

High-Speed Rail and the Chicago Hub

How Do We Bridge Present and Future?

Yuki TANAKA, Director, Japan International Transport Institute

Acknowledgement: This Study has been conducted in association with Lou Thompson at Thompson, Galenson and Associates and Prof. Betty Deakin et al. of University of California, Berkeley.

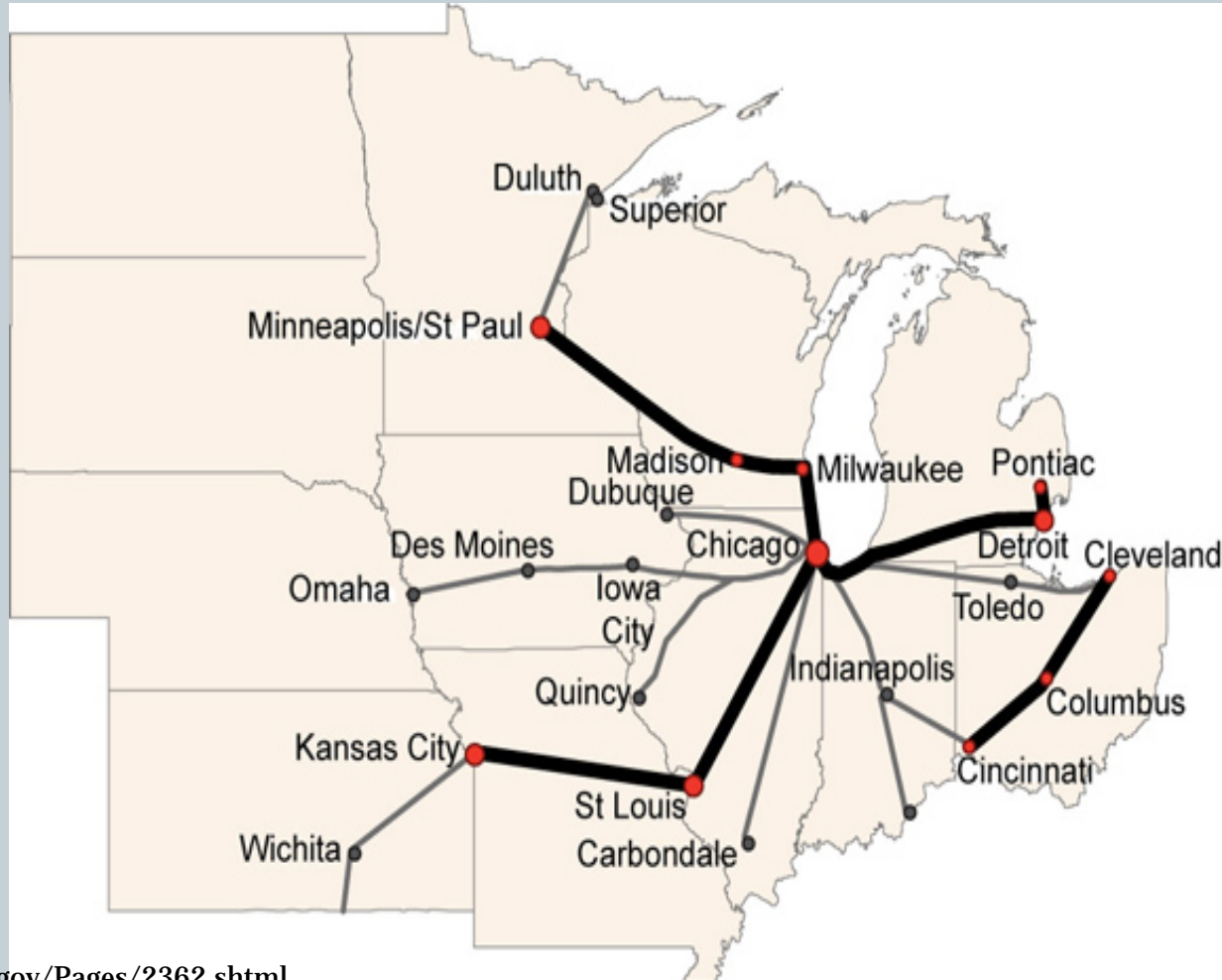
Outline of the Presentation

- “Rail Era” Started in Midwest Region
- How can we maximize the benefits?
- Potential of HSR in the Chicago Hub area
- Bridging Present and Future





“Rail Era” Started in Midwest Region



<http://www.fra.dot.gov/Pages/2362.shtml>

“Rail Era” Started in Midwest Region (2)



- **Chicago-Milwaukee:** Increase on time performance and reliability.
- **Milwaukee-Madison:** a new passenger rail service at **110 mph** speed by upgrading infrastructure.
 - ✓ Current rail +bus : 5 hours
 - ✓ Future rail : 1.5-2 hours
 - ✓ Driving : 1.5 hours



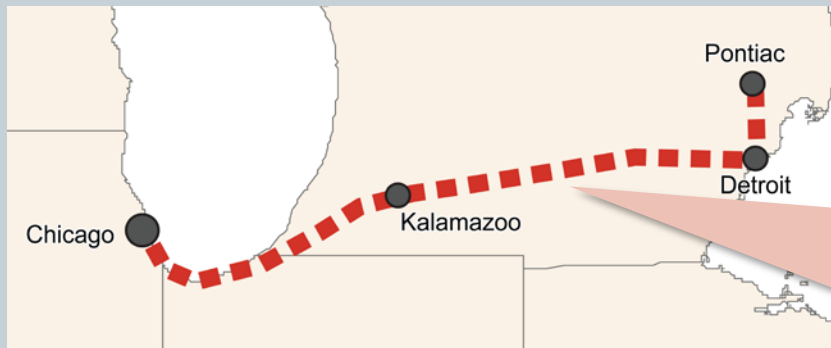
- **Chicago-St. Louis:** The improvement of infrastructure and the implementation of positive train control technology will decrease travel time from Chicago to St. Louis.
 - ✓ Current rail : 5.5 hours
 - ✓ Future rail : 4 hours
 - ✓ Driving : 5 hours

Travel time is estimated by JITI study.

