





The Recent Progress of Hokuriku Shinkansen and Its Way to Completion

- A Reevaluation of The Japanese Constructiong High-speed Rail -

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Introduction

Japan

Tokaido Shinkansen

1964



Introduction



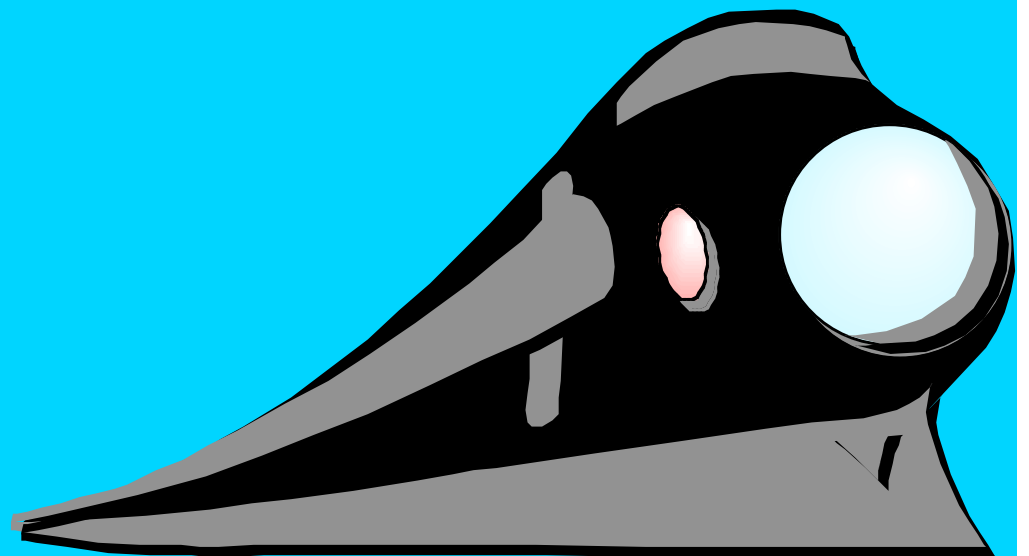
Japan	Tokaido Shinkansen	1964
France	TGV	1981
Italy	Direttissima	1988
German	ICE	1991
Spain	AVE	1992
France / England	Eurostar	1994

Introduction

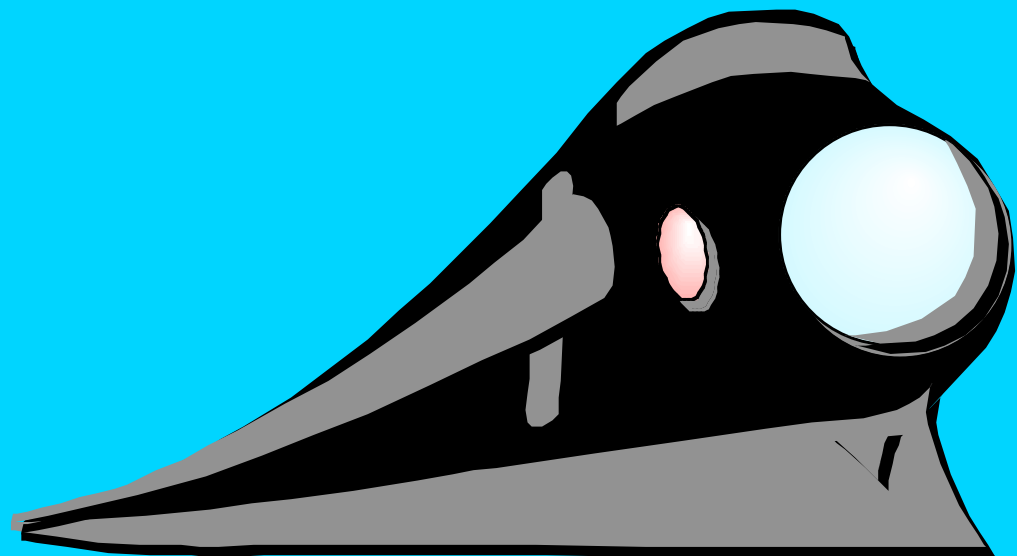
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France	TGV	1981
Italy	Direttissima	1988
German	ICE	1991
Spain	AVE	1992
France / England	Eurostar	1994
USA	Acela Express	2000
:	:	:
China		coming soon
South Korea		coming soon
Taiwan		coming soon

Now bullet trains will be operated in almost every developed country.

Shinkansen:

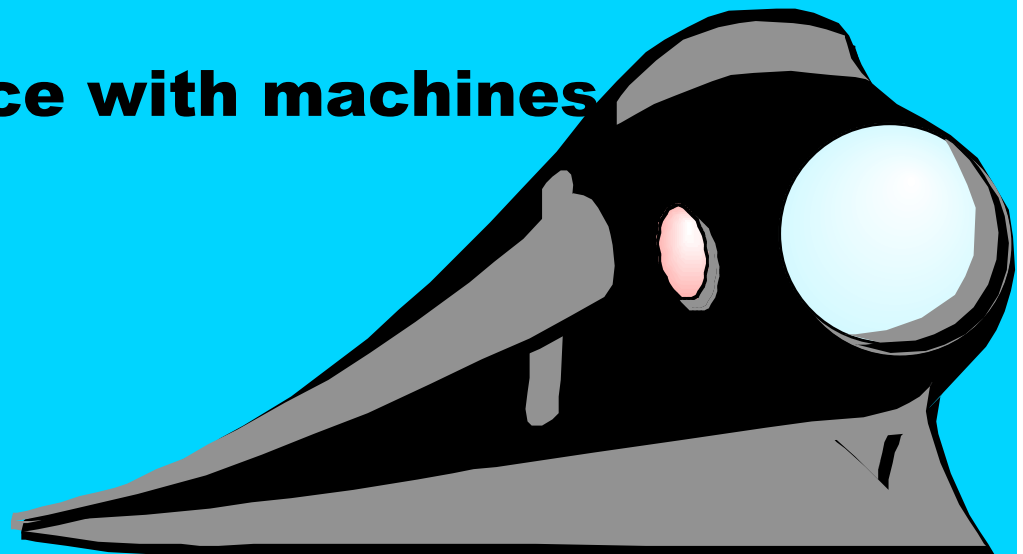


Shinkansen: over 200 km/h (max 300 km/h)

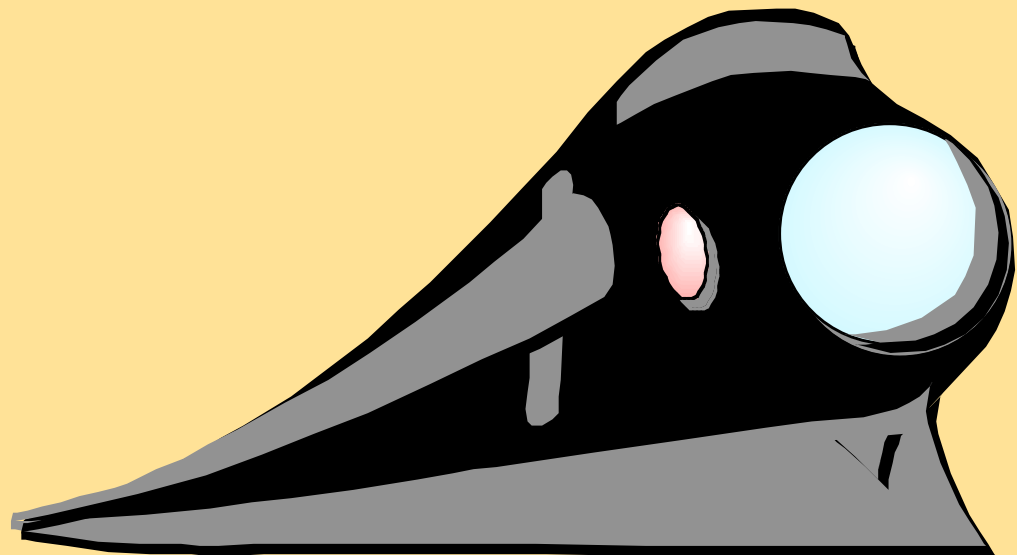


Shinkansen: over 200 km/h (max 300 km/h)

