

# Does the Passenger Train have a Future?

*DAVID BURNS*

*RAILROAD INDUSTRIAL ENGINEERING  
CONSULTANT*

*CHICAGO, USA*

# The Answer!

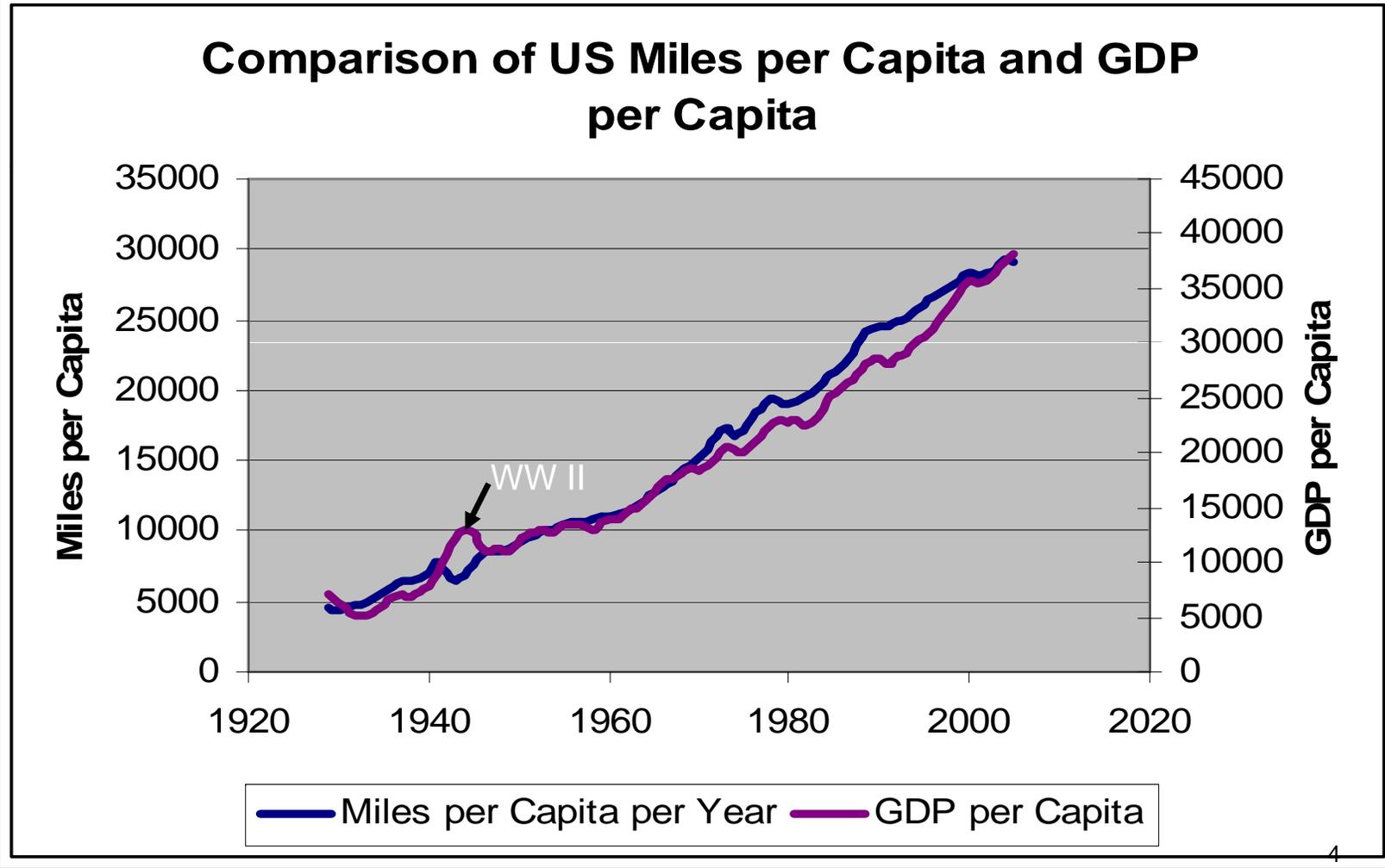
- YES
- NO
- MAYBE
  
- It depends on where it is

- **People want to travel for work and pleasure**
- **It started with the horse**
- **Then came the bicycle,**
- **Motor cycle,**
- **Car**