“Rail Era” Started in Midwest Region (3)



- **Cleveland-Cincinnati:** The largest metropolitan areas without passenger rail service will be connected by 79 mph rail.
 - ✓ Current rail : 15.3 hours
 - ✓ Future rail : 4.3 hours
 - ✓ Driving : 4.3 hours
- Create thousands of jobs and will bring livability benefits to the region, as many new stations will be constructed or restored in historic downtowns.



- Travelling times between Detroit and Chicago will be reduced, and railroad congestion will be relieved by addressing a series of major chokepoints.

Travel time is estimated by JITI study.

Benefits from Improved Rail Network

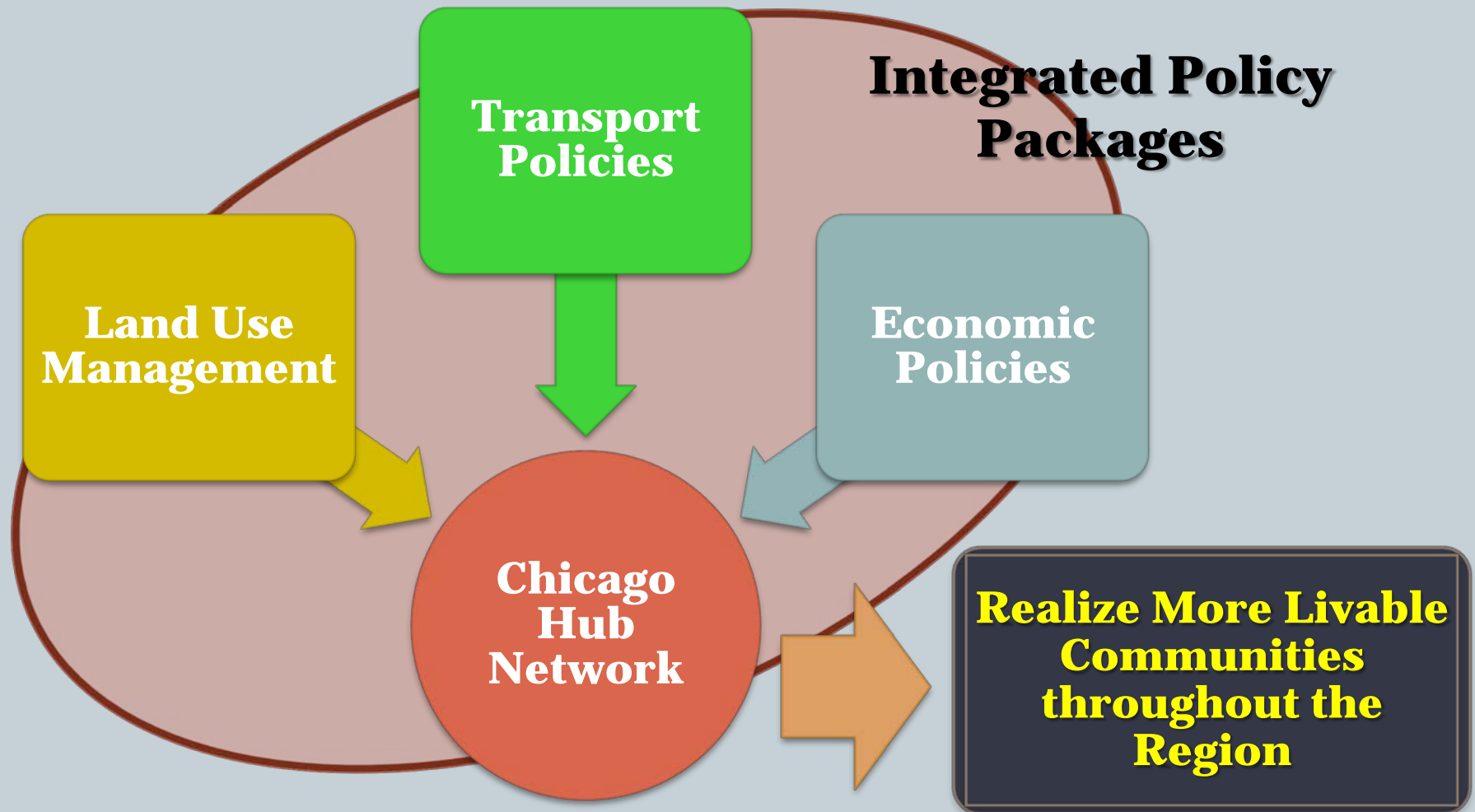
- **Economic Benefit / Job Creation***
 - ◆ Overall Economic Benefit: \$23.1 billion
 - ◆ Benefit-to-Cost Ratio: 1.8
 - ◆ Permanent New Jobs: 57,450
 - ◆ Average Annual Jobs During Construction: 15,200
- **Environmental Benefit**
 - ◆ Decreased energy consumption
 - ◆ Improved air quality
 - ◆ Opportunities for transit-oriented land use development etc.