- 1) No road crossing (overpass or under pass)**
- 2) 30~70 km apart from each stations**
- 3) Few switch rails (no crossing rails)**
- 4) Gentle curve**
- 5) Gentle slope**
- 6) High-performance car: high-power moter, air suspension, small current collector...**
- 7) Cab signal (with automatic breaking system)**
- 8) Centralized Traffic Control**
- 9) Heavy rail truck**
- 10) Rail truck maintenance with machines**

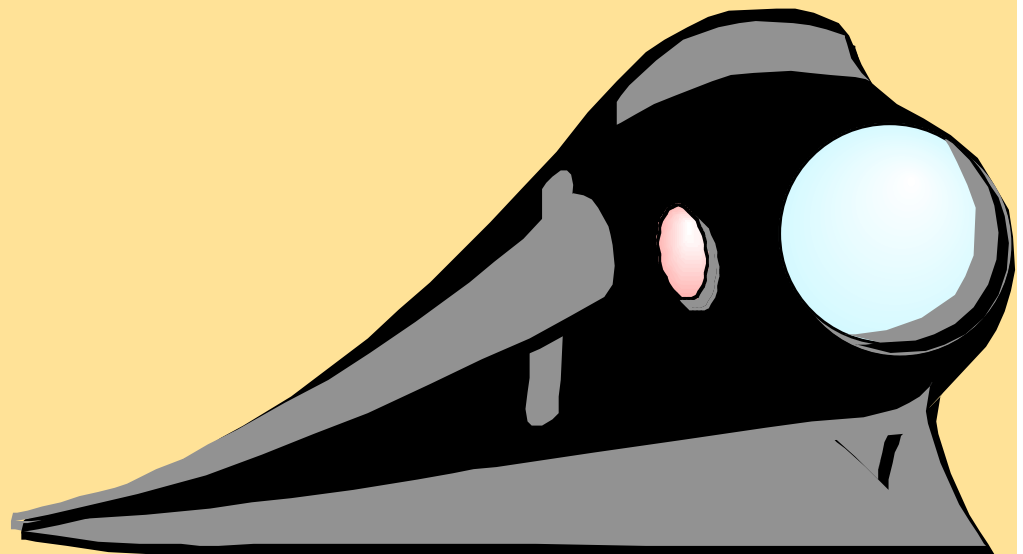


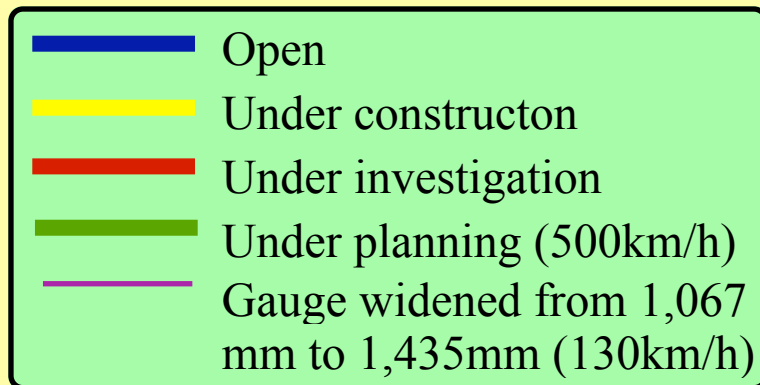
Shinkansen:



Shinkansen:

- a) can make a good profit (if without loans)**
- b) is not a huge investment ~~compared with G.R.P.~~**
- c) ~~one of~~ the best transportations for environment**
- d) its mortality rate is almost completely zero**
- e) can carry so many persons**
- f) has a strong competitive power**
at 200 - 800 km range
- g) can reduce traveling hours and fare**





0 500Km

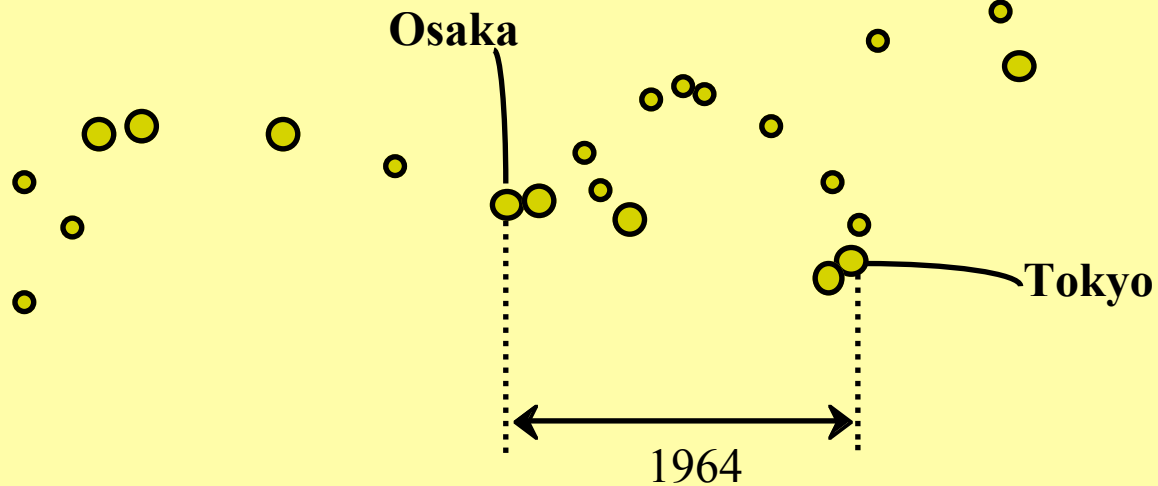


Figure 1. Shinkansen Network in Japan (2002)

