Agenda

- BRT basic concepts
- International examples
- Principles of Good TOD and BRT
- Integrating BRT, TOD and value capture
In USA, BRT = broad menu of high-performance transit options

- Fast, reliable, convenient, affordable and distinct from “regular” bus services
- MAP-21: System of “Systems” or “Elements”, but:
  - Fixed Guideway-based: System of elements + >50% in dedicated lane
  - Corridor-based: System of elements + <50% in dedicated lane
USA vs. International Basic Differences

- International approaches to BRT planning: Network-based
  - Europe/Australia/Canada: LRT-like, cost effectiveness
  - Latin America: high-capacity “metro on wheels” concept developed out of necessity

- USA approach to BRT planning: Raise corridor bus performance
  1. Wide array of incremental bus improvements
     - Boston Silver Line: Marketing and branding of BRT
     - Los Angeles Metro Rapid: Low-cost, urban arterial BRT strategies with measurable impact on performance
  2. Corridor-based projects
     - Los Angeles Orange Line: Full-fledged BRT carrying more passengers and at a lower cost than LRT
     - Eugene, Oregon EmX: Context-sensitive design for smaller city spine
7 elements of BRT planning, each with a spectrum of options

<table>
<thead>
<tr>
<th>Element</th>
<th>Image</th>
</tr>
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<tbody>
<tr>
<td>Running Ways</td>
<td><img src="image1" alt="Image" /></td>
</tr>
<tr>
<td>Stations and Land Use</td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>Vehicles</td>
<td><img src="image3" alt="Image" /></td>
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<td>Service and Operations Plan</td>
<td><img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>Fare Collection</td>
<td><img src="image5" alt="Image" /></td>
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<tr>
<td>ITS</td>
<td><img src="image6" alt="Image" /></td>
</tr>
<tr>
<td>Marketing and Branding</td>
<td><img src="image7" alt="Image" /></td>
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Integration of Elements
BRT can achieve the performance of more expensive modes using the flexibility of buses.

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<th>Typical Capital Cost per Mile</th>
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<td>Mixed flow BRT</td>
<td>$0.5-2 million</td>
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<td>$2-15 million</td>
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CW: Only Rail TOD = Property Values

- Washington, DC (Heavy Rail)
  + $2 to $4 per sq foot for commercial (PB)

- San Jose (LRT)
  + 23% for commercial

- Portland (LRT & Streetcar)
  + 10% rent premiums

- Dallas (LRT)
  + 39% for residential
  + 53% for office

Sources: Center for Transit Oriented Development and Parsons Brinckerhoff
BRT Is Also Attractive to Developers and Retailers

- Significant examples of TOD generated around BRT:
  - Ottawa, Ontario Transitway
  - York, Ontario Viva
  - Cleveland Health Line
  - Boston Silver Line
  - Pittsburgh East Busway
  - Denver 16th Street Mall
  - L.A. Orange Line
  - Curitiba, Brazil Surface Metro
  - Bogota, Colombia TransMilenio

- Several new studies on BRT and TOD
  - GAO, NBRTI, TCRP, EMBARQ, ITDP
<table>
<thead>
<tr>
<th>City (BRT Service)</th>
<th>TOD Policies?</th>
<th>Economic Value</th>
<th>Influencing Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston (Silverline)</td>
<td>Yes</td>
<td>$700 mil now, 3.7 bil + announ.</td>
<td>Pent-up demand, redevelopment policies</td>
</tr>
<tr>
<td>Bogota (Transmilenio)</td>
<td>Weak station area planning, strong bicycle amenities, ped access mixed</td>
<td>$2.5 bil. + overall density increased by &gt;8%, FAR density by 7%</td>
<td>Development, pedestrian, bicycle policies; By 2015, 80% of residents will live &lt;500 m of a station.</td>
</tr>
<tr>
<td>Cleveland (Silverline)</td>
<td>Yes</td>
<td>$5 bil + est.</td>
<td>Major redevelopment policies, planning</td>
</tr>
<tr>
<td>Curitiba (Linghinero)</td>
<td>Strong master planning + auto use curbs</td>
<td>$1.6 bil est.</td>
<td>Strict land use policies + CBD car use restrictions</td>
</tr>
<tr>
<td>Denver (16th St. Mall)</td>
<td>Yes</td>
<td>$1 bil + est.</td>
<td>Pedestrian mall + links with regional transit</td>
</tr>
<tr>
<td>Las Vegas (MAX)</td>
<td>No</td>
<td>Few $100K</td>
<td>Joint development of one added station</td>
</tr>
<tr>
<td>Ottawa (Transitway)</td>
<td>Some</td>
<td>$700mil +</td>
<td>Ped access and redevelopment policies</td>
</tr>
<tr>
<td>York (Viva)</td>
<td>Yes in select areas</td>
<td>$3 bil in phases</td>
<td>Master plans in Phase 2</td>
</tr>
<tr>
<td>Los Angeles (Orange)</td>
<td>Yes in select areas + bicycle amenities</td>
<td>$500 mil (w/ Red Line)</td>
<td>Major redevelopment policies, rail links</td>
</tr>
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</table>
Phase 2 York, Ontario ‘Vivanext’ Rapidways

$1.2 billion investment, 23 miles of center lanes

Economic situation forcing revised opening (2019)

$3 billion Markham TC construction
Brisbane Southeast Busway: Exploiting Activity Centers and Nodes

- Brisbane, Australia
  - Translink/Busway

- 15,000 pax/hour
  - 3 to 4 buses per minute
  - Mix of dedicated and feeder routes
    - Dedicated 20%
    - Feeder express services 80%