* Benefits from Midwest Regional Rail System

“Economic Impacts of the Midwest Regional Rail System” (April 2007)

<http://www.dot.wisconsin.gov/projects/state/docs/mwrri-regional-brochure.pdf>

How Can We Maximize the Benefits? (1)



How Can We Maximize the Benefits? (2)

• Transport Policies

- ◆ Accessibility & usability: requisites for attractive rail networks
 - ✦ Good access from/to the station
 - ✦ Seamless connection --- public transit, park & ride, ticketing system, online time table, etc.
 - ✦ Combination with effective pricing policies to promote rails
- ◆ Good opportunity to manage transport demands & restructure transport systems in the communities

How Can We Maximize the Benefits? (3)

- **Land Use Management**

- ◆ Integration & coordination of transport and land-use planning
 - ✦ To incentivize public & private investments toward livable communities
- ◆ Key concept:
 - ✦ Rail-oriented community planning & development
 - ✦ Station as a town center, shopping mall, business complex, etc.

How Can We Maximize the Benefits? (4)

• Economic Policies

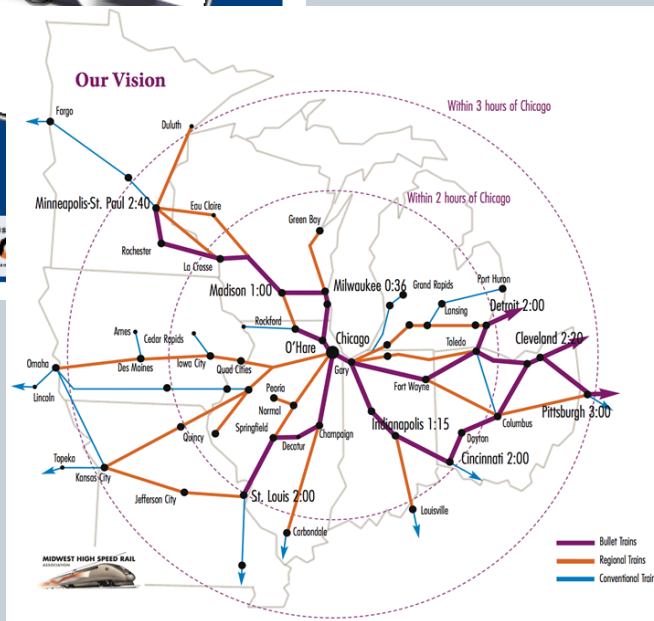
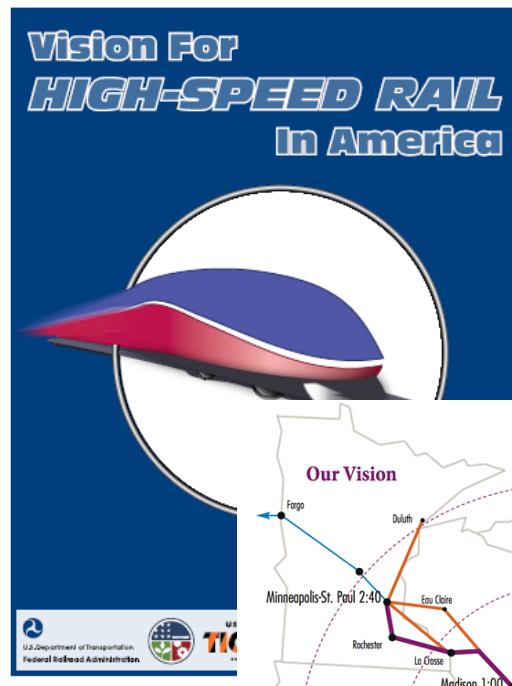
- ◆ Effective economic policies will strengthen the benefits, taking advantage of improved rail connection.
 - ✦ e.g. attraction and promotion of such industries as manufacturing, service and tourism
- ➔ Can create new business opportunities throughout the region, combined with land use policies.
- ➔ Should be pursued both at State and local levels

Land Use Improvement --- Japanese Case

Station as a Core of the Land Use Improvement

- Stations = ***Shopping Zones***, a part of ***Shopping Malls*** and ***Department Stores*** with functions needed for everyday lives.
- Can contain daily functions such as
 - ◆ Grocery stores, bookshops, stationary shops, boutiques, pharmacies, etc.
 - ◆ Clinics, nursery schools
- Exclusive stores and high-class restaurants attract repeaters.
- Stations = a part of ***Urban Development***, ***Urban Renewal*** and ***Center of More Livable Communities***.