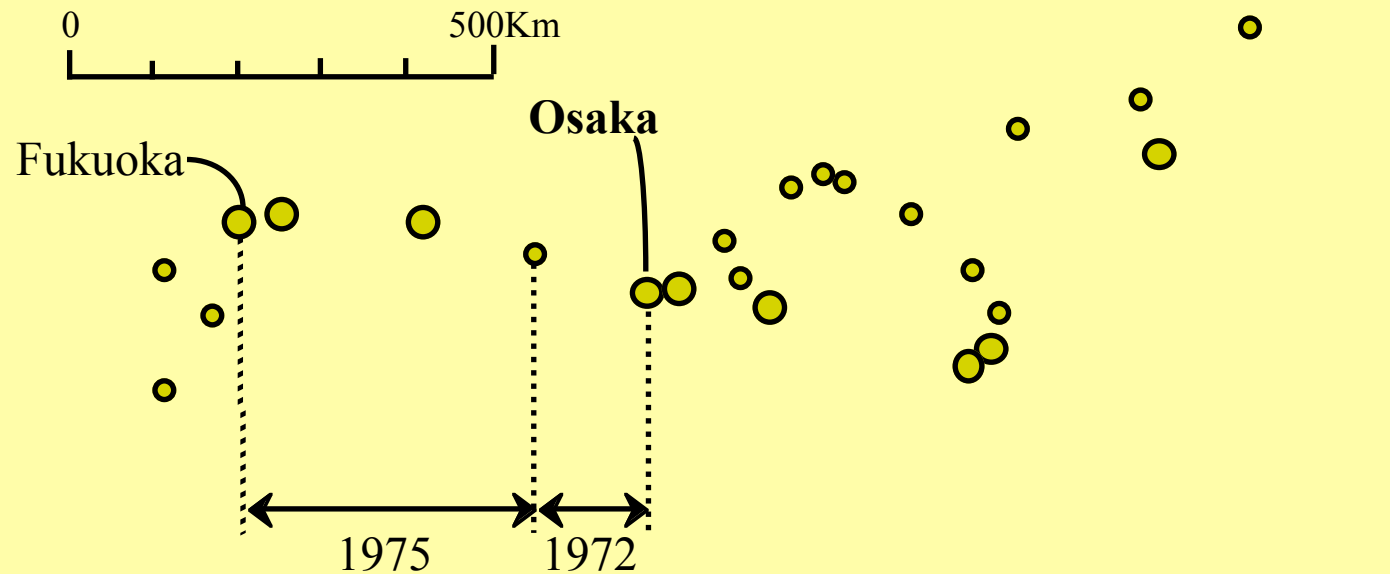
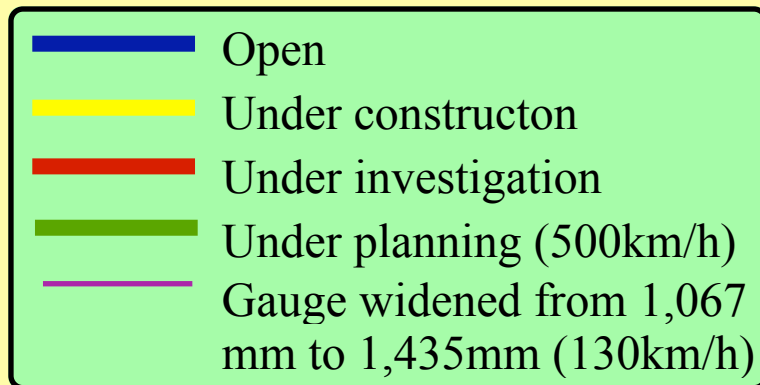


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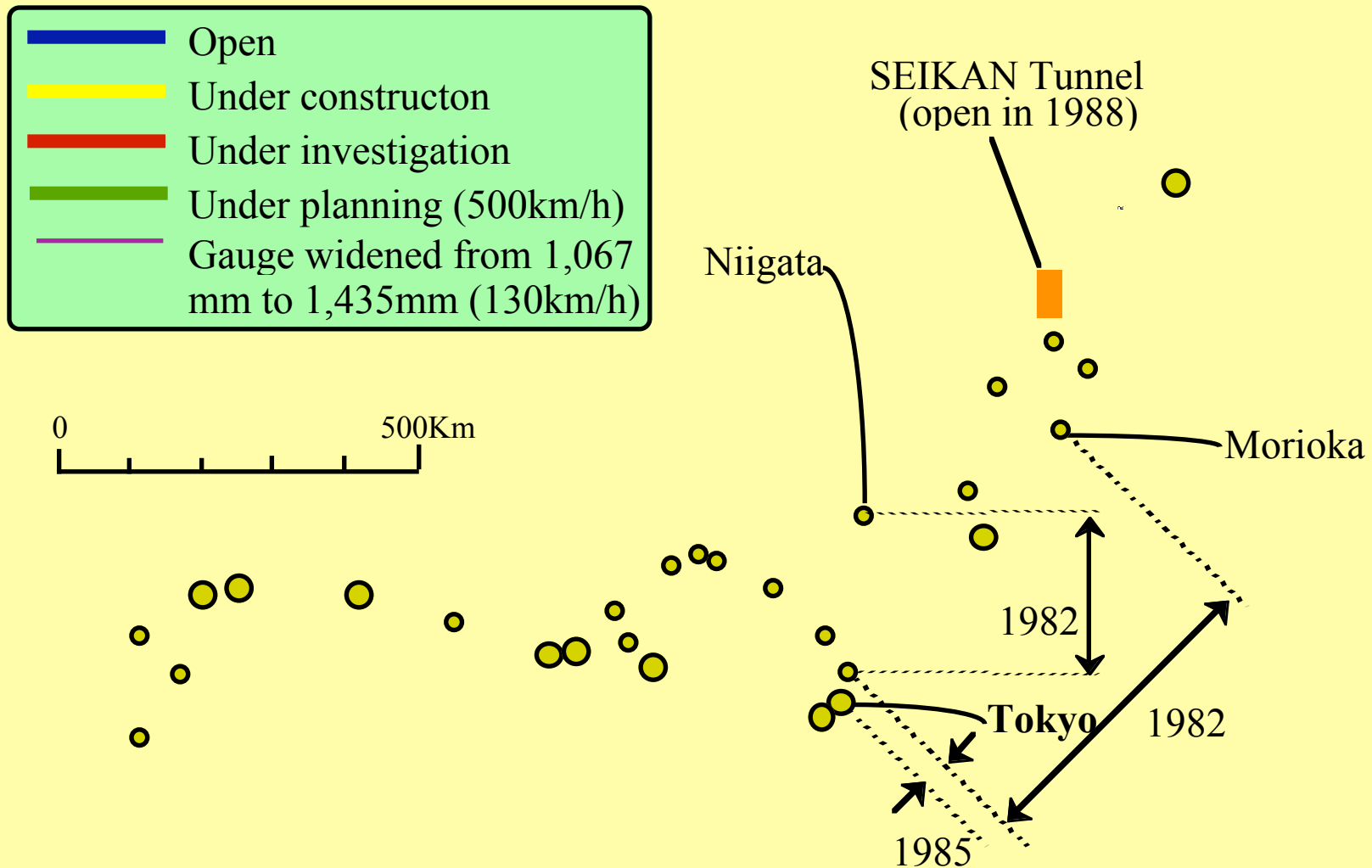