**Somewhere in this transition are the**

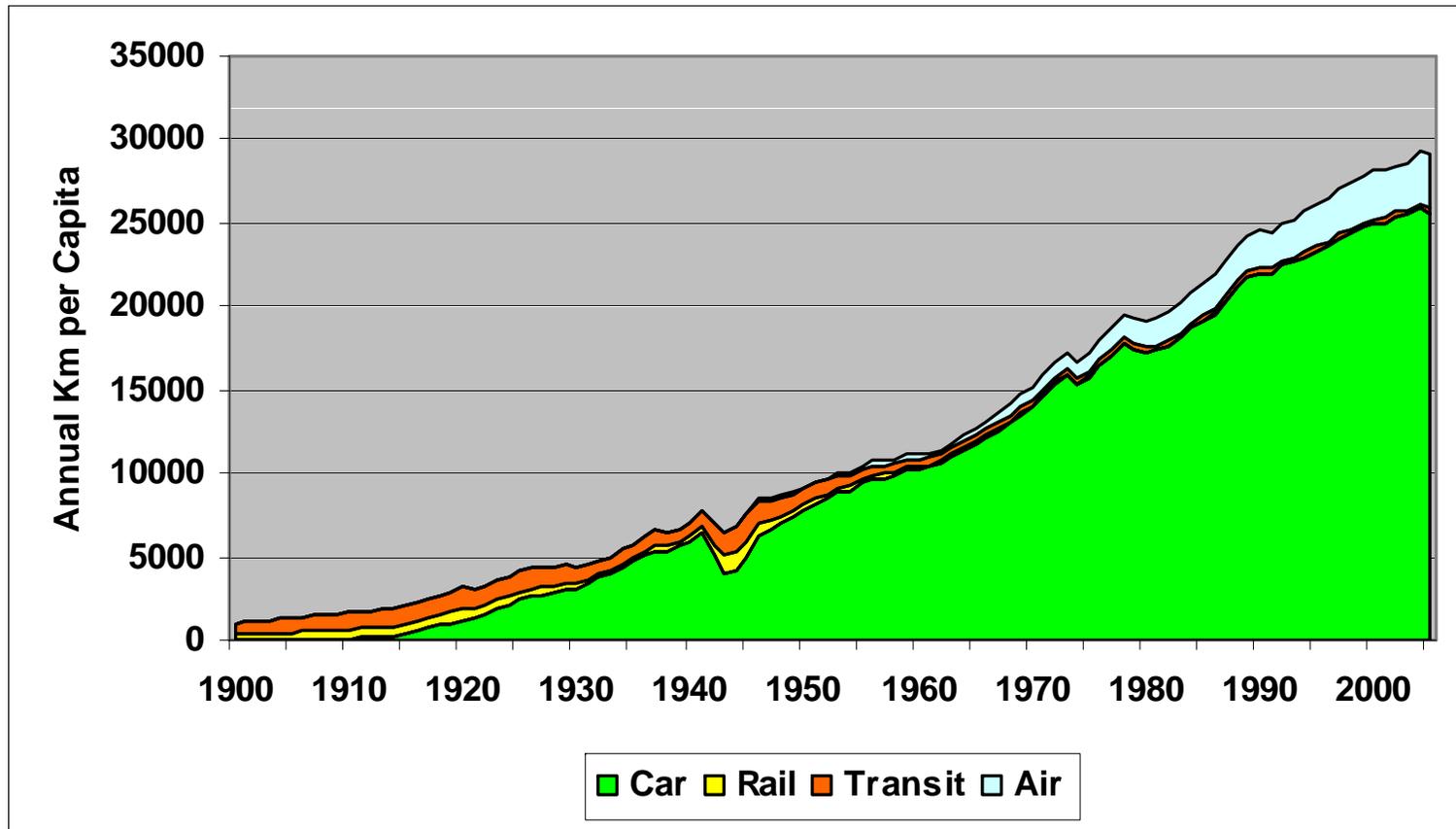
- **Urban, commuter, metro, and LRV trains**
- **Regional train**
- **Intercity and, perhaps, high speed trains**