High Speed Rail as the Next Goal



- HSR as the next goal to further enhance the benefits from the rail network
- What are needed?
 - ◆ Official plan or design for 150+ mph HSR
 - ◆ Multistate strategy for incremental development
 - ◆ Funding committed for 150+ mph HSR
 - ◆ New ROW

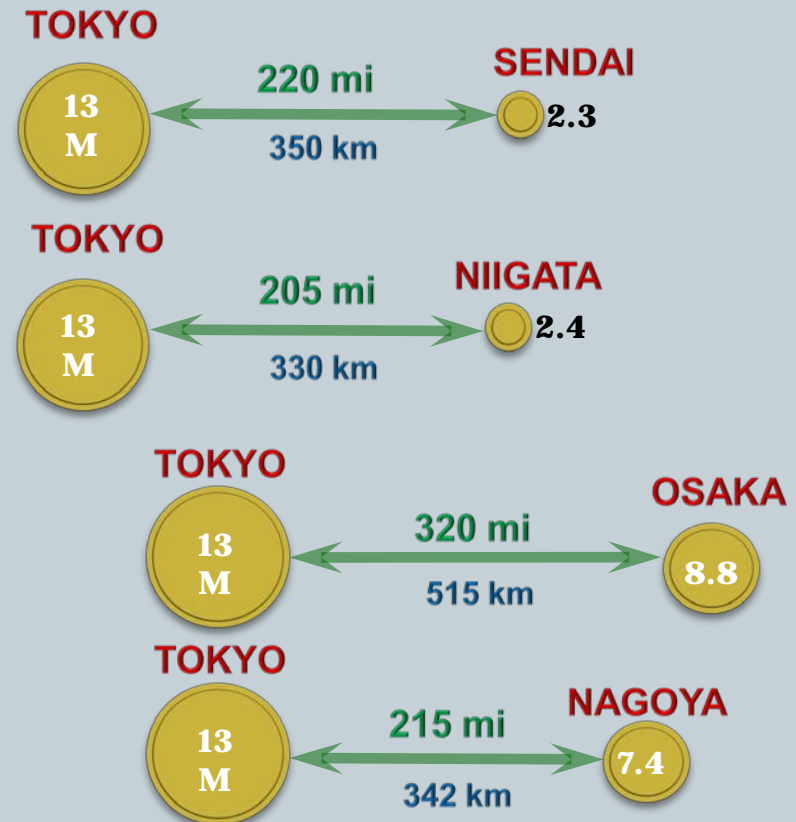
Worldwide Experiences of HSR



Potential of the Chicago Hub (1)

Key Strength of the Region

- Population and distances are comparable with counterparts around the world.



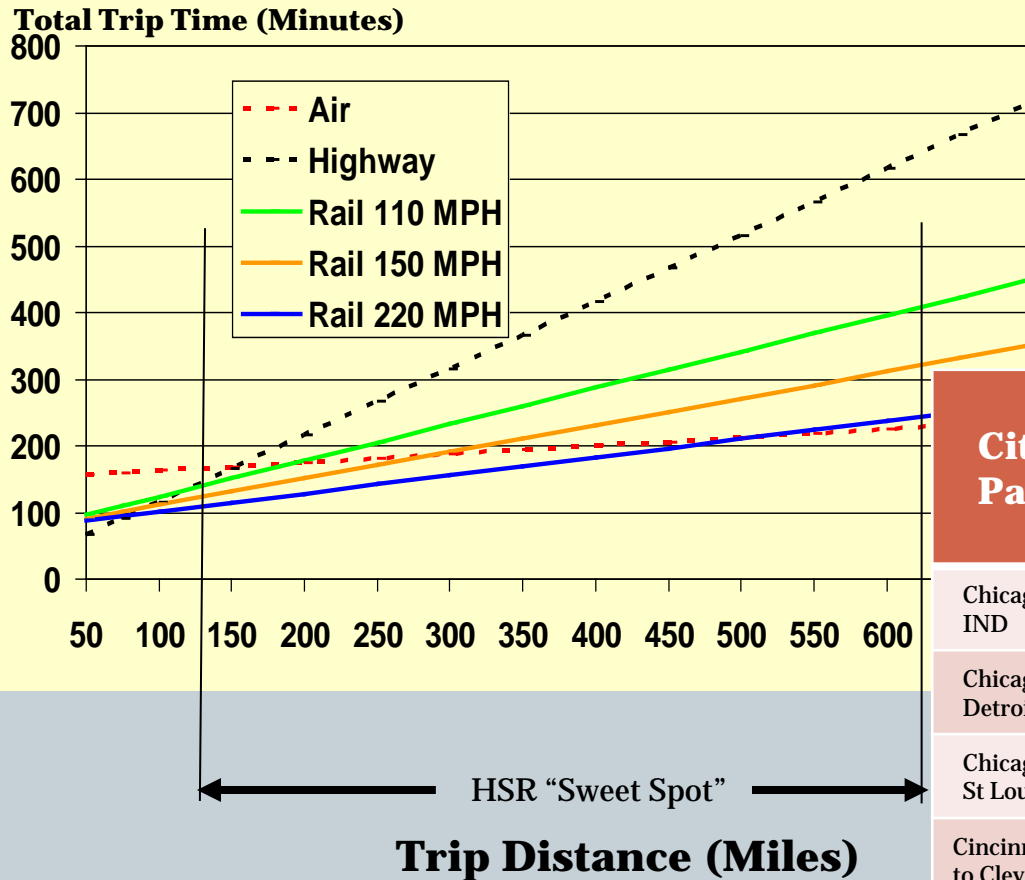
Potential of the Chicago Hub (2)

Key Strength of the Region

- High density downtowns spread across the region, centered at Chicago
- Ring and radial freeways are highly congested in many cities during commuting hours
- ➔ Connected by 220 mph HSR network via the Chicago Hub, the region could create new flows of business and social activities, realizing its full potential

Potential of the Chicago Hub (3)

