

Issues & Challenges Facing First and Last Miles of Regional and High-Speed Rail Development: Call for Further Research



SNCF TGV



JR Shinkansen



Amtrak NEC



Taiwan HSR



British Rail ECML



DB ICE

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Session **378** • *Sharing Rail Access to Urban Cores*
Presentation **PII-0787**

The Call for This Session

**“First and Last Mile Issues of
Regional and High Speed Rail”**

“Which regional and intercity rail systems were successful in leveraging synergies with local trains by sharing corridor or tracks?”

and

“Why?”

“What are the technical, operational, and institutional challenges for track sharing between high speed intercity and commuter trains in urban corridors?”

and

“Why?”

“Has regional and intercity rail both seen increased ridership in all market segments (commutation, business, leisure) after upgrading the last mile?”

and

“Why?”

“Are urban trackage cost-prohibitive compared to line-haul segments?”

and

“How should costs, benefits, risks, and track capacity be allocated on joint last mile infrastructure?”

Additional Issues to Consider

**“First and Last Mile Issues of
Regional and High Speed Rail”**

“Within urban corridors, how independent (or dependent) is high-speed rail on other train services?”

and

“Do those services compete with or compliment each other?”

“What’s a workable level of cooperation that facilitates desirable linkages between intercity and other rail services?”

and

“What current or proposed transportation services are advantageous to have linked to high-speed rail?”

“Do such linkages afford required operations safety, interoperability, and reliability to enable effective and financially sustainable intercity rail?”

and

“Where, when, and how do freight services operate in the corridor?”

“How do transit oriented developments (TODs) improve or impair integration of high-speed rail with other modes?”

and

“How do TODs impact whether intercity and regional services can achieve synergies through shared use?”

**“There is nothing more deceptive
than an obvious fact.”**

– Sherlock Holmes

Problem Statement

“Is the location and accessibility of terminals within the metropolitan area a deciding factor for success of the regional or high speed rail network?”

or

“Can there be a successful regional or high speed rail system without a good feeder system, multiple interchanges, and access to business districts?”

Criss-Crossing Issues

Criss-cross (v.)

1. To cross in a pattern, often random
2. To move back and forth (over something)
3. To mark with a pattern of crossed lines
4. To cross one another in opposite directions

The First and Last Miles

- **Large Metro Areas**
 - Multiple activity centers
 - Station siting isn't "given"
- **Access & Line-Haul Times**
 - Trade-off for suburban markets
- **Joint Development Issues**
 - What makes a successful site?
- **Blurring Boundaries**
 - Intercity or Regional Rail
- **Shared Infrastructure**
 - Right-of-way acquisition challenges
 - Improved train control systems



Large Metros – Multiple Activity Centers



Photo: Patrick Theiner

- **Multiple CBDs**
 - NY: Midtown, Downtown, Brooklyn, L.I.C., Jersey City
- **Distributed Cities**
 - LA: Burbank, Long Beach, Anaheim, San Bernadino
- **Suburban Edge Cities**
 - NY: Stamford, Mineola, Morristown, Edison
 - Boston: Providence, Brockton, Worcester, Lowell-Lawrence
- **Research Questions:**
 - Where should terminal(s) be?
 - How many are required?