# Travel is Proportional to Income

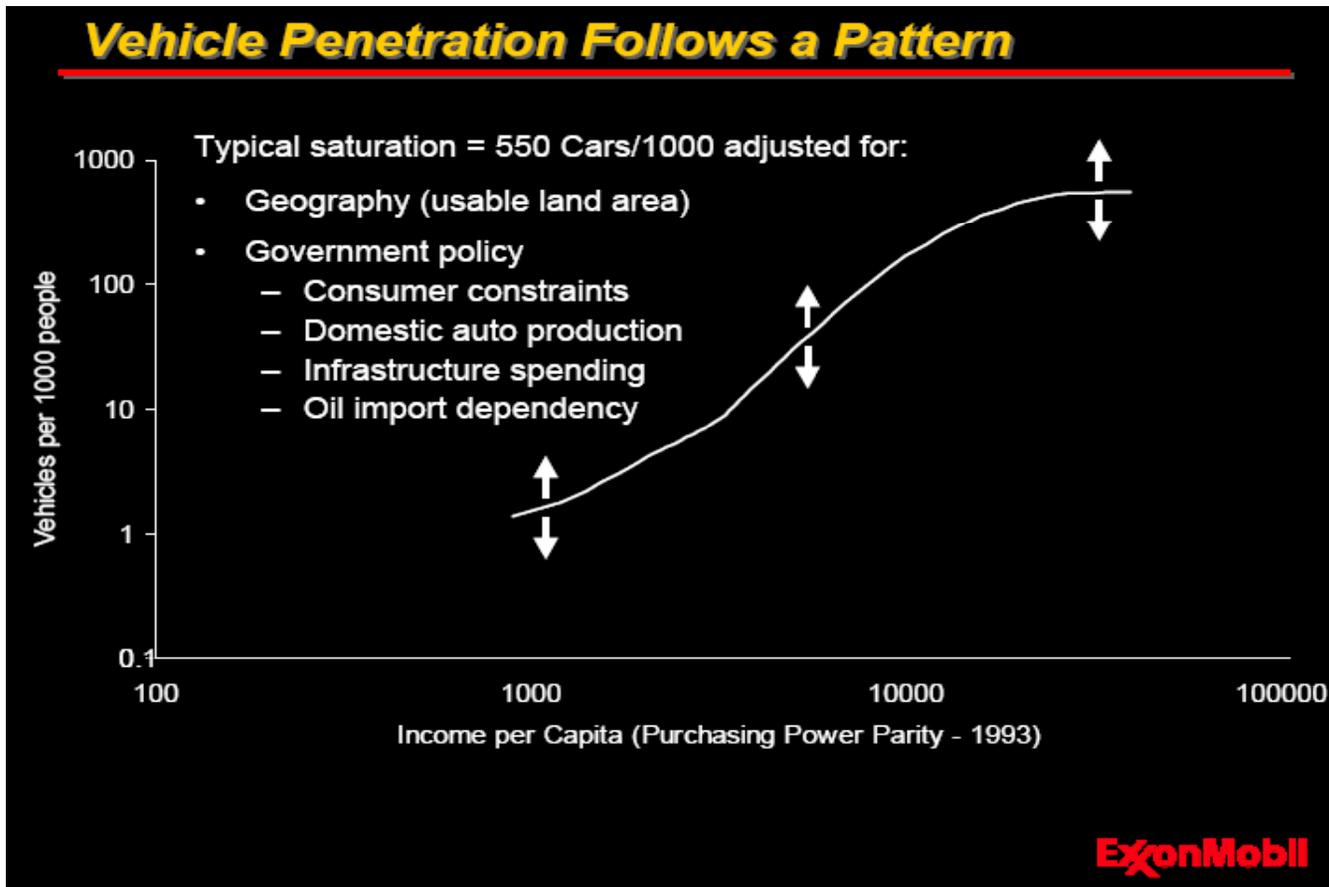


# As Income Increases, Mode Changes

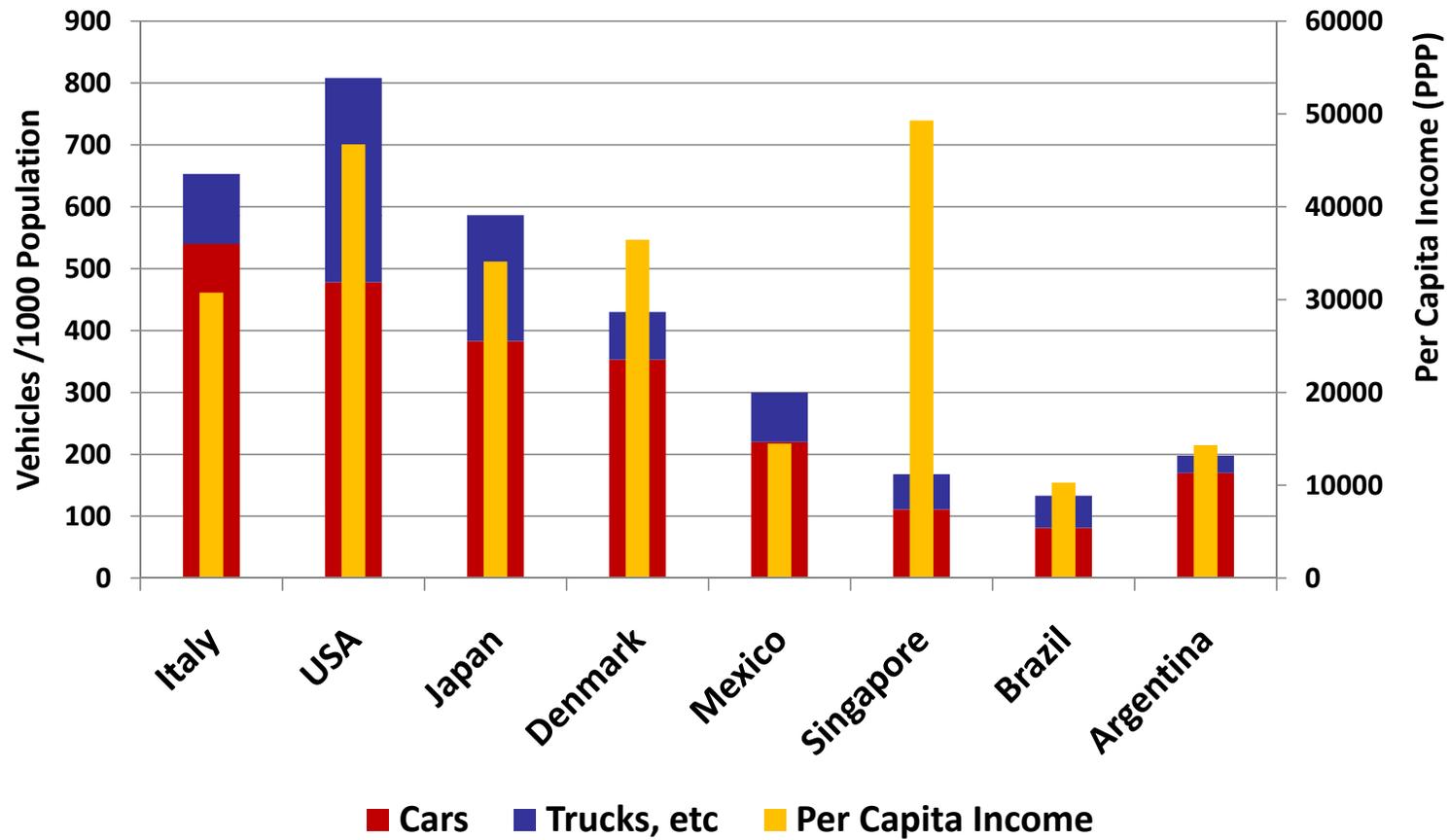
US km per Capita, by Mode



# Cars are inevitable



# Vehicles per 1000 population & Income



2005 data

# URBAN RAILWAYS

## Urbanization, a growing trend, why?

- More jobs
- Better jobs
- Better income
- Better social life

# The Urban Travelers' Choice



Which mode would you choose?