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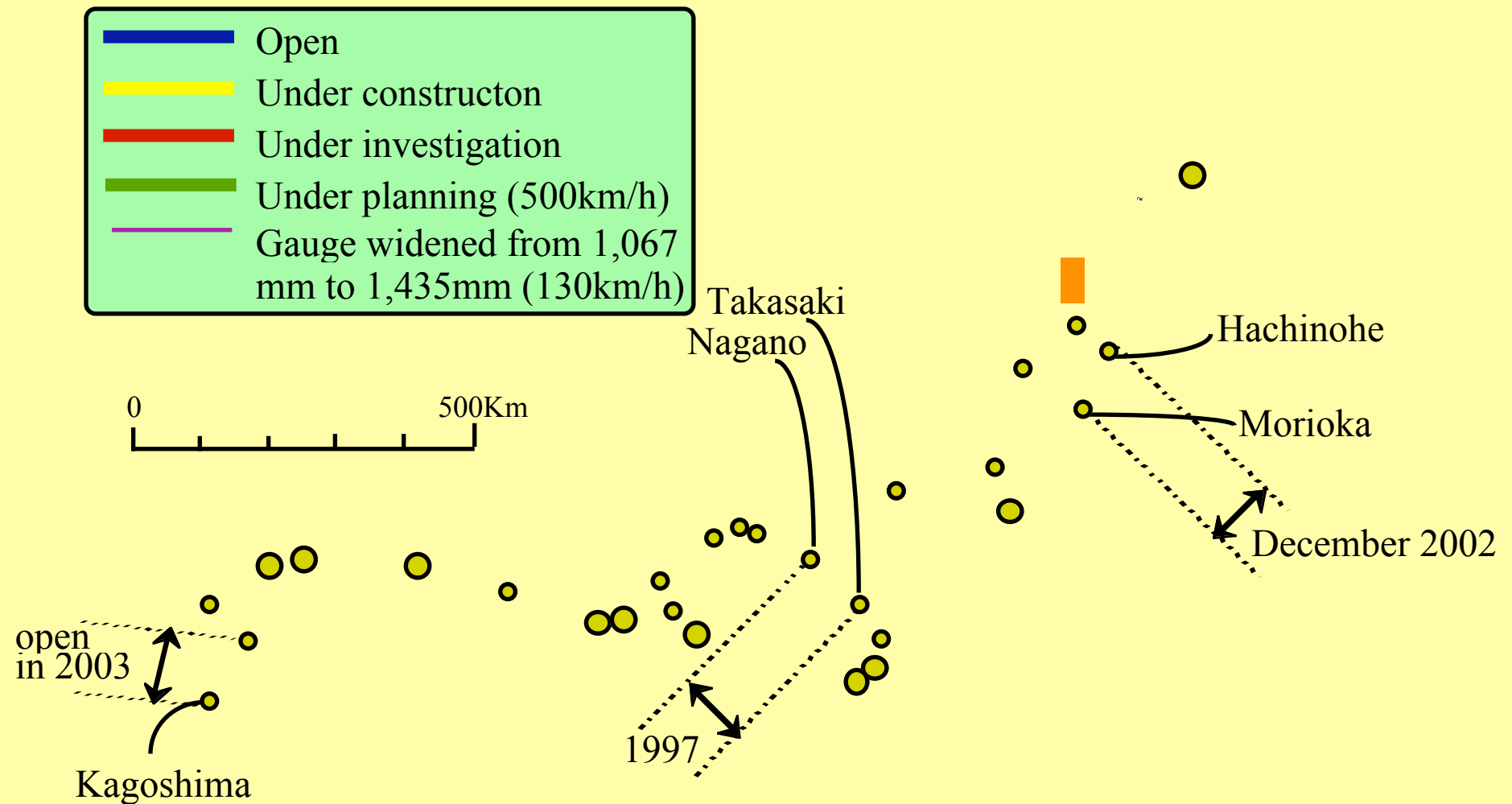


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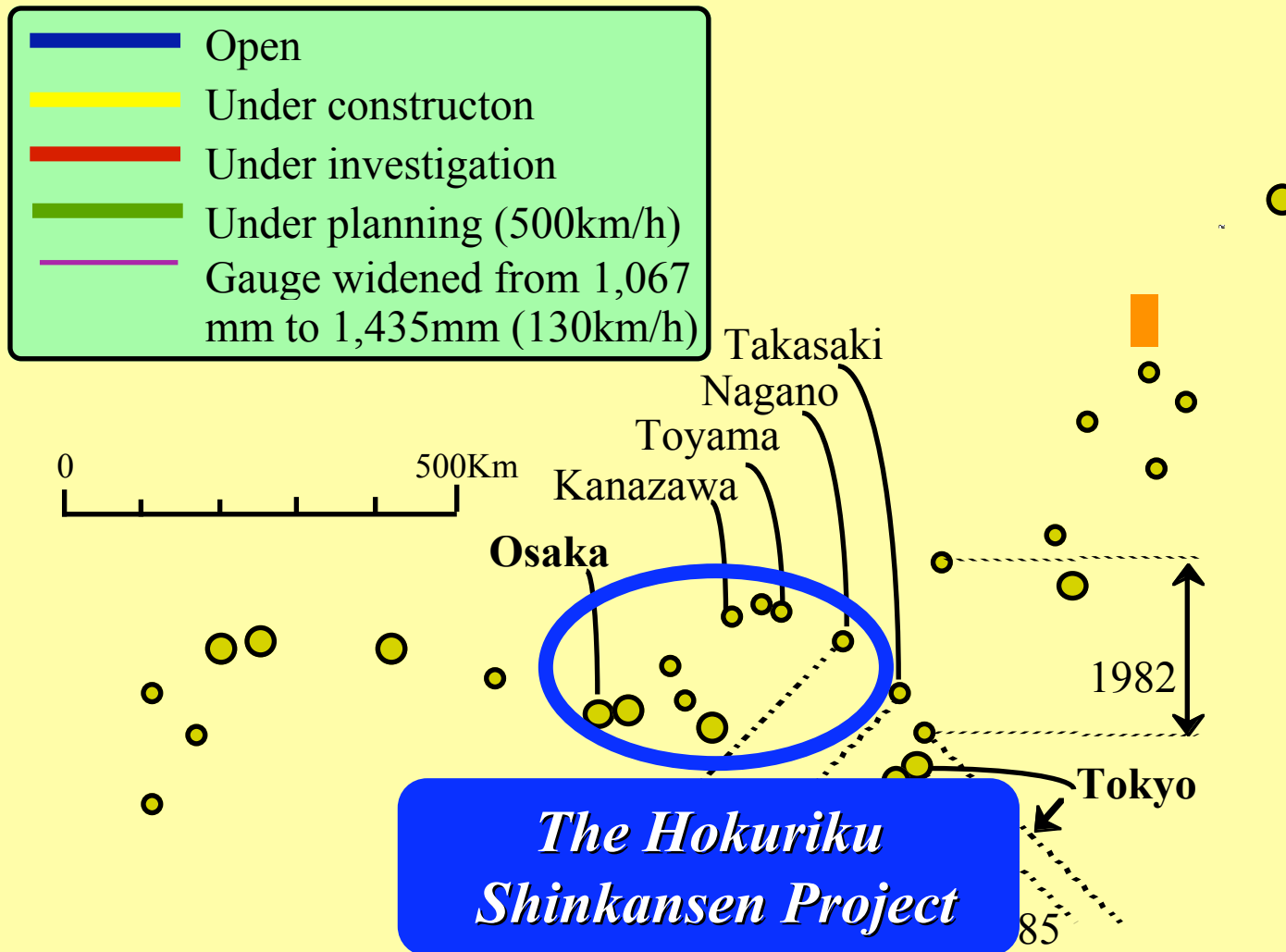


Figure 1. Shinkansen Network in Japan (2002)

The aim of this study is ...