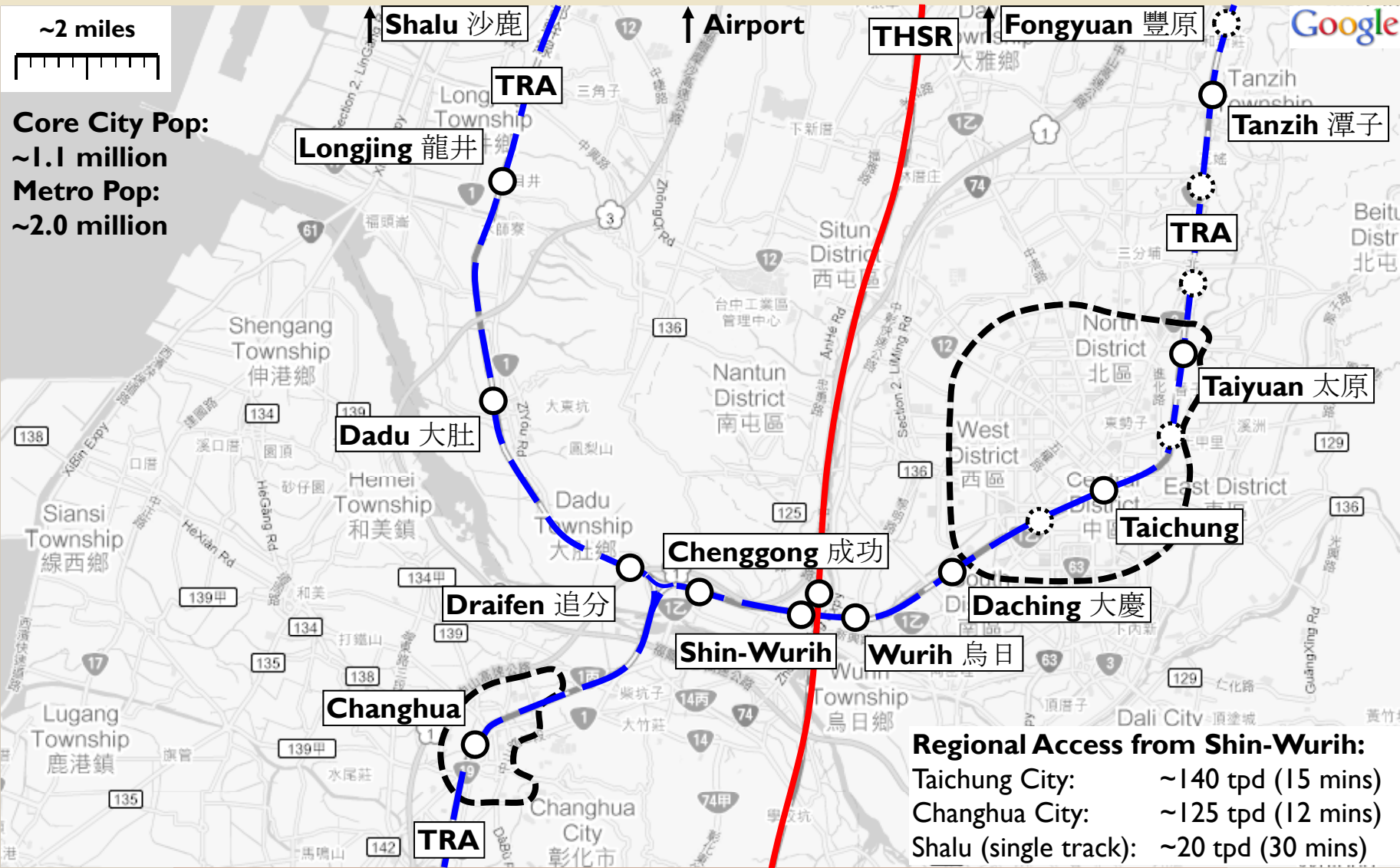
Station Siting and Regional Connections

- **Airlines are Concerned About Local Distribution**
 - Substantial airport access literature indicates importance
- **Philadelphia, Penn.:**
 - **Intercity:** Trenton (N.J.), 30th Street, Wilmington (Del.)
 - **Suburban:** Reading Terminal, Market East
 - **Access Opportunities:** North Phila, Temple U., University City?
- **How To Prove This?**
 - How much time is saved?
 - Job density? Population density?

Photo: Mike Brotzman

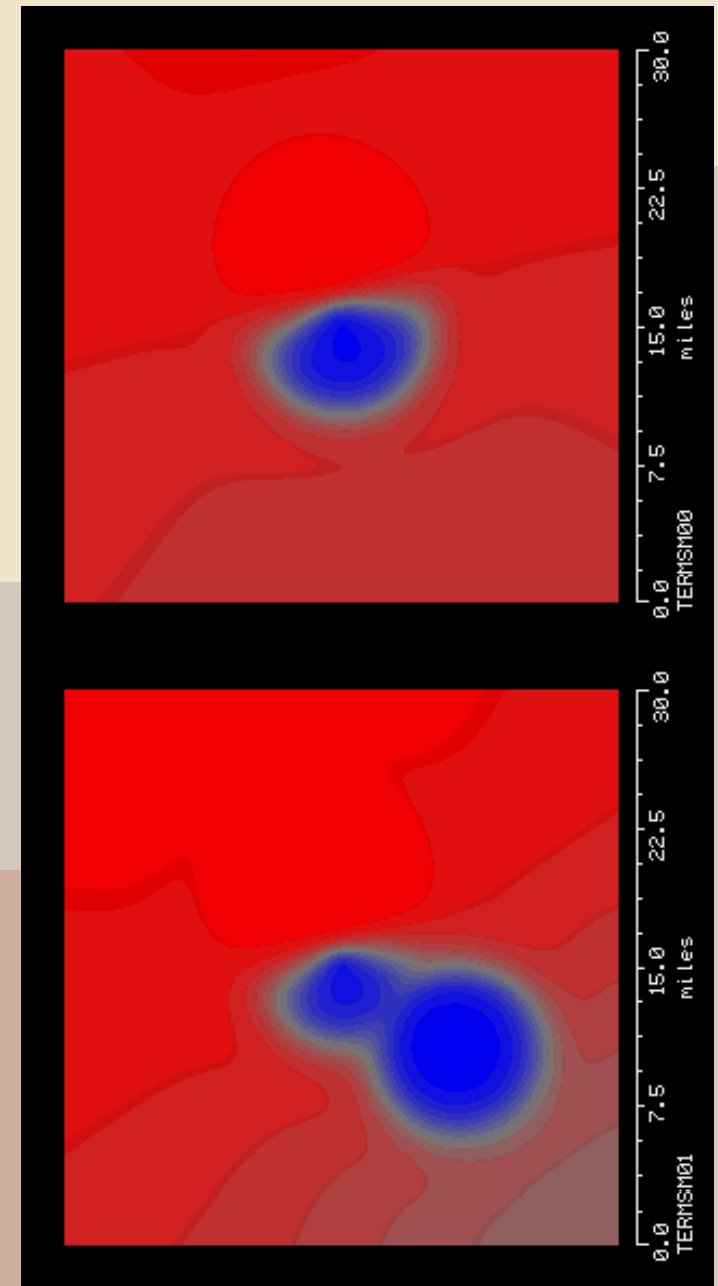


Taichung: Shin-Wurih (新烏日) Interchange



Access Time and Competitiveness

- **Trade-off Access and Time**
 - Timings need to be competitive
 - Achieve without sacrificing access
- **Origin-Destination (O-D) Market Analyses**
 - Total logistics cost models (line haul time + access time)
 - **Include urban access modes (transit, private auto)**
 - Travel demand O-D matrices
 - **Station siting to capture ridership**
 - **Joint development impacts?**