THE  
NANO

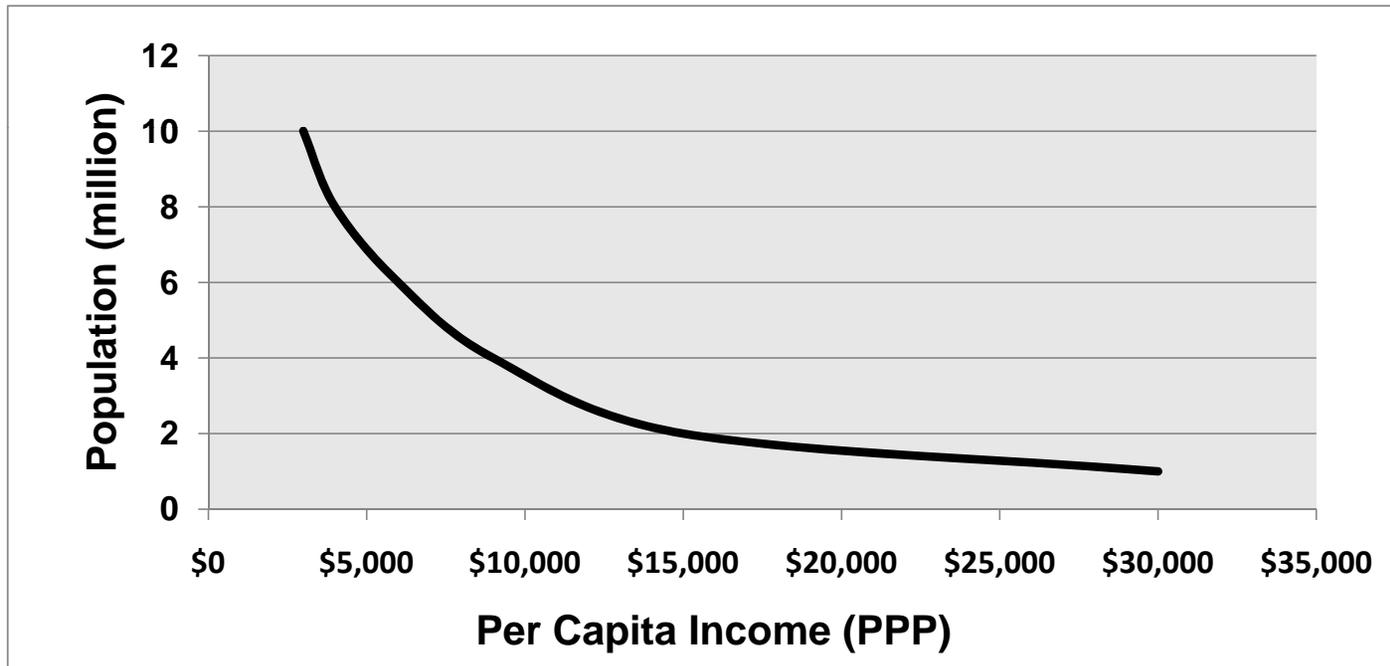
## Almost everybody will choose to own a car which increases congestion



### Which

- Increases pollution
- Increases lost time
- Increases the need for construction
- Lowers property values
- Etc.

## As Income and City Population Increase, Rail Mass Transit Becomes a Necessity



When does a city need to construct urban railways?

## So the City is Forced to Build an Urban Railway

There are basically 3 types:

- Light Rail Vehicles (LRV) or maybe Bus Rapid Transit  
Stations every 500 m      Route length 12 to 15 km
- Metro Rail  
Stations 1.5 to 4 km      Route length 15 to 30 km
- Commuter Rail  
Stations 4 to 10 km      Route length 25 to 80 km

**All are expensive! Except BRT**

## **Cost of Urban Rail – very expensive**

- **Beijing - \$75 million per km**
- **Delhi - above ground, \$24 million per km**
- **Delhi – underground, \$56 million per km**
- **Bangkok - above ground, \$55 million per km**
  
- **London - \$75 to \$360 million per km**
- **Los Angeles - \$100 to \$200 million per km**
  