- Freeway location limits land use integration & development

- Land use primarily Queensland State responsibility

- Several stations with very good supportive land use strategies
Queensland government ID’d 8 busway and rail sites for TOD
  - Local governments prepare Growth Management Strategies

Busway Examples:
  - Queen Street Station:
    - 6 storey shopping mall built with underground BRT station
    - Located on the Queen Street Mall (3-block mixed use pedestrian mall)
  - Mater Hill Station:
    - Air rights sold to hospital for expansion
  - Boggo Road and Buranda Stations
    - New Town developments
Land Values Increased Near Brisbane SE Busway

Property values along Brisbane’s South-East Busway have jumped as much as 20 percent as buyers take advantage of traffic-free travel to the city.
Bogotá’s Choice of TransMilenio

<table>
<thead>
<tr>
<th></th>
<th>Heavy Rail (1997 Proposal)</th>
<th>TransMilenio Phase 1</th>
<th>TransMilenio Phase II</th>
<th>TransMilenio Master Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weekday Ridership</strong></td>
<td>795,000**</td>
<td>792,000</td>
<td>468,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td><strong>Coverage of City’s Total Transit Trips</strong></td>
<td>16 percent</td>
<td>16 percent</td>
<td>10 percent</td>
<td>85 percent</td>
</tr>
<tr>
<td><strong>Length – km</strong></td>
<td>29km</td>
<td>41km</td>
<td>41km</td>
<td>388km</td>
</tr>
<tr>
<td><strong>Cost per km</strong></td>
<td>$105M / km</td>
<td>$8.3M / km</td>
<td>$15.2M / km</td>
<td>$8.6M / km</td>
</tr>
</tbody>
</table>

TransMilenio BRT Phase I COMPLETED IN 2000
Bogotá Urban Renewal / Mobility Program

Before

After

Rents increased by 1.3% for every minute closer to BRT station
Cambridgeshire Guided Busway

- Cambridge-Huntingdon, 15.5 mi (25 km), 10 stations
- World’s longest busway
- 11,500 trips per weekday
- Ped access and P&R lots for Northstowe housing project (9,500 houses, largest new town since Milton Keynes)
Curitiba – 35 years with a coordinated land use and transport plan with a BRT backbone

Keys To TOD Success

- Get the planning right
- Apply the power of partnerships
- Market driven, not transit driven TOD
- Design for the pedestrian
Transit Orientation (5 “P’s”)

- People – Density
- Places – Diversity of land uses
- Physical Form – Street patterns
- Pedestrian/Bike
- Performance – Quality of transit service
Aligning Transit Policy and Market Areas
Match Market Strength to TOD Strength
Lessons: Same for All Modes

- Establish planning vision and policies early
- Coordinate with all stakeholders early
- Location, location, location
- Station Plans: design for the pedestrian
- Ridership might not help development
- Same TOD Strategies As LRT, CR, HR
  - Think “sense of place”
Good TOD Enhances Value Capture

- **Value capture techniques:**
  - Tax increment financing (through enhanced property values, *not* property tax increases)
  - Impact fees (OK these *are* tax hikes…)
  - Joint development agreements (ped connections, easements vs. takings etc.)
  - Leases (air rights, adjacent land and station space leases)

- **Talk the developers’ language:**
  - Transit improves marketability
  - Show the track record – get “comps”
  - Help them with policy changes (zoning, parking, tax incentives etc.)

- **Get a good financial analysis/plan**
  - Reserves to hedge market timing etc.

- **International does this about as often as U.S. does**
  - A concept being rediscovered (except in Hong Kong)
International and USA BRT TOD Comparisons

Cliff Henke and Kim Ibioshi-Sloop, Parsons Brinckerhoff

Rail-Volution October 2013
Other Slides for Q&A
## Rail and Bus Modal Applications

<table>
<thead>
<tr>
<th>Mode (Examples)</th>
<th>Circulator</th>
<th>Local/Linehaul Network</th>
<th>Feeder to RT Network</th>
<th>Interurban Network</th>
<th>Commuter/Regional Network</th>
<th>Intercity Network</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rail</strong></td>
<td>Streetcars (Portland, San Diego)</td>
<td>Heavy Rail, LRT (New York, BART, St. Louis)</td>
<td>LRT, APMs (Baltimore, Hudson-Bergen LRT, Miami’s Metromover)</td>
<td>LRT L.A. Blue Line, Salt Lake City</td>
<td>Commuter rail, Heavy rail Chicago Metra, New York MNRR</td>
<td>Amtrak CA HSR TGV</td>
</tr>
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Capital Cost Per Mile
## Implementation Challenges

<table>
<thead>
<tr>
<th>Challenge</th>
<th>LRT/ Heavy Rail</th>
<th>Commuter Rail</th>
<th>Streetcar</th>
<th>BRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Implement</td>
<td>7-10 years+</td>
<td>3-7 years</td>
<td>4-7 years</td>
<td>1-7 years</td>
</tr>
<tr>
<td>Political Difficulty</td>
<td>High and increasing</td>
<td>Moderate but increasing</td>
<td>Moderate</td>
<td>Lower</td>
</tr>
<tr>
<td>Flexibility to shifting commute patterns</td>
<td>None to very low</td>
<td>None to very low</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
Curitiba new BRT Corridor (2009-2010)

Rodovia BR116 “Before”
Photo: URBS

Linha Verde “Now”
Photo: CTS Brasil

Linha Verde “Future”
Image: URBS