Source: http://lexciestuff.net/Papers/thesis_appendices.pdf

Entry Speeds and Suburban Stations

Entry Dir.	Metropolitan Area	Rail Corridor	Shared Trk. or Corr.?	# Sta.	Max. Eqp. Spd	Max. Trk. Spd	Time to Main Sta.	Avg. Entry Spd
EB	Boston	Downeaster	Yes	3	110	79	45	49.3
EB	Boston	NEC	Yes	4	150	150	40	63.0
WB	New York	NEC	Yes	2	150	90	55	39.3
EB	New York	NEC	Yes	3	150	110	35	41.1
WB	Washington	NEC	Yes	3	150	135	30	60.0
NB	Taipei	THSR	Yes	3	187	187	20	107.6
Both	Taichung	THSR/TRA	No	1	187/69	187	40	45.0
SB	Kaohsiung	THSR/TRA	No	2	187/69	187	35	50.0
SB	London	BR ECML	Yes	2	140	115	25	65.4
NB	Leeds	BR ECML	Yes	3	140		40	44.2
NB	Newcastle	BR ECML	Yes	3	140	110	35	61.8
SB	Newcastle	BR ECML	Yes	2	140	90	30	69.4
NB	Edinburgh	BR ECML	Yes	3	140	125	50	34.9
SB	Edinburgh	BR ECML	Yes	4	140	110	35	44.1
SB	London	BR WCML	Yes	2	125	110	35	54.1
NB	Manchester	BR WCML	Yes	4	125		45	41.5
NB	Liverpool	BR WCML	Yes	3	110		45	47.4
NB	Glasgow	BR WCML	Yes	2	140	110	35	49.3

Sources: Amtrak System Timetable, BR InterCity Public and Working Timetables, Taiwan Travel Passport

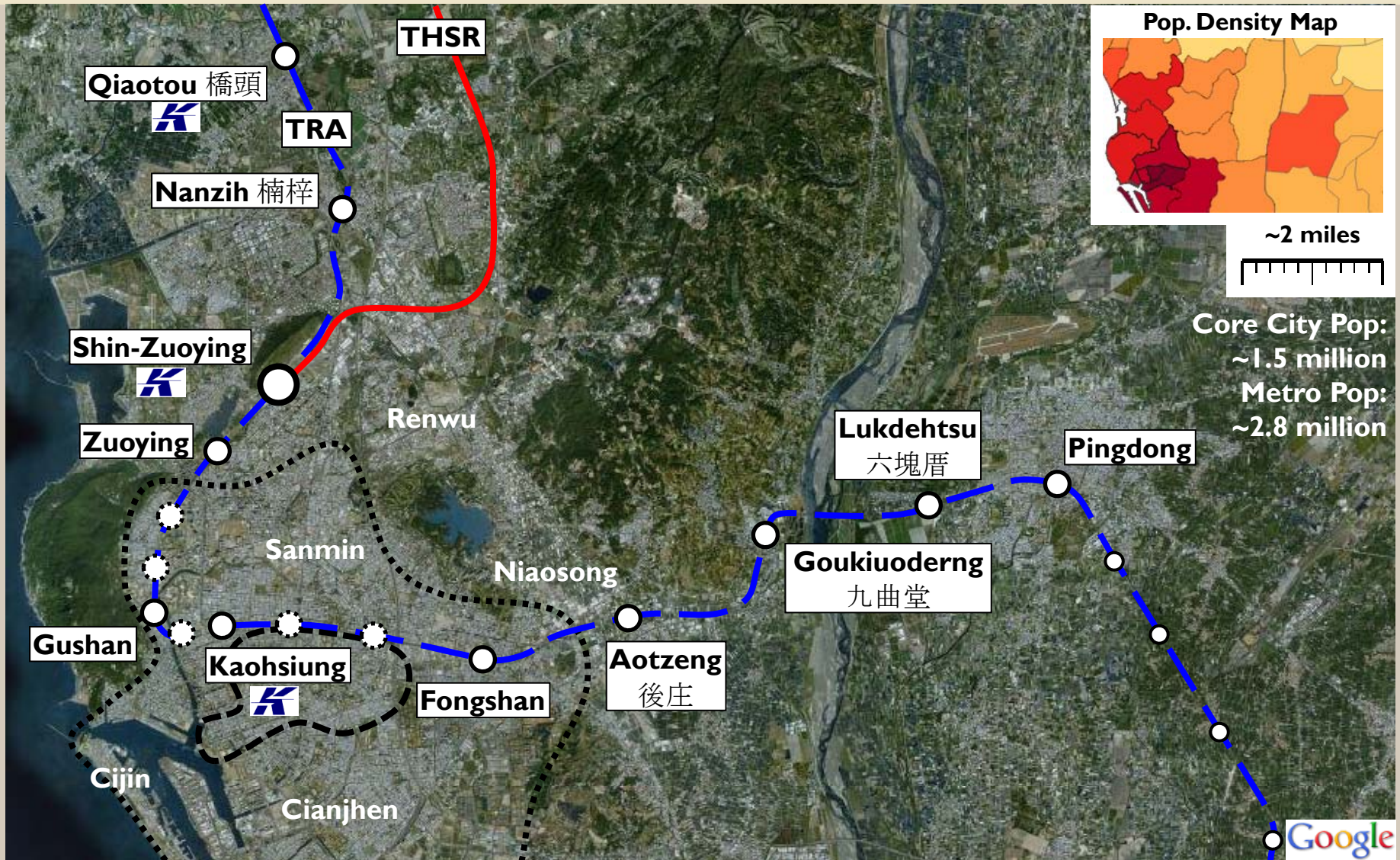
Note: “Metro area” is considered to be about 30 mile radius regardless of city size.