- **However, Bus Rapid Transit (BRT) is as low as \$10 million per km**



**Bus rapid transit costs less than light rail, so why spend the extra money?**

## People want to ride the trains? BUT

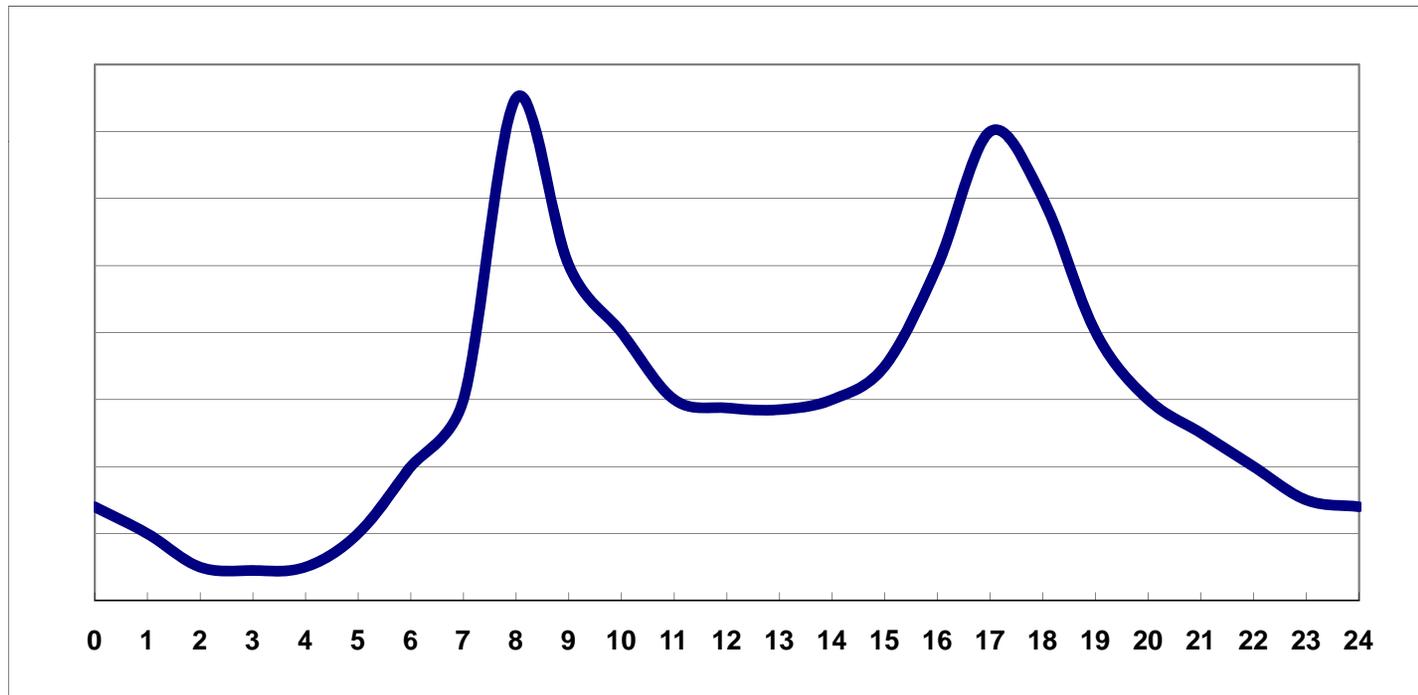
- **Given the choice, most people want to ride in their own air conditioned cars with their own background music**

### **Commuting by public transit (rail & bus)**

- **Dallas: 4.5%, New York: 20%, Paris: 24%,**
- **Tokyo: 57%, Osaka: 60%, Singapore: 65%**
- **Why the difference?**



## The System will Require a Large Subsidy if Ridership looks Like This



**One North American Railway needs 180 coaches for peak hours, and no more than 18 coaches the rest of the day**

# What is Needed for Financial Viability

## Rail-Centered Mentality

- User friendly
- Stations must be destinations
- Park and Ride or 'Kiss and Ride'
- Must be an integrated transport system
- Rail can only be marginally more expensive than buses

## Transit Orientated Development

- Must include, housing, offices, retail shopping



## Example of User Friendly – Berlin Main Station

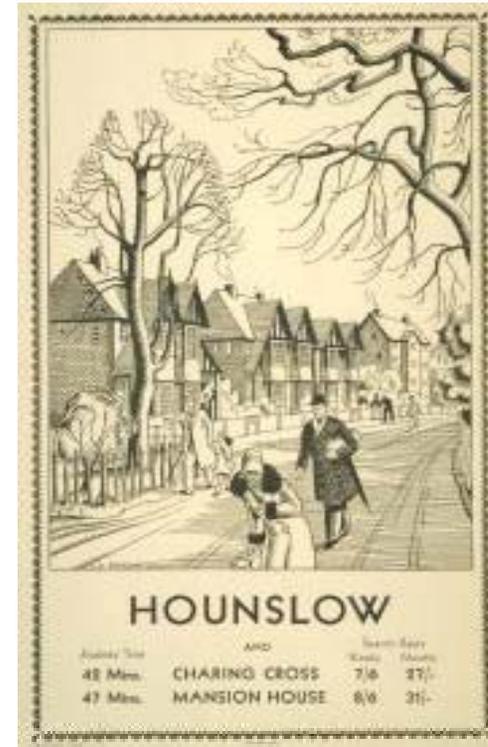
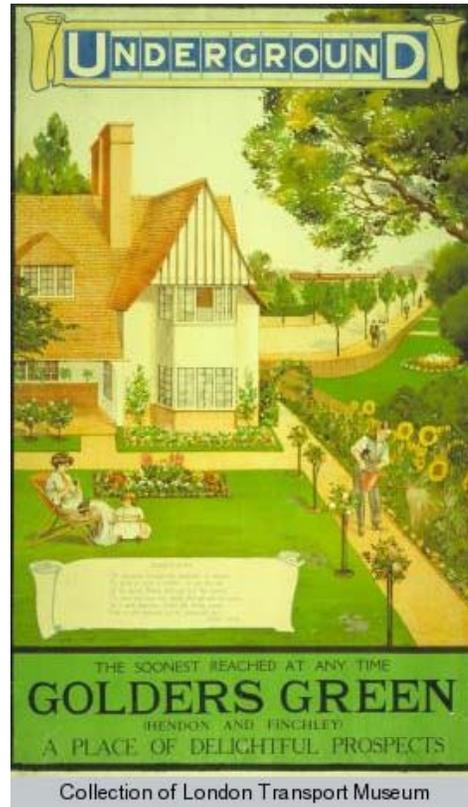
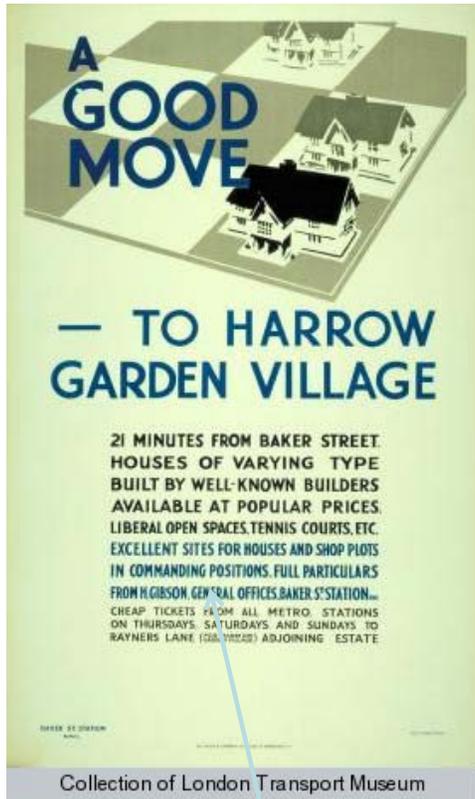


