaced with Alewife Red Line Extension (interstate funds transfer)
  - Southwest Expressway (I-95)
- Community opposition = effective force
  - Park Freeway West (Milwaukee), Somerset Freeway (NJ), West Side Highway (Manhattan)
- Highways seen as bad in urban areas
Cancelled Highway Projects

Southwest Expressway (I-95), Boston, Mass.

I-295 and U.S. Route 6, Providence, R.I.

Route 1 and MA 60, Lynn, Mass. (planned I-95)

I-189 (at U.S. Route 7), Burlington, Verm.

Who was Right?

- Direct Costs
  - Opportunity cost of land (acquisition costs)
  - Construction cost

- Externalities (also Costs)
  - Displacement of existing residents
  - Devaluation of properties immediately adjacent
  - Splitting neighbourhoods in half

- Direct Benefits (Convertible to Revenue)
  - Time saving for passengers
  - Logistics cost savings for freight

- Positive Externalities
  - Increase in value of nearby properties
  - Reduction in accident rate

- Monetize costs and benefits for Project Evaluation (Economic Analysis)
Using Numbers

• Lots of people are kicked out of their homes. How many is lots? Is it too many?
  – Highway Footprint = (Lane Width * Lanes + Shoulders) * Length
  – Dwelling Replacement Cost = Pop. Density * Footprint * Cost per Dwelling
  • Translate this ‘problem’ into a ‘cost’

<table>
<thead>
<tr>
<th>Highway Footprint Control Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Lanes (both directions combined)</td>
</tr>
<tr>
<td>Lane Widths (standard = 12’)</td>
</tr>
<tr>
<td>Pad for shoulder, median, reservations, etc.</td>
</tr>
<tr>
<td>Right of Way Width</td>
</tr>
<tr>
<td>Highway Footprint per Mile</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dwelling &amp; Opportunity Cost Control Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Urban Density</td>
</tr>
<tr>
<td>% of Land within Town zoned Residential</td>
</tr>
<tr>
<td>Effective Urban Density</td>
</tr>
<tr>
<td>Implied Displacement by Highway (per mile)</td>
</tr>
<tr>
<td>Replacement Dwelling Unit Cost (incl. moving expenses, land cost)</td>
</tr>
<tr>
<td>Dwelling Displace Costs per Mile</td>
</tr>
</tbody>
</table>

• Not an alignment analysis, but gives general results
  • Reasonably accurate and verifiable:
    612 dwellings/mile * 8.3 miles = 5,079 (actual ~5,000)

Estimating Social Costs

<table>
<thead>
<tr>
<th>Urban Freeway Social Cost Control Panels</th>
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<tbody>
<tr>
<td>Lexcie Lu, MIT Center for Transportation Studies, 04/06/03</td>
</tr>
<tr>
<td>Based on prior work by Steve Alpert, MIT Department of Civil Engineering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value of Time for the Average Citizen</th>
<th>$20 per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent per Household per Annum</td>
<td>$18,000 per household per annum</td>
</tr>
<tr>
<td>Number of Households per Building</td>
<td>4.0 households/building</td>
</tr>
<tr>
<td>Opportunity Cost per Building per Year</td>
<td>$7,000 per building per annum</td>
</tr>
<tr>
<td>Opportunity Cost per Mile</td>
<td>$11.0 million per annum</td>
</tr>
<tr>
<td>(This should increase with inflation -- ongoing cost)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Property Devaluation Control Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Estimator Site of Alignment Impacted</td>
</tr>
<tr>
<td>Number of paxs per household</td>
</tr>
<tr>
<td>Household Impacted per Mile</td>
</tr>
<tr>
<td>Assume Rent Value Reduced by % in These Households</td>
</tr>
<tr>
<td>Loss of Equity per Annum per Household</td>
</tr>
<tr>
<td>Total Loss of Equity per Annum</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Neighbourhoods Cut-off Control Panel</th>
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<tbody>
<tr>
<td>Population per Neighbourhood</td>
</tr>
<tr>
<td>Percentage of Neighbourhood Transactions Affected</td>
</tr>
<tr>
<td>Time-Value Penalty per Transaction Affected</td>
</tr>
<tr>
<td>Daily Penalty per Neighbourhood</td>
</tr>
<tr>
<td>Number of Neighbourhood Transactions per Person per Week</td>
</tr>
<tr>
<td>Annual Penalty due to Neighbourhood being Cut-off</td>
</tr>
</tbody>
</table>