Measures of Accessibility and Market Size



- **Measuring Access and Market Penetration**
 - Population? Employment?
 - **Within ½ mile?**
 - **Within ½ mile of one transfer to feeder mode?**
 - **Driving < 10, 20, 30 mins?**
 - Trip generation?
 - **Trips > 10, 20, 30 miles?**
 - Required traffic density to justify stations?
- **Commuter Rail and Transit Enlarges Catchment Area?**

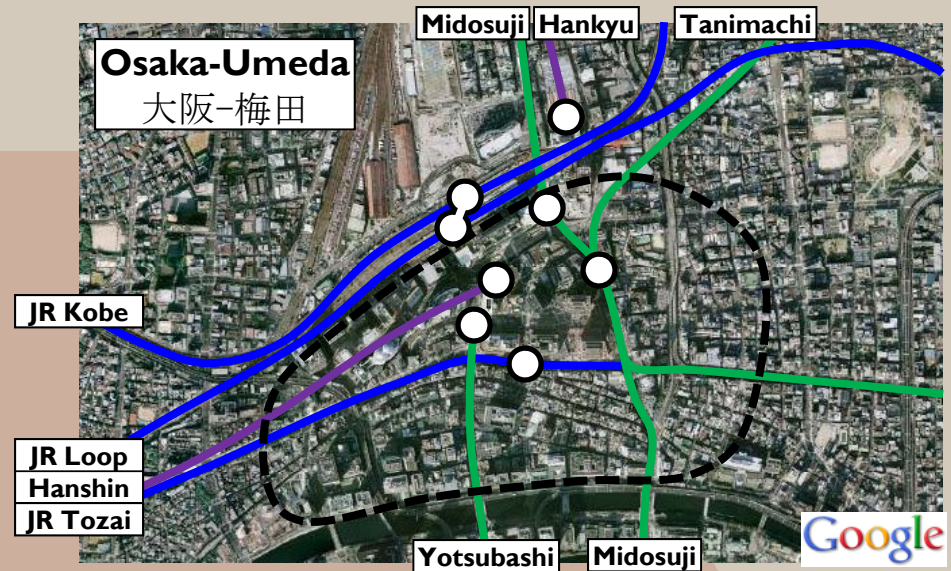
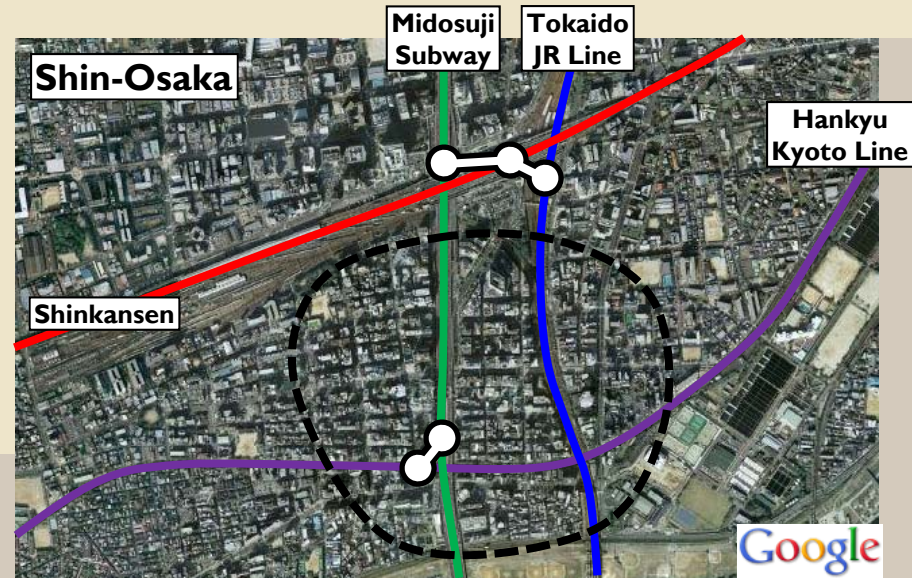
Kaohsiung: Shin-Zuoying (新左營) Terminal



Population Density Map Source: [http://zh.wikipedia.org/zh-tw/File:Population_density_map_of_Kaohsiung-Pingtung_region_\(Dec_2009\).svg](http://zh.wikipedia.org/zh-tw/File:Population_density_map_of_Kaohsiung-Pingtung_region_(Dec_2009).svg)