- Intercity, regional, and urban trains in one station
- Trains on 3 levels with lifts and escalators to the middle of the platforms
- Shops, restaurants, parking for 800 cars, bus connections
- Indoor connection to offices

Note:

German population density 25% that of Bangladesh

# Housing Development Played a Major Role in Building Metros



Note: Information for houses can be obtained at station

# Property and Urban Railways Development Must be Coordinated



An attempt at coordinated property development and urban rail  
Unfortunately, rail and property are being developed separately

Offices

Station



## Japan's Railways - successful



- Urban Transport 26%
- Real Estate 20%
- Entertainment and Communications 12%
- Travel 13%
- Hotels 9%
- Retail 16%

Hanshin-Department-Umeda-Store owned by Hanshin Electric Railway  
Adjacent to an Osaka Station

## A Perfect TOD – Baseball!



**‘TOD’  
Transit  
Oriented  
Development**

The railway company has a baseball team above a station. By controlling game time, it can encourage passengers during off peak hours.

## Hong Kong – does it right

### Typical Cash Flow Income

- Property Development 48%
- Property Management 10%
- Station Businesses 11%
- Railway 31%



Storage yard and workshop

# Restrictions on cars – a must

## Government restrictions on ownership

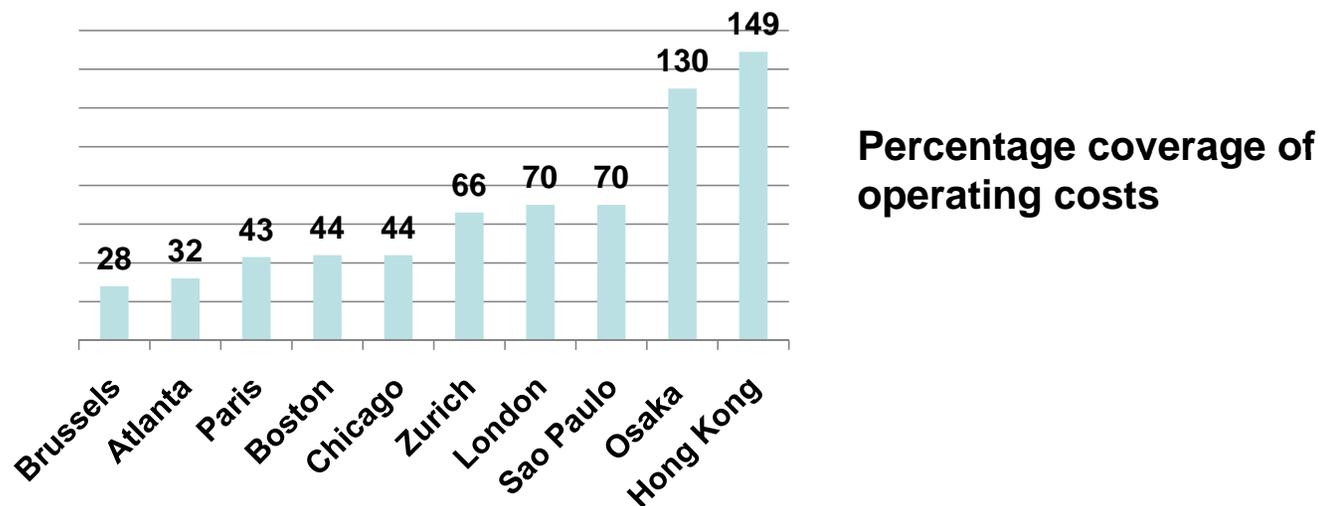
- Parking
- Restrictions on car ownership, Japan, Singapore, Hong Kong
- Annual inspection

## Pricing constraint on usage

- Fuel tax
- Toll ways
- Congestion Charging

## Subsidy is Required unless using the 'Japanese' approach

- Some urban railways cover as little as 28% of the operating costs
- Almost none cover construction cost
- Almost all dedicated urban railways require substantial subsidy – taxes?



## **Urban Railways Conclusion**

- **Urban railways are a necessity for cities where size and income that road traffic causes congestion**
- **Urban railways MUST be actively involved in urban planning - NOT the reverse**
- **Governments should 'encourage' property developers to build urban railways**
- **Proactive approach is essential**
- **National and, especially, city governments must actively discourage automobile ownership and use**