- **suggesting the argument about a completion of Project Hokuriku Shinkansen**
- **through a comparative study on routing issue**
- **of the final section (Tsuruga - Osaka)**

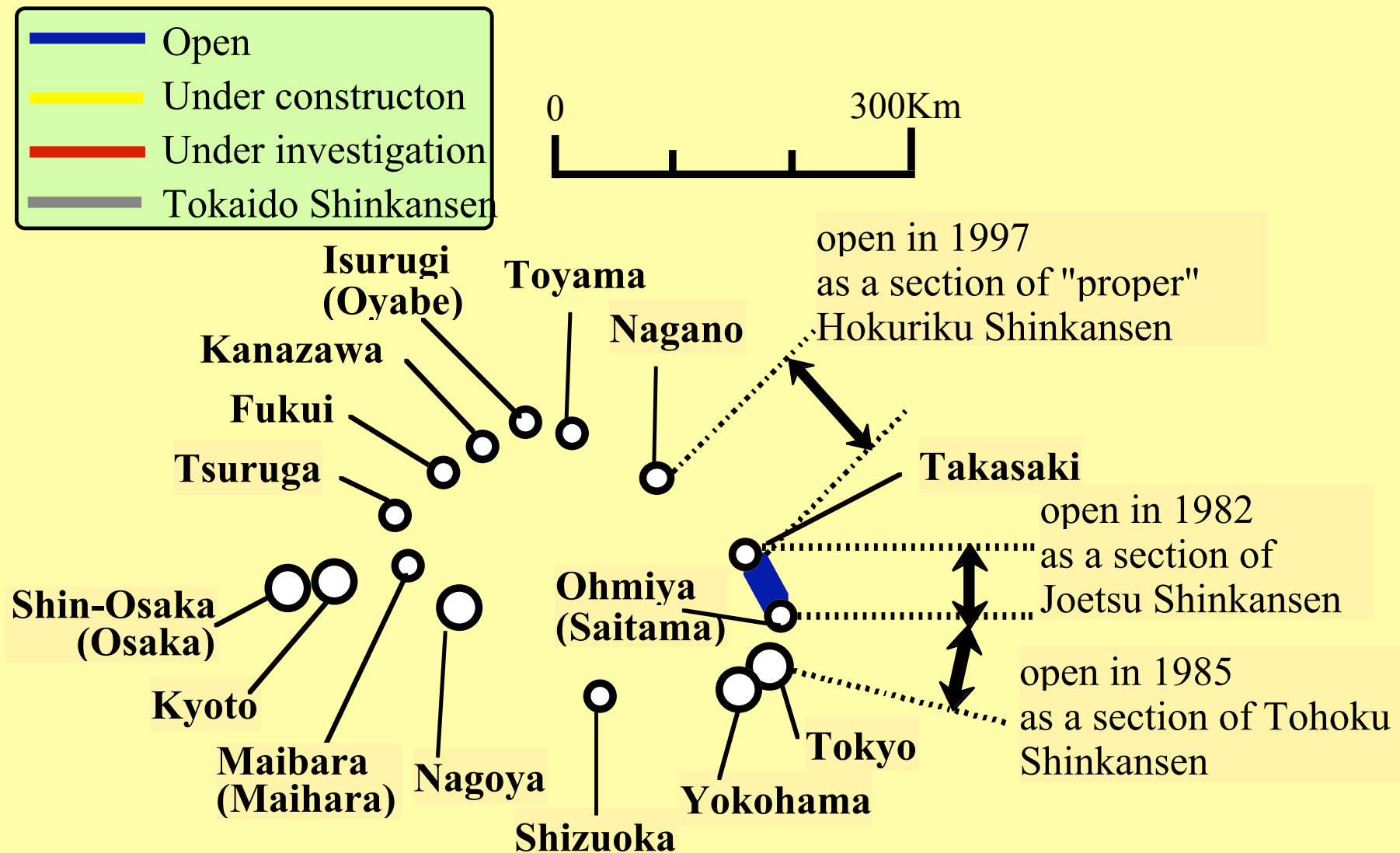


Figure 8. Location of Project Hokuriku Shinkansen

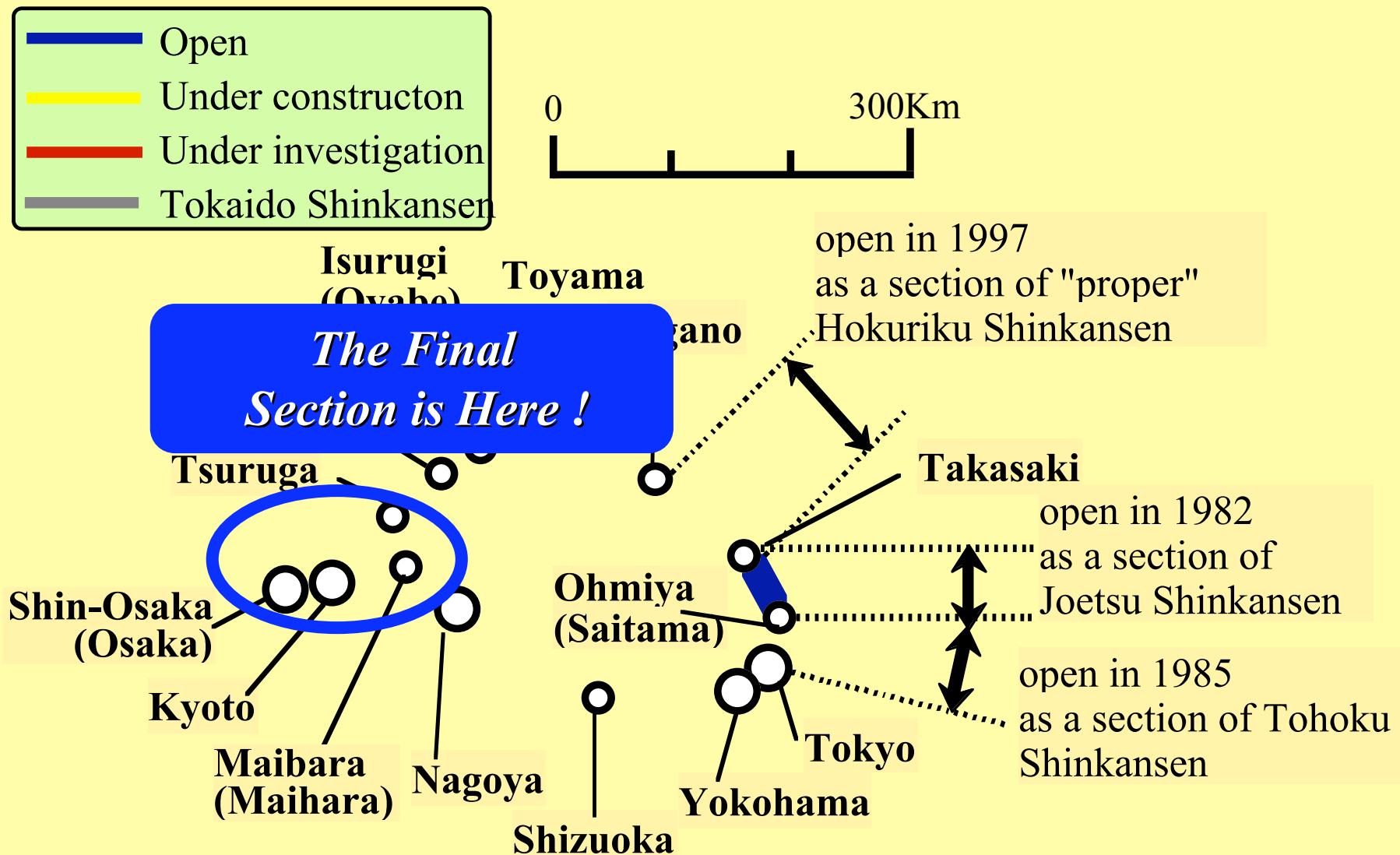