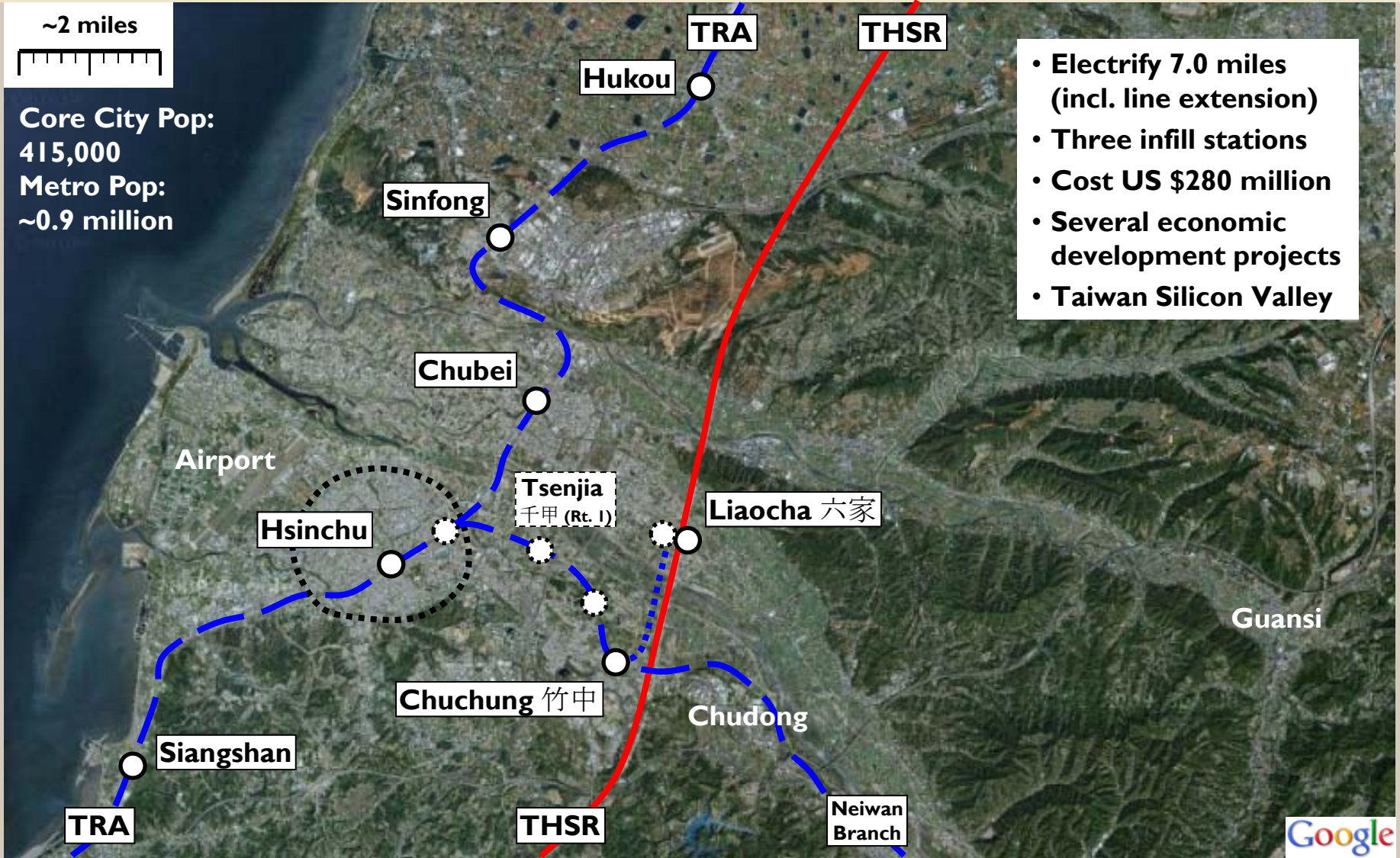
Joint Development Issues

- **“If You Build It, They Will Come!”**
 - How far? Why?
- **Successful Examples:**
 - Liaocha, Hsinchu, Taiwan
 - Route 128, Boston, Mass.
 - Shin-Osaka, Japan (1964)
 - Only 2 miles from downtown
 - City Pop. 2.7m; County 8.8m
- **Transit & Commuter Rail Likely Critical**
 - How do we prove this?
 - Gravity Models? Trip Generation? Property Valuation? Case Studies?



Osaka Suibway Map Source: <http://www.kotsu.city.osaka.jp/foreign/english/subway/img/map.pdf>

Hsinchu: Neiwán (內灣線) Electrification



Alignment Source: <http://www.rrb.gov.tw/04100.aspx?id=14>

High Speed Rail: Regional or Intercity?



Photo: Amanda Marsh

- **Less-than-Daily Commutes**
- **“One Day Living Circle”**
- **Blurring Distinctions**
 - **LIRR:** Montauk, Greenport
 - **MNCW:** Port Jervis, Wassaic
 - **Amtrak:** Downeaster, Keystone, Empire, Hiawatha, Capitol Corridor
 - Altamont Commuter Express
 - New Mexico Rail Runner
 - **Former British Rail**
 - Liverpool St.-Ipswich, Leeds-Manchester, Paddington-Hereford, Marylebone-Snow Hill, Waverly-Queen St.
 - **Nederlandse Spoorwegen**
- **Definitions of Intercity, Regional, High Speed?**
 - 79, 90, 110, 125, 140 mph?

Right-of-Way Acquisition Challenges

- **Urban Infrastructure Projects: Big and Expensive**

- Mass. Tpk. Extension
- LIRR's East Side Access
- Taiwan's Taipei tunnel
- Shinkansen Ueno-Tokyo
- London's CrossRail

- **Frequently Forces Corridor Sharing**

- I-90, I-93 in Boston
- LIRR's ESA East River Tubes
- Taipei's Civic Blvd.
- Shinkansen, JR Yamanote Line