The Role of Speed



Travel Time by Modes

City Pair	Rail Dist. miles	Air	High way	Rail Speed		
				110 mph 2 stops	150 mph 2 stops	220 mph 2 stops
Chicago to IND	196	174	211	176	149	127
Chicago to Detroit	281	185	296	222	183	150
Chicago to St Louis	284	185	299	224	184	151
Cincinnati to Cleveland	288	185	303	226	186	152
Chicago to Cleveland	341	192	356	255	207	167
Chicago to Minneapolis	486	210	501	334	265	206

Bridging Present and Future

- Visionary partnership between Midwest States
 - ➔ Works as the foundation toward the future HSR network in the region
- Accumulated “rail experiences” of people and increased ridership through improved rail networks
 - ➔ Pave the way for HSR as the next step
- Many relevant factors, a variety of options for HSR
 - ➔ Require meticulous consideration

Ridership Projections

	FRA (1997)	MWRRI (2004)	SNCF (2009)	MWHSRA (2010)
Projection date	2020	2025	2028	2-3 yrs after opening
Rail top speed	200 mph	110 mph	220 mph	220 mph
System analyzed	CHI-STL,DET,MIL (607 miles)	CHI-CIN,STL,MIN,GB,DET,CLE (1815 miles)	CHI-DET,CLE,CIN,STL,MIN (1500+ miles)	CHI-STL (307 miles)
Air shift to HSR	28.1%	Unknown	Unknown	65-80%
Auto shift to HSR	4.4%	Unknown	Unknown	6.6-19.9%
Pax-mi per year	1,680 M	2,387 M	Unknown	400 M-760 M
Trips per year	8.1 M	14.8 M	42.3 M	1.5 M-3.0 M
Induced demand	7%	10%	15%	2.5-6.5%
From air	42%	18%	26%	Unknown
From auto	33%	52%	58%	Unknown
From rail	18%	21%	1%	Unknown

NOTE: These projections make different assumptions regarding alignment, stations, economic/demographic situation, rail speed and start date and are not comparable.

Menu to help visualize the concrete plan

- Travel volume between various ODs by modes and by trip purposes?
- Upgrade existing tracks or new tracks?
- Existing stations or new stations and where to put stations to maximize development potential?
- Legislation required for higher density development?
- Subsidy available for the operating costs?
- Seamless transfers to other modes at the stations?

Variety of Options – Infrastructure

- **Monolithic.**

One manager, one operator.

- **Dominant with tenants.**

HSR owns and controls infrastructure, but allows non-competing tenants, usually suburban or short haul intercity, to operate for an access fee.

- **Fully separated.**

- ◆ Gross cost franchise for infrastructure (or public provider)

- ◆ Net cost franchises for operators (because they don't have the financial risk of the infrastructure) paying access charges

Variety of Options – Financing

- **Full Public Operation.**

China, Korea, Japan (before privatization).

- **Build-Own-Operate (BOO) Scheme.**

Channel Tunnel. Can transfer all risks.

- **Build-Own-Operate-Transfer (BOOT) Scheme.**

Taiwan case at first stage. RoW acquired by public.

- **Management Contract.**

- **“Gross” Cost Franchise.**

- **“Net” Cost Franchise.**

Variety of Options – Financing

Option	Risk Management	Financing
<p>Management Contract</p>	<ul style="list-style-type: none"> ● Public sector takes all design and construction risks. ● Contractor may take some operating cost risks if demand is as specified by public sector. 	<ul style="list-style-type: none"> ● All financing from public except for working capital needed by contractor. ● Rolling stock may be leased, but will be guaranteed by public owner.
<p>Gross Cost Franchise</p>	<ul style="list-style-type: none"> ● Public sector takes investment and demand risks. ● Franchise takes operating cost risk within specified demand levels. 	<ul style="list-style-type: none"> ● Public responsibility, though franchise can be required to provide financing. ● Public and private can share investment with agreed payback approach.
<p>Net Cost Franchise</p>	<ul style="list-style-type: none"> ● Demand risk and some part of investment risk shifted to franchise. 	<ul style="list-style-type: none"> ● Private sector can provide more financing, but some forms of public contribution or guarantee are always required.

Life with Rails – Examples from Japan –



Station as a Shopping Zone



Station as a Shopping Mall



Station as a Department Store



Fancy Shops and Gourmet City



High-Class Shops in Stations



Stations Create New Cities



<http://ja.wikipedia.org/wiki/%E6%A8%AA%E6%B5%9C%E3%81%BF%E3%81%AA%E3%81%A8%E3%81%BF%E3%82%89%E3%81%8421>

... and One More Thing

Make no little plans.

Make big plans.

Aim high in hope.