Figure 8. Location of Project Hokuriku Shinkansen

Three Routes from Tsuruga to Osaka

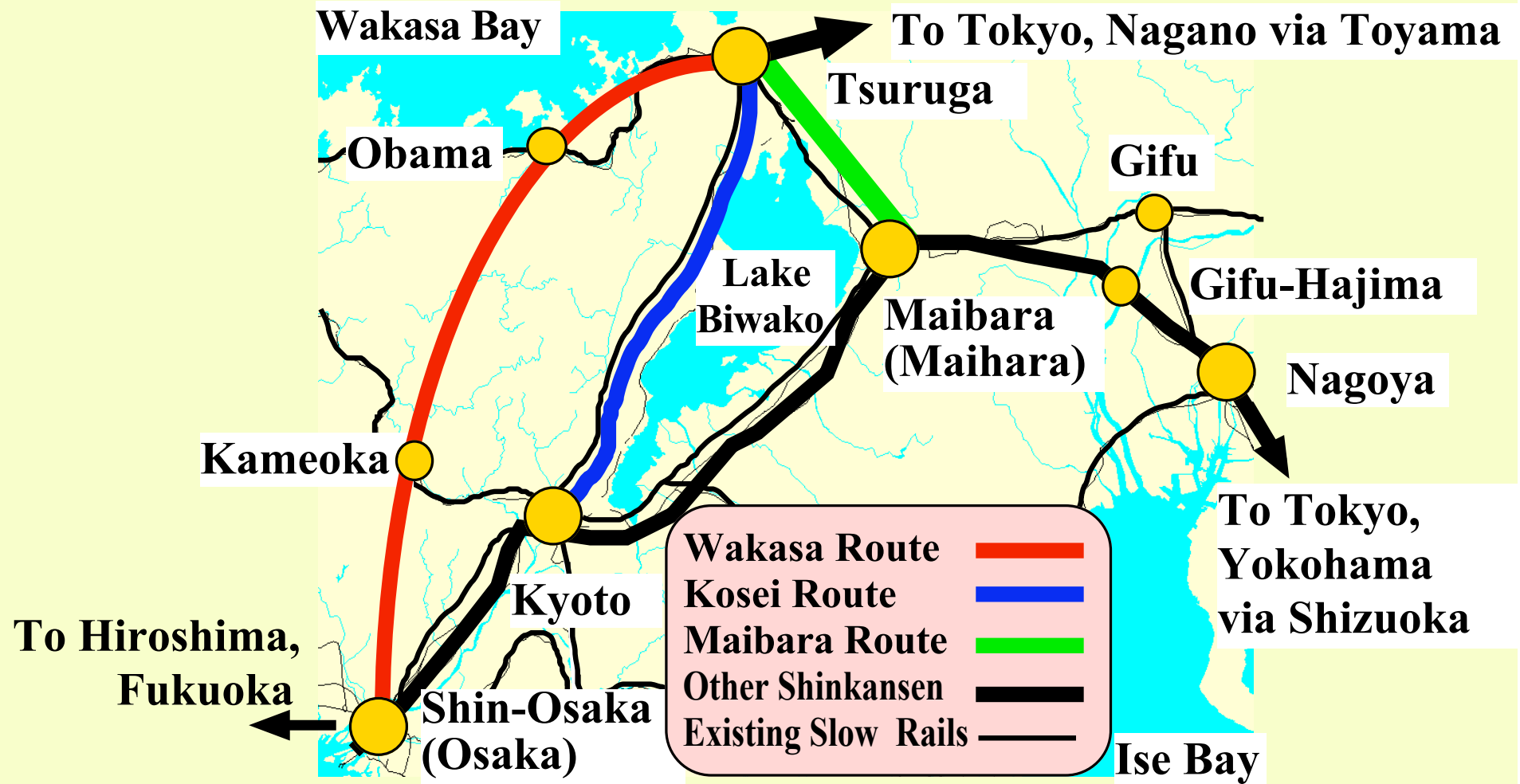


Figure 9. Principal Route Plans Between Tsuruga and Osaka

Passenger Flow to Hokuriku Area

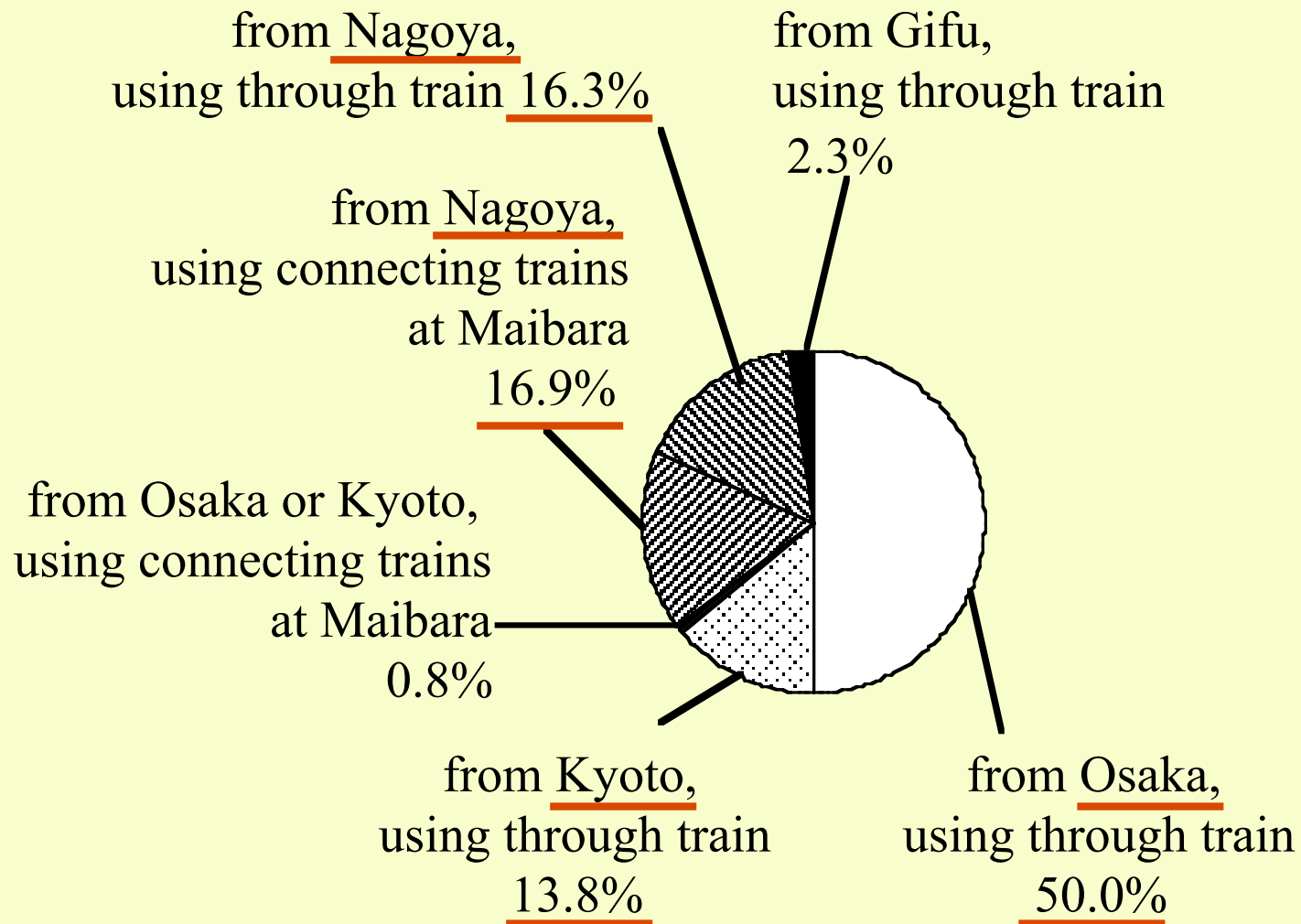


Figure 10. Percentage of Passengers for Hokuriku Area

Settings for Comparison (1)