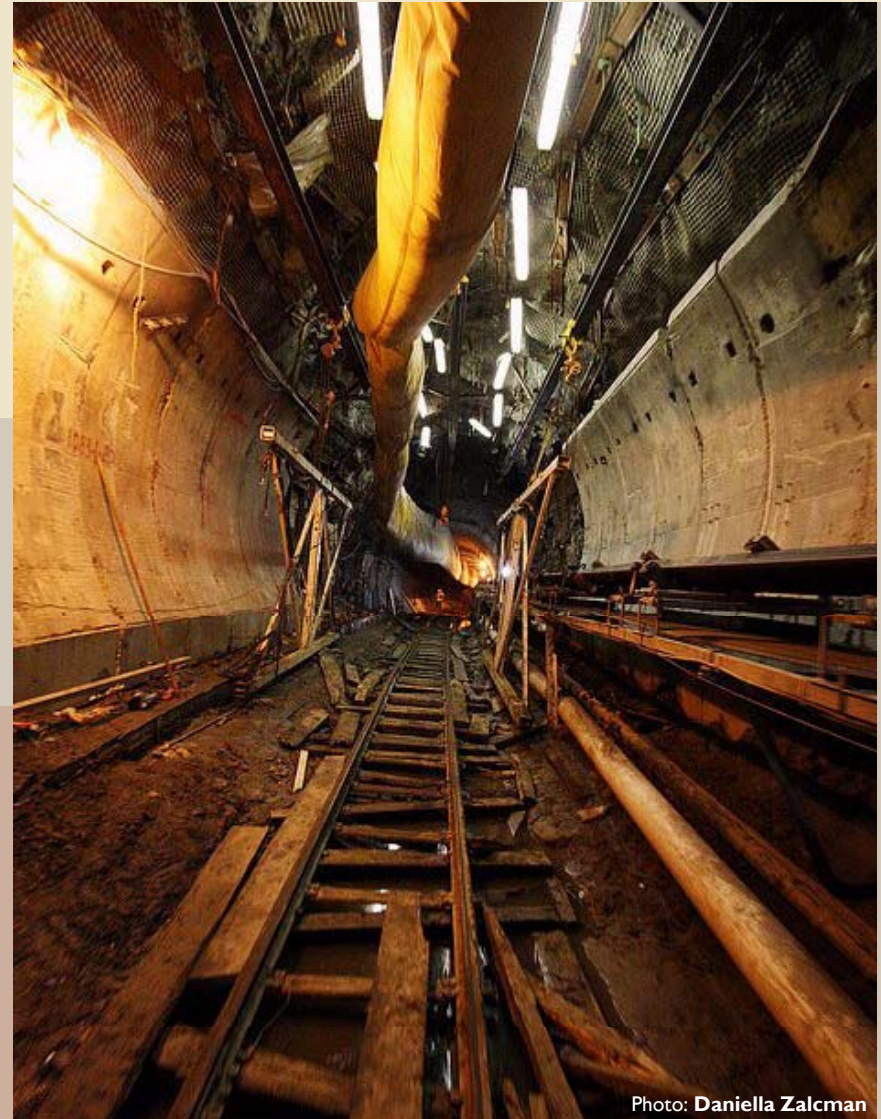


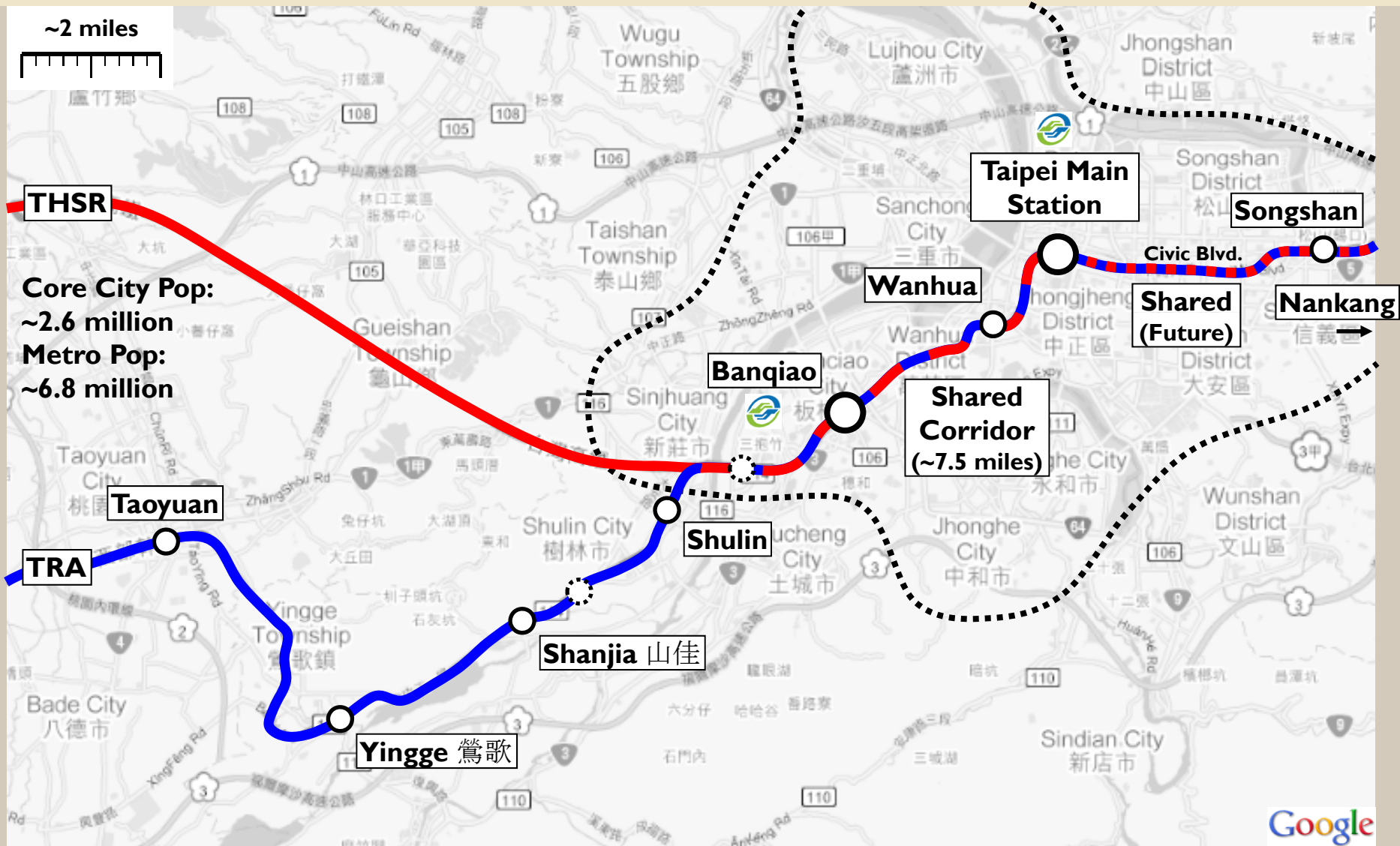
Photo: Daniella Zalczman

Shared Urban Infrastructure

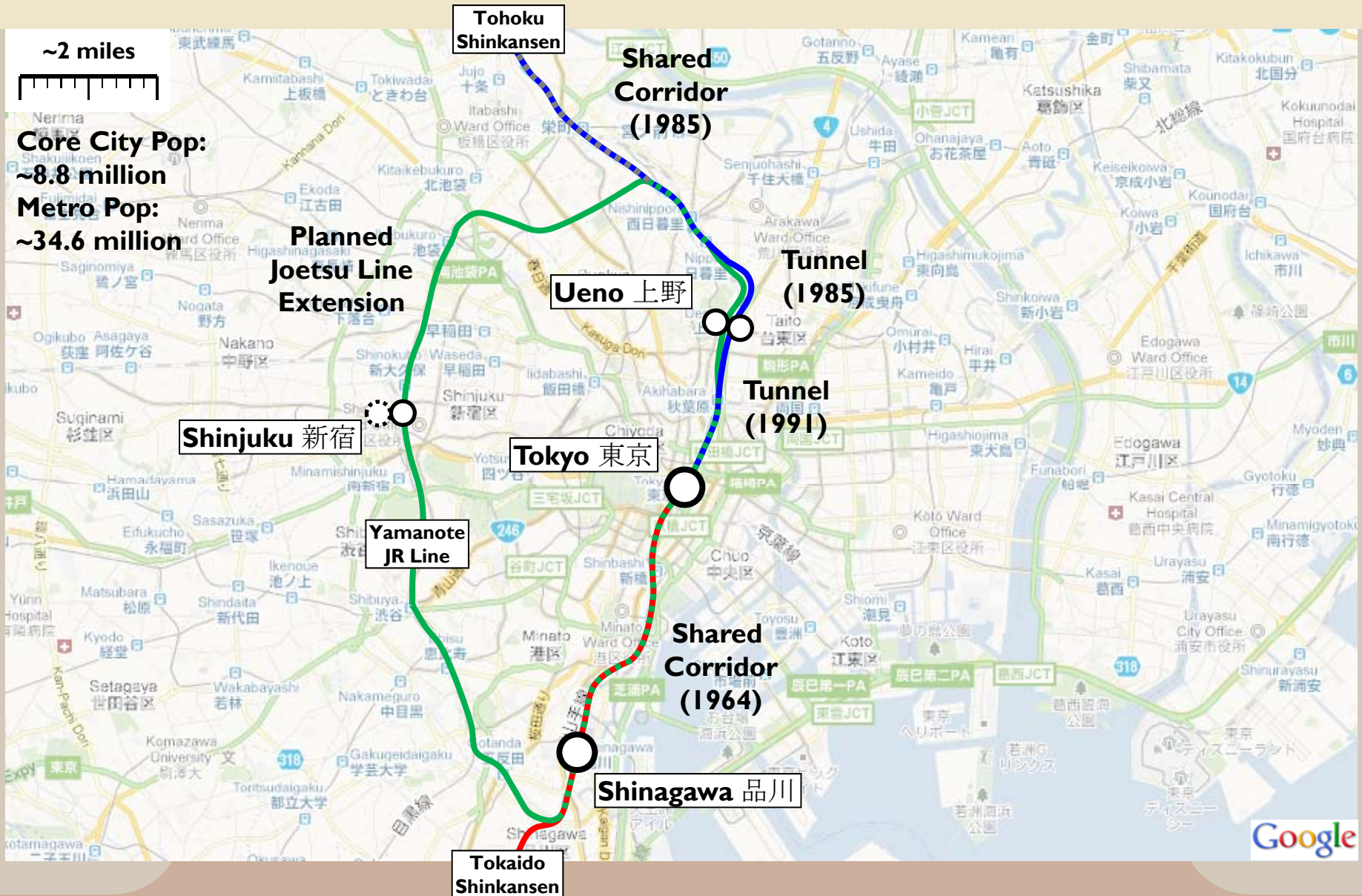


- **Existing Urban Corridor Owners:**
 - Commuter rail authorities
 - Highway or park authorities
 - Freight railroads
- **Track or Corridor Sharing Reasons:**
 - For connections & transfers
 - Sole feasible option?
 - Solve geometric constraints
 - **Shorter time in all markets**
 - Lower speeds in urban core
 - Track or corridor sharing:
 - **Question of track gauge?**

Taipei: Shared Corridor Shulin-Nankang



Tokyo: Phased Urban Shinkansen Building



Worldwide Review of Research & Sources

Inter-disciplinary (*adj.*)

1. Drawing from or characterized by participation of two or more fields of study
2. Crosses traditional boundaries between disciplines, as new needs emerge