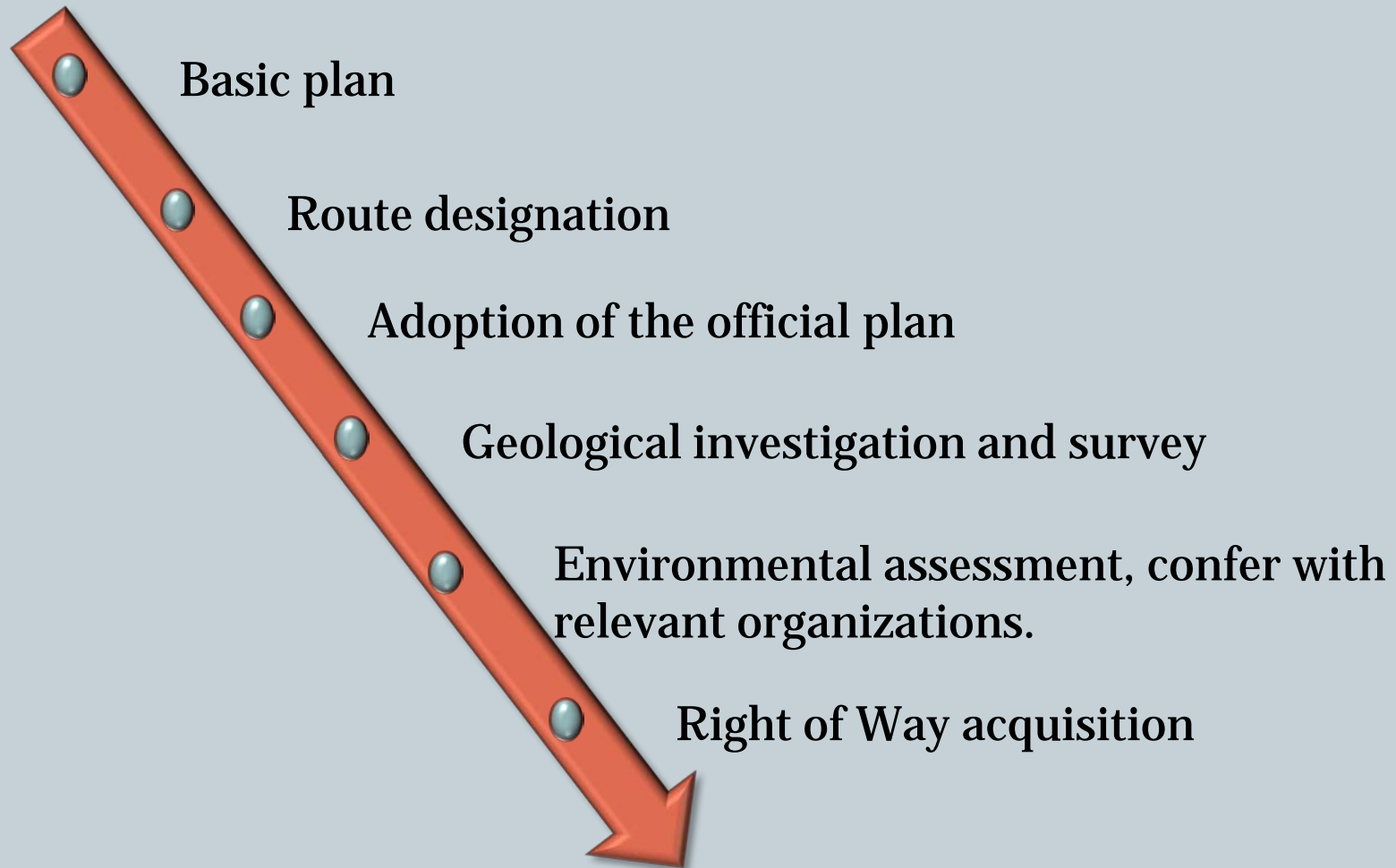
GET STARTED NOW!

**Thank you very much
for your attention.**

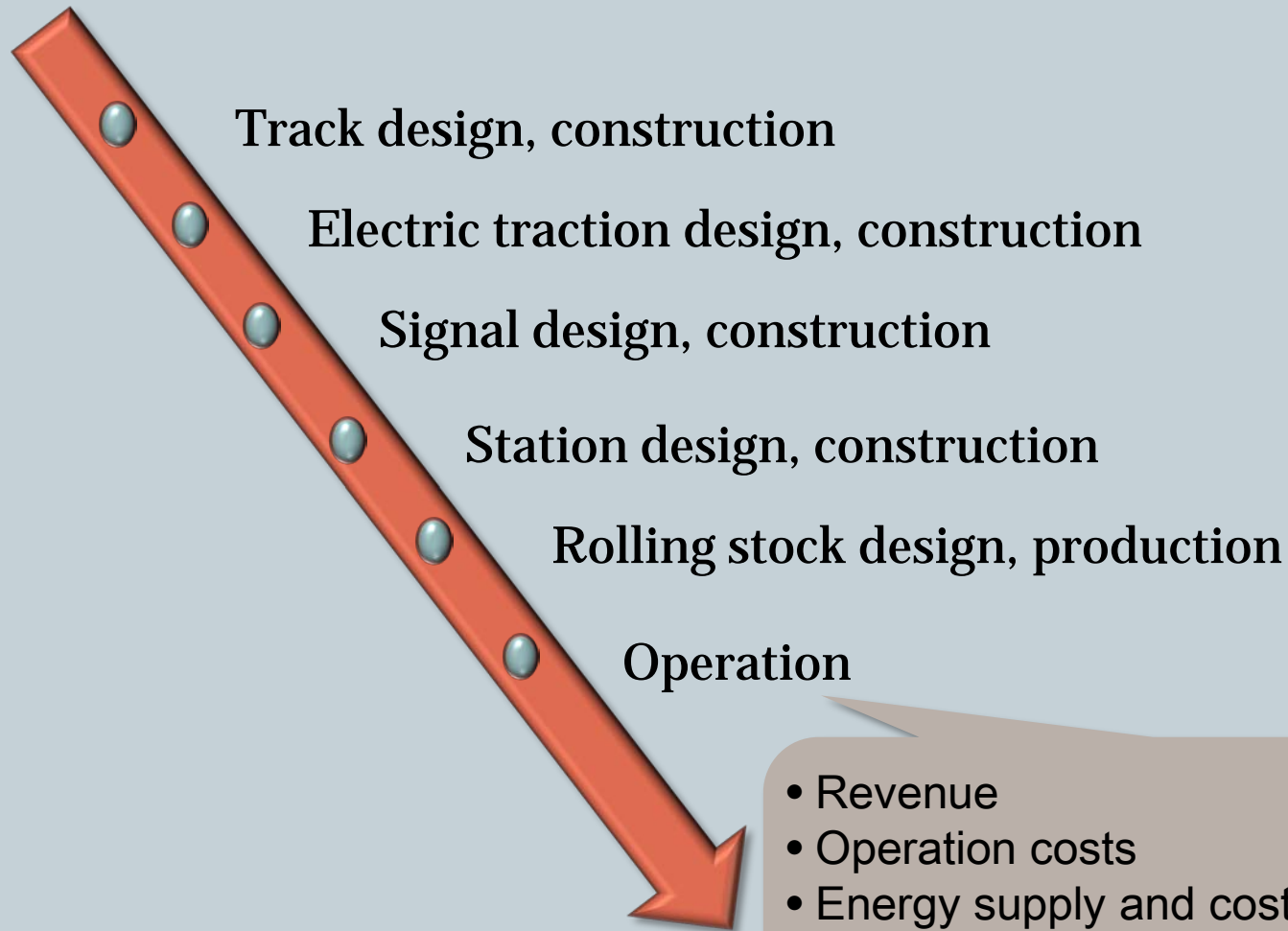
For more information, please contact:
y-tanaka@jterc.or.jp