**98% of commuters want rail mass transit for the other person to ride!**

**A quote from the 'The Onion'**

## Finally

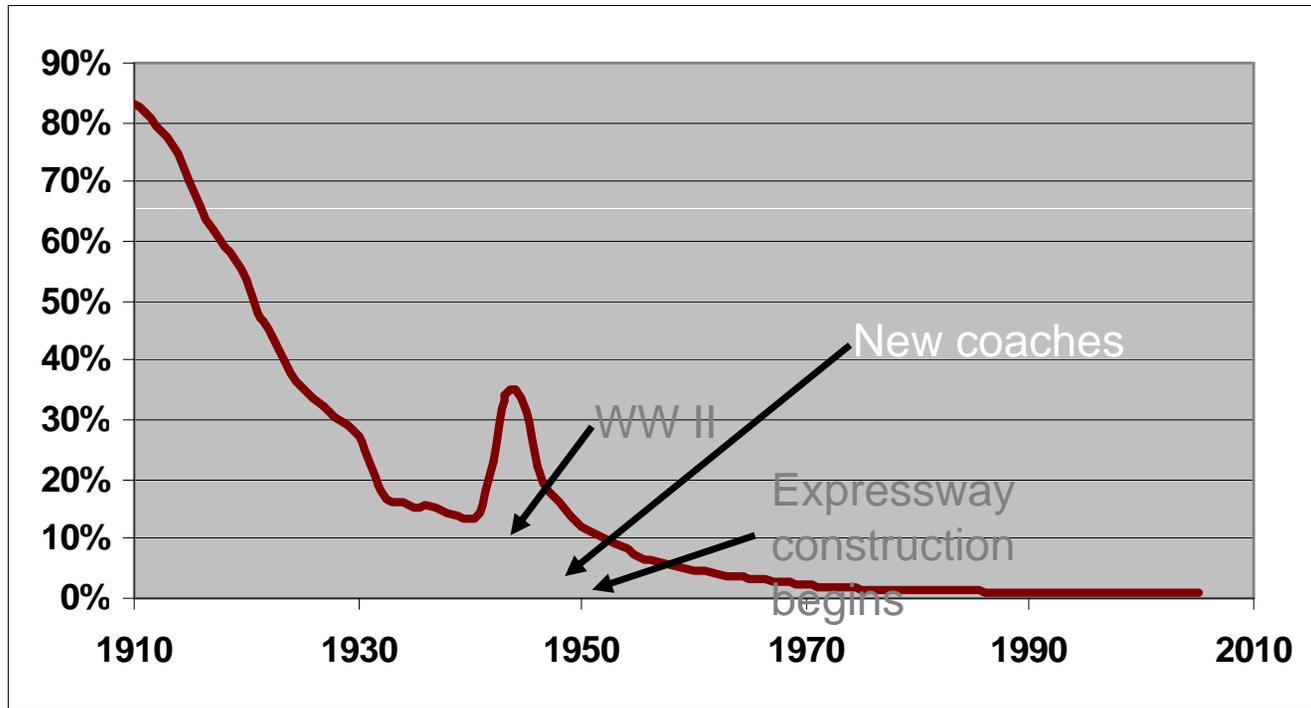
Urban Rail - You build for your grandchildren because you probably cannot justify building it today

But, if you wait for tomorrow, you will be able to afford to build it even less than today!

# Regional and Inter-City Trains

- No regional and intercity trains cover their fully allocated costs
- Almost all passenger service require annual subsidies
- In high income countries, rail national market share less than 10%, except Japan
- On corridors rail seldom has more than 30% market share
  
- So is there a future?

# US Travel by Intercity Rail



Source: AAR and Eno Foundation

**Travel increases BUT NOT BY TRAIN!!!!**

## National Rail Market Shares

- France 9%
- German 8%
- Britain 6%
- USA 0.2%
- Brazil 0.1%?
  
- Switzerland 12%
- Japan 30%

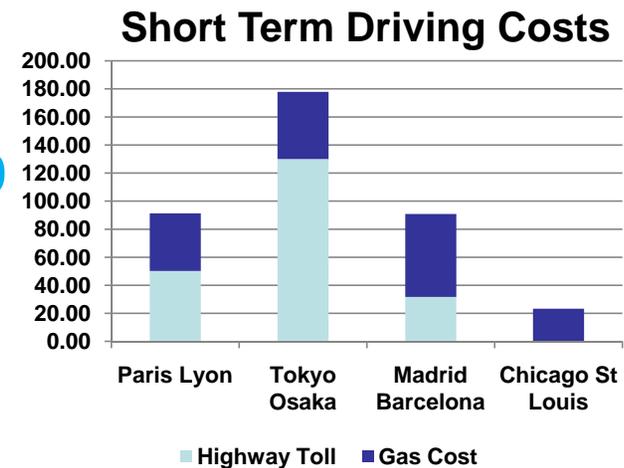
**What does this tell you? Switzerland gives a clue, but Japan appears to have the answer**

## The Japanese Use the Train, Why?

- Must have off street parking to own a car
- Annual car inspection \$1000
- Gasoline \$5.66 per gallon
- High speed train every 15 minutes
- There is a 'Railway Mentality'
- Excellent public urban transportation

- Train fare Tokyo Osaka \$130
- Plane fare Tokyo Osaka \$146
- Highway toll Tokyo Osaka \$130

- **However discount airlines are causing market share to decline**



## **So Why Take a Regional or Intercity Train?**

- **Avoid the congestion**
- **Ticket price cheaper than plane ticket**
- **Convenience**
- **Save time**
- **Able to work en-route**
- **The service and food is better?**
- **Better for the environment**

Intercity car travel congestion  
usually not a problem



# Typical Range of costs/prices for about 500 km of travel



# Buses can offer more frequent service



=



Capital costs are about the same!