Wakasa Route :

the full Shinkansen standard

1,435 mm gauge

260 km/h

Kosei Route:

Gauge Changeable Train

1,435 mm or 1,067 mm dual use

160 km/h

Maibara Route:

the full Shinkansen standard

Settings for Comparison (2)

Unit cost of full track:

7.1 billion yen/km (Takasaki - Nagano)

The schedule speed:

the full Shinkansen standard line:

206km/h (the same as Nozomi super express)

Kosei Line:

131 km/h

Minimum transfer time:

Seven minutes

Fare:

the full Shinkansen standard line:

the same rate as the Tokaido Shinkansen

Kosei Line:

the class A fare system of JR express train

Features of the three routes (1)

Table 1. Features of the 3 Routes from Tsuruga to Osaka

Route	Existing Rail	Wakasa Route	Kosei Route	Maibara Route
Track standard	Narrow gauge	The full Shinkansen standard	Raised track with narrow gauge	The full Shinkansen standard
Train Top speed	130 km/h	260 km/h	160 km/h	260 km/h
Length of New Track	---	128 km	(94 km)	46 km
Construction Cost	---	922.9 billion yen	---	330.9 billion yen
Influences on the Other Rails	---	---	Commuter / Freight trains on existing lines	Tokaido Shinkansen
Trainset	---	Standard	Fewer capacity	Standard
Other Problem	---	Track layout of Shin-Osaka terminal	Gauge changeable bogie is under development	Track layout of Maibara junction

Features of the three routes (2)

Table 1. Features of the 3 Routes from Tsuruga to Osaka

Route		Existing Rail	Wakasa Route	Kosei Route	Maibara Route
Tsuruga to Shin- Osaka	Via	(Kyoto)	---	(Kyoto)	Maibara
	Distance	133 km	128 km	133 km	153 km
	Time	75 min.	38min. (-37min.)	65min. (-10min.)	52min. (-23min.)
	Fare	4,500yen	5,130yen (+630yen)	4,500yen (+0yen)	5,440yen (+940yen)
Tsuruga to Kyoto	Via	---	Kameoka	---	Maibara
	Distance	94 km	108 km	94 km	114 km
	Time	53min.	50min. (-3 min.)	43min. (-10min.)	34min. (-19min.)
	Fare	3,280yen	4,700yen (+1,420yen)	3,280yen (+0yen)	4,810yen (+1,530yen)
Tsuruga to Nagoya	Via	(Maibara)	Kameoka, Kyoto	Kyoto	Maibara
	Distance	228 km	243 km	228 km	112 km
	Time	70min.	93min. (+23min.)	86min. (+16min.)	39min. (-31min.)
	Fare	5,020yen	8,900yen (+3,880yen)	7,640yen (+2,620yen)	5,130yen (+110yen)

Construction Cost vs User Benefit

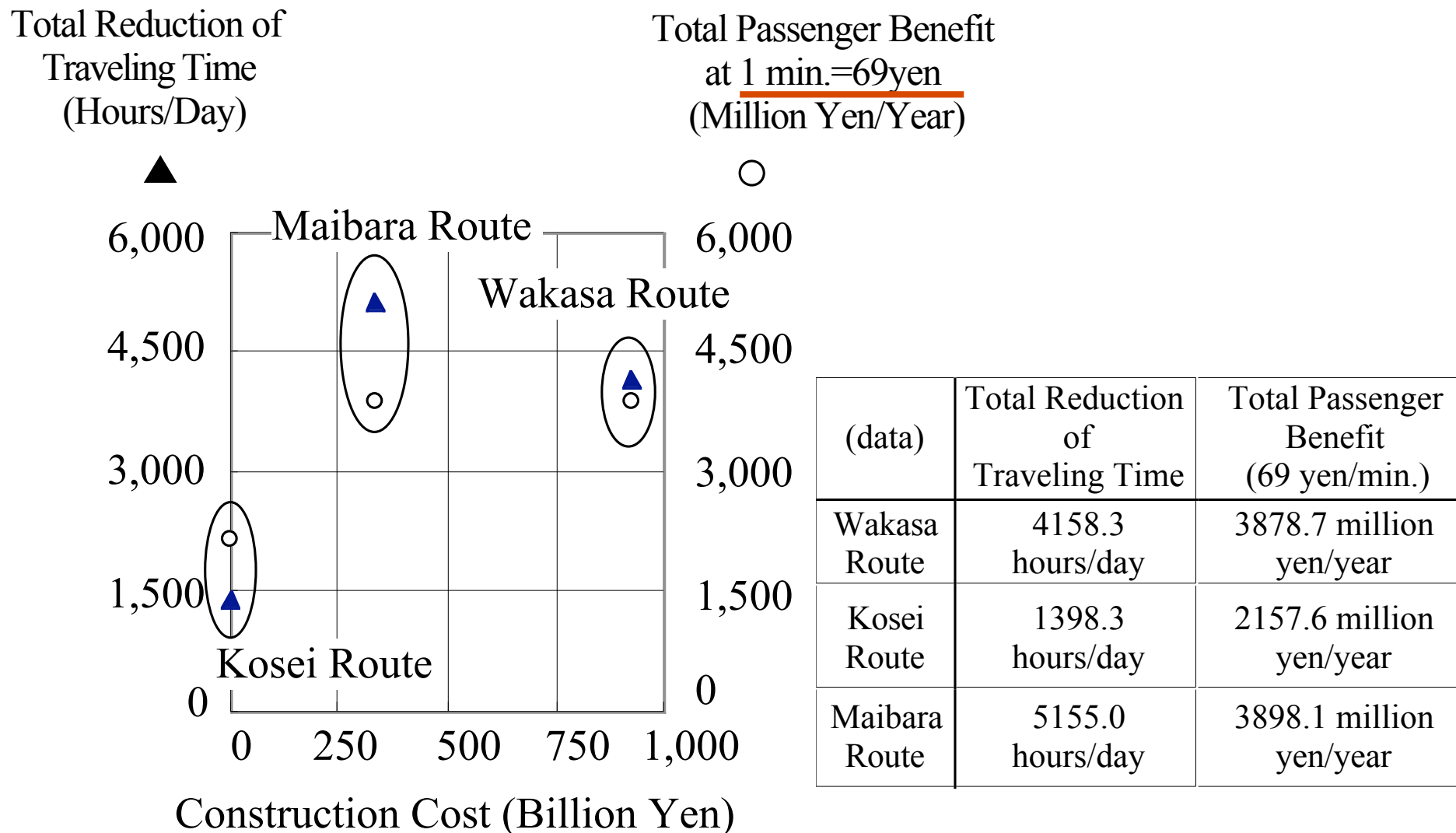


Figure 12. Construction Cost and User Benefits (1995)