• Repeat the process for each item considered a social ‘cost’
  • Invent ways to model intangibles
    – Neighbourhood cut-off? Use gravity model!
Estimating Social Benefits

Urban Freeway Social Benefits Control Panels

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Savings for Passenger Vehicles</td>
<td>$630, $440, $160 million</td>
</tr>
<tr>
<td>Increase in Value of Properties</td>
<td>$230, $120, $10 million</td>
</tr>
<tr>
<td>Reduction of Accidents</td>
<td>$20, $20, $20 million</td>
</tr>
<tr>
<td>Logistics Cost Savings for Freight</td>
<td>$20, $15, $5 million</td>
</tr>
</tbody>
</table>

Benefits – Costs

<table>
<thead>
<tr>
<th>Present Value</th>
</tr>
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<tbody>
<tr>
<td>Total</td>
</tr>
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Urban Freeway Evaluation

- Use Net Present Value method
- Negative social externalities are huge
- But so are social benefits – compensate losers

Evaluation of Urban Freeways

Lexcie Lu, MIT Center for Transportation Studies, 04/06/03
Based on prior work by Steve Alpert, MIT Department of Civil Engineering

Interest Rate (i%) = 7%
Inflation Rate (j%) = 3%
Value of Time = $20 per hour
Time Horizon = 100 years

Population Density Parameter

<table>
<thead>
<tr>
<th>Bronx</th>
<th>Somerville</th>
<th>Hicksville</th>
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<tbody>
<tr>
<td>1,548</td>
<td>19,715</td>
<td>1,000</td>
</tr>
</tbody>
</table>


Displacement of Existing Residents

<table>
<thead>
<tr>
<th>Present Value</th>
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</thead>
<tbody>
<tr>
<td>-$240, -$140, -$7 million</td>
</tr>
<tr>
<td>Opportunity Cost of Land</td>
</tr>
<tr>
<td>Devaluation of Immediately Adjacent Properties</td>
</tr>
<tr>
<td>Cutting of Neighborhoods in Half</td>
</tr>
<tr>
<td>Construction Cost</td>
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Benefits

<table>
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Steve Alpert & Lexcie Lu
Sensitivity Analysis

- Economic case for urban highways very sensitive to existing population density
- Net benefit low or negative in dense areas
  - Little economic development benefits
  - High opportunity cost of land
- Net benefit high in not-so-dense areas
  - Time saving remain the same, if highly utilized
  - Lower displacement and opportunity costs
- Most externalities are people-related (explains high sensitivity to pop. density)
- Toll the highways to pay the abutters

Did Moses know this stuff?
- Not really, he was mostly a philosopher
- His vision was great everywhere except downtown New York City

How to Build Urban Freeways

- Avoid dense neighbourhoods – detour
  - Retain time savings (Crotona Park alignment)
- Skirt existing conurbations – design
  - Land use pattern will adapt (I-95 Providence)
- Analyze costs and benefits explicitly
- Relax Interstate standards if necessary
  - Highway design could be economically driven
  - Urban or Mountain terrain:
    - provide some access
    - lower design speed to lower externalities
  - Elevated over existing alignments, or Prairies:
    - low externalities permit higher engineering standards
- Sometimes a question of who got there first! (Value of existing infrastructure)
The Cross-Bronx Today

- 160,000+ vehicles per day on average (259,200 capacity)
- Routinely backed up at all hours
- Still 6 lanes (no room to widen)
- Only one good alternate route (Bruckner Expressway to I-87) – still ends up at I-95
- Many signs from when it was built still up

**Verdict:** Although built at great social and financial cost, the Expressway was sorely needed locally, regionally, and nationally. Still a traffic bottleneck, but much better alternative than surface arteries.

**Suggestions in retrospect:**
- Use the Crotona Park routing (fewer people displaced)

Acknowledgements

Carl D. Martland – **1.011 Project Evaluation**  
(MIT Civil & Environmental Engineering)  
http://www.mit.edu/~1.011/