ANNEX: Investment Scheme

Where Risks Lie (1)



Where Risks Lie (2)



- Revenue
- Operation costs
- Energy supply and costs
- Infrastructure & rolling stock maintenance
- Public support

New (Real) HSR Systems: Capital Investment Risks

	Type of Risk	Allocation and/or Mitigation Measures	Who is Best Suited to Bear the Risk?
Environmental Analysis	Litigation and delay cost	Public outreach	Public
Right of Way Acquisition	Delay, litigation cost	Eminent domain reduces delay but can increase cost risk	Public
Right of Way Improvements (grading, tunnels, major bridges)	Construction cost and schedule	Careful design and competitive contracts	Can be either public or private. In large projects, public is best placed to bear
Track design and construction	Construction cost and schedule. Compatibility	Competitive procurement. Use unified design for track, ET and rolling stock	Public or private
Electric traction design and construction	Construction cost and schedule. Compatibility	Competitive procurement. Use unified design for track, ET and rolling stock	Public or private
Signal design and construction	Construction cost and schedule. Compatibility	Competitive procurement. Use unified design for track, ET and rolling stock	Public or private
Stations design and construction	Construction cost and schedule. Coordination with local agencies	Intensive outreach and detailed agreement with local authorities	Private sector after agreements with local authorities
Rolling Stock design and construction	Delay in availability and unacceptable performance. Incompatibility with infrastructure	Use proven designs. Rolling stock can be leased rather than purchased. Design rolling stock and infrastructure as a system	Private sector can bear
Information Technology	Unacceptable performance	Use proven approaches. Can be leased, or can contract with separate companies	Private sector can bear
Financial	Debt cost too high, equity unavailable	Public guarantee of private borrowing	Public or private guarantors

New (Real) HSR Systems: Operating Risks

	Type of Risk	Allocation and/or Mitigation Measures	Who is Best Suited to Bear the Risk?
Revenue (Demand and Price)	Demand or allowed prices too low	Avoid over optimism, define and enforce regulatory regime. Public can guarantee minimum demand levels	Public (gross cost franchise) has become typical. Net cost franchises would transfer risk to franchisee
Train operations costs	Low demand causes unit costs to be too high or overoptimistic cost estimates	Competition for train operations, or a part of franchise award	Private sector can bear cost estimates within agreed demand levels. Public sector bears risks outside agreed levels
Energy Supply and Costs	Energy supply restricted or costs too high	Futures or long term contracts	Public may need to assume risks of major supply or cost shocks due to international disturbances.
Infrastructure Maintenance	Costs too high, or poor coordination with operations	Contract maintenance under enforceable agreement with operations dispatching	Private sector can bear risks
Rolling Stock Maintenance	Maintenance costs too high, or reliability and availability too low	Contract maintenance under enforceable agreement with supplier. Use leasing and/or restrict to experienced suppliers	Private sector can bear risks
Public support	Public support inadequate or not paid in full or on time	Enforceable agreements subject to international arbitration	Public

Public/Private Benefits and Costs



	Private net benefits	Public net benefits	Outcome	When could this happen?	Remarks
Case I	+	+	Project should go ahead	Rail project is profitable to the private operator with purely private financing, and it reduces road or air congestion, reduces total emissions or improves road or air safety	Private sector will do; no PPP needed, but some public coordination needed. Very rare case
Case II	+	-	If private net benefits are sufficiently > public net dis-benefits, regulation or tax can shift enough benefits from private to public for project to go ahead. If not, project should stop.	Rail project is profitable to the private operator with purely private financing, but it generates added road or air congestion, increases total emissions, reduces road or air safety, or causes undesirable development	PPP is appropriate if benefits and dis-benefits can be balanced. More likely for air than for HSR.
Case III	-	+	If net public benefits are sufficiently > than private losses, then public support (capital or operating) can cause the project to go ahead. If not, project should stop.	Rail project is unprofitable to the private operator, but it improves road or air congestion, improves road or air safety, or reduces total emissions	PPP is appropriate if benefits and dis-benefits can be balanced. Possible case for some HSR corridors
Case IV	-	-	Project should not go ahead	Rail project is unprofitable and it adds to road or air congestion, increases total emissions or increases accidents	Should not be done by either private or public sector. Less common, but possible if rail load factors are too low