Traffic on the Tokaido Shinkansen

Table 2. Traffic on the Tokaido Shinkansen

Section	Direction	Passengers	Seats	Passenger Load Factor
At the West of Shin-Yokohama Station	Westbound	123,900	163,800	<u>75.6 %</u>
	Eastbound	116,600	165,100	70.6 %
At the East of Nagoya Station	Westbound	115,700	159,900	72.4 %
	Eastbound	109,800	154,700	71.0 %
At the West of Nagoya Station	Westbound	102,000	154,700	66.1 %
	Eastbound	93,100	149,500	62.8 %
At the West of Maibara Station	Westbound	98,700	154,700	63.8 %
	Eastbound	91,400	149,500	61.1 %

Potential Ability of the Tokaido Shinkansen

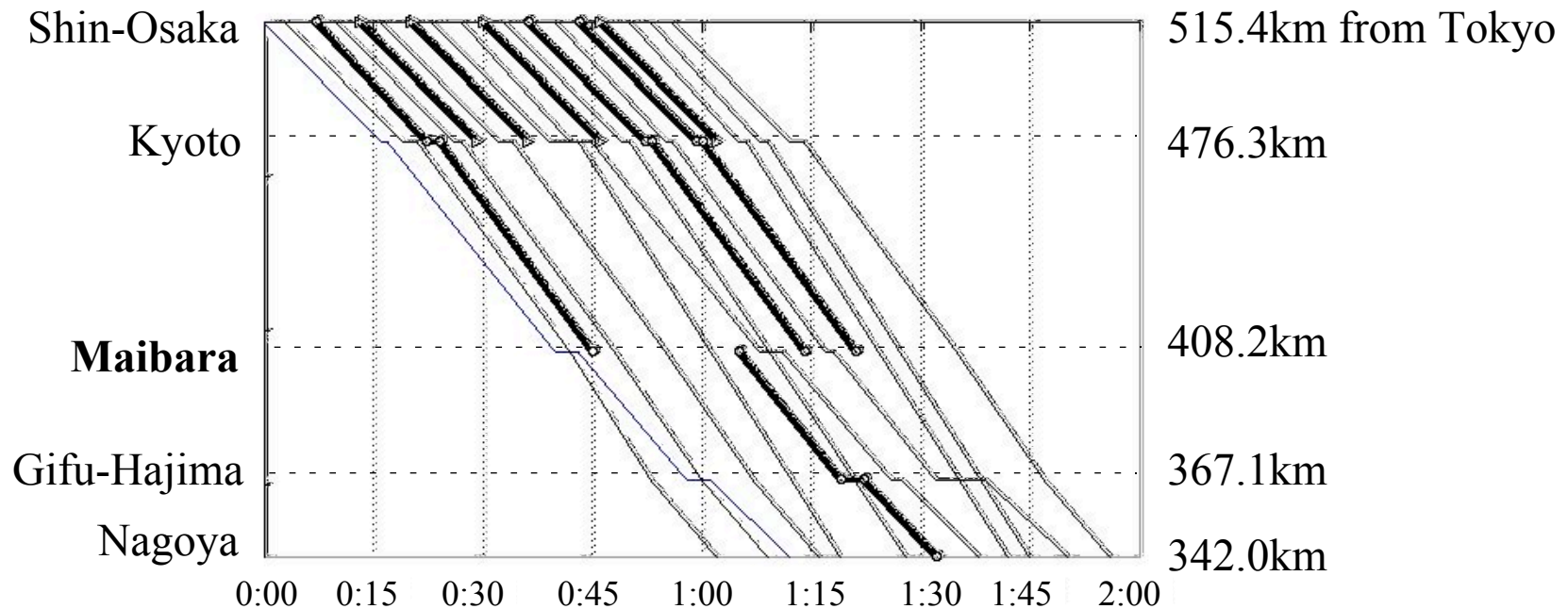


Figure 13. Potential Ability of the Tokaido Shinkansen Between Shin-Osaka and Nagoya
Trial Diagram for Additional Trains Based on Present Diagram (revised in Oct. 2001)

Case of Changing Trains at Maibara

Table 3. Estimated Traffic on the Tokaido Shinkansen (Case of Changing Trains at Maibara)

Section	Direction	Passengers	Seats	Passenger Load Factor
At the West of Shin-Yokohama Station	Westbound	123,900 (+0)	163,800	<u>75.6 % (+0.0pt)</u>
	Eastbound	116,600 (+0)	165,100	70.6 % (+0.0pt)
At the East of Nagoya Station	Westbound	115,700 (+0)	159,900	72.4 % (+0.0pt)
	Eastbound	109,800 (+0)	154,700	71.0 % (+0.0pt)
At the West of Nagoya Station	Westbound	104,400 (+2,400)	154,700	67.5 % (+1.4pt)
	Eastbound	95,800 (+2,700)	149,500	64.1 % (+1.3pt)
At the West of Maibara Station	Westbound	105,600 (+6,900)	154,700	68.3 % (+4.5pt)
	Eastbound	99,700 (+8,300)	149,500	66.7 % (+5.6pt)

Case of through train (trainset of 12 cars with 885 seats) Twenty-three trains from Osaka Fifteen trains from Tokyo

Table 4. Estimated Traffic on the Tokaido Shinkansen

(Case of Hokusiku Shinkansen Trains Slipping into the Tokaido Shinkansen)

Section	Direction	Passengers	Seats	Passenger Load Factor
At the West of Shin-Yokohama Station	Westbound	123,900 (+0)	157,600 (-6,200)	78.6 % (+3.0pt)
	Eastbound	116,600 (+0)	158,900 (-6,200)	73.4 % (+2.8pt)
At the East of Nagoya Station	Westbound	115,700 (+0)	153,700 (-6,200)	75.3 % (+2.9pt)
	Eastbound	109,800 (+0)	148,500 (-6,200)	73.9 % (+2.9pt)
At the West of Nagoya Station	Westbound	104,400 (+2,400)	148,500 (-6,200)	70.3 % (+4.2pt)
	Eastbound	95,800 (+2,700)	143,300 (-6,200)	66.9 % (+4.1pt)
At the West of Maibara Station	Westbound	105,600 (+6,900)	145,200 (-9,500)	72.7 % (+8.9pt)
	Eastbound	99,700 (+8,300)	140,000 (-9,500)	71.2 % (+10.1pt)

Checking Train Capacity of the Hokuriku Shinkansen

Case of “Potential Ability of the Tokaido Shinkansen” :

Osaka:

3 trains * 15 hours * 885 = 39,825 seats >> 13,200 seats

Tokyo(Nagoya):

1 train * 15 hours * 885 = 13,275 seats >> 6,600 seats

Case of “Changing Trains at Maibara” :

any amount of trains can be operated

Case of “Through train” :

Osaka: 23 trains * 885 = 20,355 >> 13,200 seats

Tokyo(Nagoya):

15 trains * 885 = 13,275 >> 6,600 seats

Some Tasks For Completion

Wakasa Route:

- * funding problem
- * access from Kyoto or Nagoya

Kosei Route:

- * low risk and low return
- * train schedule with commuter trains or freight trains
- * depends on the new designed trainset with fewer seats
- * improves nothing on Wakasa Area

Maibara Route:

- * connecting method to the Tokaido Shinkansen
- * some upgrading projects on the Tokaido Shinkansen
- * Project Chuo Shinkansen
- * funding problem
- * improves nothing on Wakasa

Conclusion

- * Maibara Route may be a good choice
at the point of users' benefit or convenience

If Maibara Route is selected...

- * A plan of changing trains at Maibara
is practicable
- * A plan of through trains
can be operated via Maibara