*Planning + Engineering + Anthropology +
Geography + History + ...*

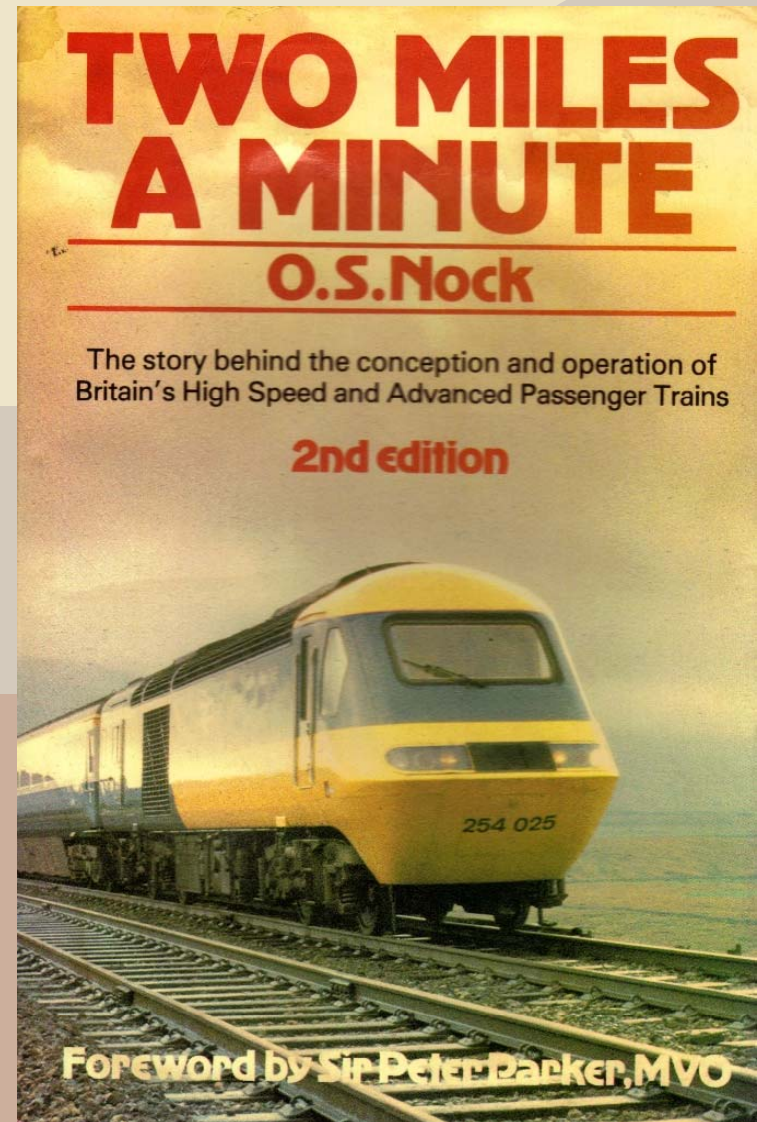
Japan's Shinkansen

- **Shin-Osaka:** Tokaido line never reaches downtown due to river constraints (p.25)
- **Ueno:** Tohoku line originally terminated in a deep craven; 2.2-mile extension to Tokyo expensive and difficult (p.31)
- **Shinjuku:** Joetsu line not complete (p.34)
- **Gifu-Hashima:** Avoiding downtown substantially reduces through trip time (p.73)
- **Kyoto-Osaka-Kobe:** Keihanshin metro area has three stations, ~25 miles apart
- **Narita Shinkansen:** Compulsory purchase problems in urban areas (p.86)
- **Commuter Use:** Izumizaki government (2h 10m from Tokyo) offers Shinkansen commuting incentives (p.114)



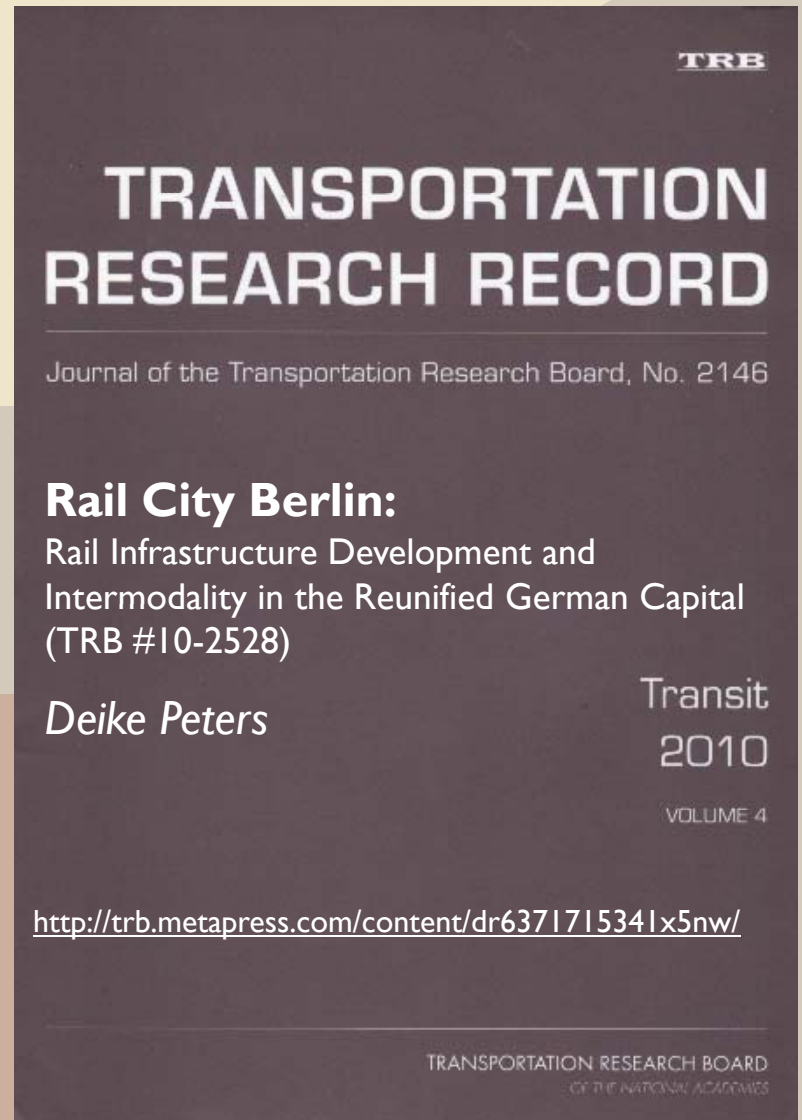
British Rail's High Speed Train

- **Relief Line Operations:** Afternoon peak usage requires ordinary expresses diverted to relief line near Paddington (p.25)
- **9%g Enhanced Braking:** Additional braking power allowed HST to run on conventional signal infrastructure (p.44)
- **Track Layout Rationalizations:** High speed crossovers benefits both local and intercity services (p.50)
- **Exceptional Cant Deficiency:** Tilting trainsets allow 16%g of acceleration on curves, thus higher speeds (p.91)
- **Maintenance Depot Separation:** Allows high trainset utilization by having dedicated maintenance facilities (p.117)



Berlin's U-Bahn, S-Bahn, and ICE

- **Relative Importance of Terminals:** Zoo, Friedrichstrasse, Alexanderplatz, and Ostbahnhof
- **U-Bahn versus S-Bahn:** Cold War-era modal separation is followed by integration after reunification
- **New Central Station:** service restructuring following Hauptbahnhof and North-South rail-link completion caused downgrading of historic terminals
- **TOD Issues:** Hauptbahnhof built in a developing area, far from historical axis; development uptake was less-than-rapid



Summary

“High speed intercity or regional rail can’t get started without urban corridors that commuter rail authorities or freight railroads currently control”

or

“Let’s figure out how high speed rail promoters can work with commuter rail authorities and other urban corridor owners to mutual benefit”