"Private net benefits" = revenues from passengers and ancillary sources minus private operating and financial costs

"Public net benefits" = value of reduced congestion, emissions, accidents, etc, minus and public operating and capital costs

How the PPP Options Function

	Right of Way	Track	ET	Signals	Rolling Stock	Operations	Attributes (why do it?)	Risk allocation	Examples
Full Public Operation							Full public transparency. Most popular model when social benefits are dominant. Would not function well as a competitive business.	Fully public	China, Korea
Management contract						Can be Multiple Operators	Mostly social benefits, but permits more efficient operation through competition for the management contract. Pricing done by public, securing social benefits.	Some operating cost risk potentially transferred	Capitol trains in California
Gross Cost Franchising (UK, EU suburban and regional)					UK has separate ROSCOs	Can be Multiple Operators	Can provide competition in or for the market if desired. Usually awarded for shorter periods to enhance public involvement, which requires that rolling stock be handled separately.	Gross cost transfers only operations cost risk.	Most UK franchises short haul, Germany, Sweden, NL franchises
Net cost franchising or Concessioning		Franchise does maint.	Franchise does maint.	Franchise does maint.		Can be Multiple Operators	Usually for 30 years or more. Minimizes public outlay and maximizes positive concession payments to the public.	Can transfer demand and construction and operating cost risks	Argentina, Brazil, Mexico
BOOT						Can be Multiple Operators	Fundamentally works when public is only needed to define the activity and secure the ROW.	Can transfer all risks	Taiwan (at first)
Exclusive BOO							Works when private benefits exceed private costs. Limited or no transparency for public.	Can transfer all risks	Channel Tunnel
Infrastructure Franchise							Shifts infrastructure investment burden to private sector	Transfers (?) maintenance cost risks, but public faces a monopoly supplier.	London Tube or Railtrack (both now defunct)

 indicates public ownership or control
 indicates private ownership or control

Important Terminology

- **“Gross Cost” franchise** (or concession): franchise takes the cost risk for delivering a required investment and level of service while the (public) franchisor takes the risk if demand or revenues fall below expected levels.
- **“Net Cost” franchise**: franchise makes all demand forecasts (including prices and revenues) and takes all risks if demand forecasts are wrong
- Experience to date: gross cost franchises are better for services with mostly social reasons whereas net cost franchises are better for “commercial” services offered in competition with other modes.
- Painful experience: if net cost franchises fail due to low demand or overoptimistic bidding, franchises can usually force conversion to a gross cost approach.
- “Franchise” and “Concession” are often used interchangeably. “Franchise” is more often used to mean gross cost, while “concession” is more often used to mean net cost.

Realistic PPP Options for a New HSR System

- Public design/build (using contractors), private operator by **Management Contract**.
- **Gross Cost Franchise**. Public awards franchise to design, build and operate the system. Public specifies demand and fare levels and pays franchise the gross cost of providing the capacity required (revenues will be netted against costs). If the private sector finances the system, public payments will cover the financing costs no matter what demand actually occurs. Most U.K. short haul franchises are gross cost but infrastructure risks are borne by Network Rail and rolling stock risks by ROSCOs.
- **Net Cost Franchise**. Public awards a franchise for minimum support payment by, or maximum contribution from franchise. Franchise is responsible for projecting demand and designing appropriate capacity. In principle, the franchise carries the demand risk and the financing risk. Eurotunnel is a net cost franchise. Some long haul U.K. franchises (Virgin West Coast) are supposed to be net cost franchises.
- **Multiple Operators**. While Asian systems have only one operator, E.U. systems can have multiple operators on the same line. This can either be an HSR, intercity, suburban and freight mix, or (as is emerging) competing HSR operators on the same line. The existence of multiple operators requires some form of access control and, usually, access charges for all users.
- **Franchise Period**. The franchise period is directly related to the lifetime of the assets that the franchise must finance. In U.K. franchises, where Network Rail handles infrastructure and ROSCOs finance rolling stock, the franchise life can be 5-10 years. When the franchise is expected to finance infrastructure or significant rolling stock, franchise life has to be 25 years or more, and some type of repurchase agreement is needed if the franchise ends before that time.

PPP Risks and Financing

Option	Risk Management	Financing	Remarks
Management Contract	Public sector takes all design and construction risks. Contractor may take some operating cost risks if demand is as specified by public sector	All financing from public except for working capital needed by contractor. Rolling stock may be leased, but will be guaranteed by public owner	Common approach for non-commercial activities (NASA facilities) where risk is high. Less appropriate where contractor has to compete with other operators
Gross Cost Franchise	Public sector takes investment (including environmental and schedule) and demand risks, franchise takes operating cost risk within specified demand levels	Public responsibility, though franchise can be required to provide financing (but with public guarantee). Public and private can share investment with agreed payback approach	Common approach when the benefits are heavily social and commercial activity is secondary
Net Cost Franchise	Demand risk, and some part of investment risk shifted to franchise	Private sector can provide more financing, but some forms of public contribution or guarantee are always required	More appropriate for mostly commercially oriented activities, or which HSR could be an example if demand risk were manageable