## On Price and Frequency the Bus is Strong Competition



In Sweden the bus is 35% the price of the train

In the USA an intercity bus ticket can be as low as \$1



**And both offer service from outside the train station!**

## Convenience

### Intercity Train

- House walk to bus
- Wait
- Bus to train
- Wait
- Intercity Train
- Wait
- Train to bus
- Wait
- Bus
- Walk to house

### Plane

- House walk to bus
- Wait
- Bus to train
- Wait
- Train to Airport
- Check in
- Wait
- Fly
- Wait for luggage
- Wait
- Train to bus
- Wait
- Bus
- Walk to house

### Car

- House to car
- Drive
- Congestion delay?
- Car to House

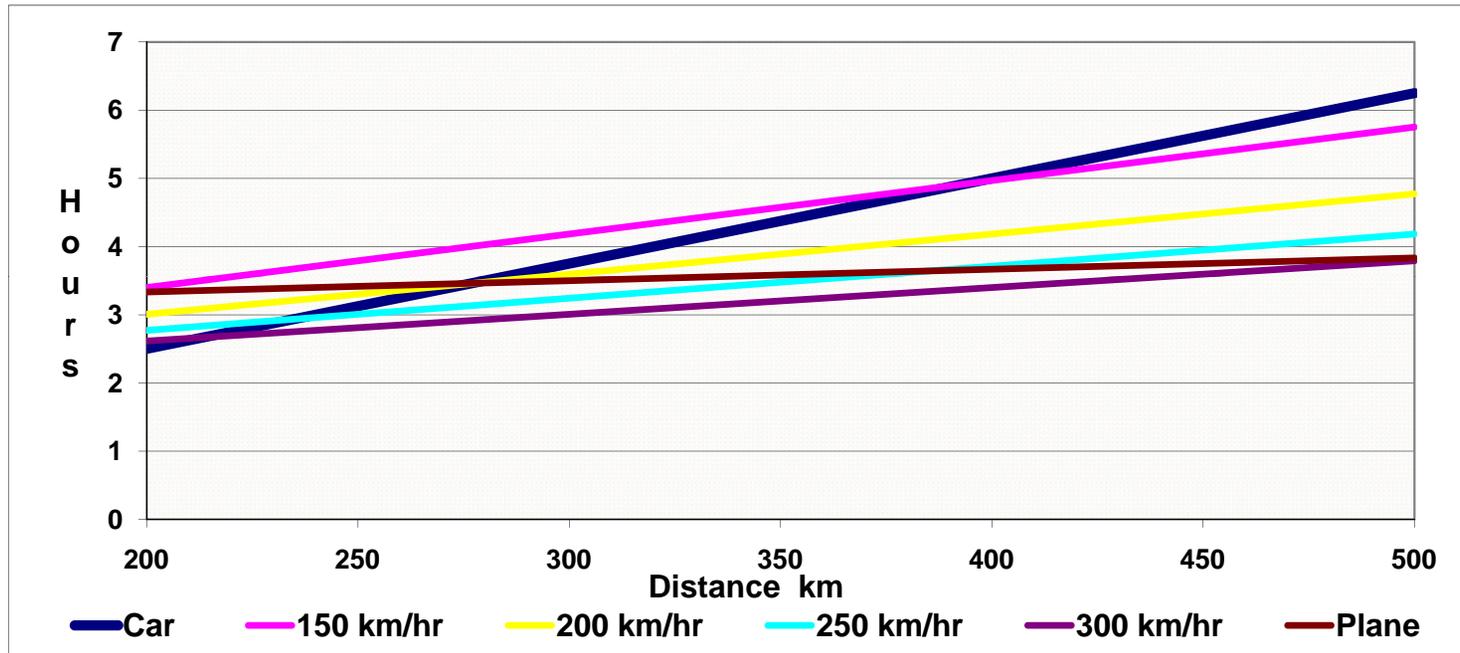
**Which is  
more  
convenient?**

## Work on Train? But how much more would you pay?

- **Businessmen are usually prepared to pay a premium ticket price**
- **\$60 per hour value of time saved (according to UK MoT)**
- **Businessmen may pay \$60 per hour more**
- **But even if they did, typically only 30% of passengers are businessmen**



## Train Speed is not that Important



- Up to 200 km car requires least time
- 300 km less than 1 hour time difference between modes
- 400 km only at 300 km/hr saves 1.5 hours
- If you have to wait an hour for the train, up to 400 km car can be just as fast

## Frequency Needs Passengers

- To justify frequency, you need population
- In a developed country, the average person makes about only 5 long distance trips a year
- If 10% are by rail, for hourly service, population centers of 4 to 8 million are required to fill the trains
- If a higher percent choose train, reduces population centers, but how?
- If 30% are by rail, for hourly service population centers of 1.5 to 2.5 million are required

## The Regional Train

- An extension of the urban commuter railway
- Primarily for longer distance commuting
- As opposed to subsidized by city, it should be subsidized by regional government to promote development of its region



Does not need to go fast, max. speed 150 km/hr

## Is High Speed Rail the Answer?

- High speed rail corridors may have 85% of train and plane passenger traffic
- But will seldom have more than 30% if cars and busses are included, except in Japan
- Washington to New York corridor is only about 8% of market share which, compared to the national average of 0.2%, is very good!

## Passenger Trains Generate Economic Benefits

- **‘Environmentally Friendly’ with a Lower ‘carbon foot print’**
- **Reduces need for roads**
- **Safer than road**
- **Less pollution**
- **Could be operated with electricity**
  
- **Will the traveler choose the train because it is ‘Environmentally friendly’? - Maybe a few will**
  
- **But, who will pay the railway for the economic benefits? The private health insurance companies!?!**

## Is Concessioning or PPP the Answer?

- **Privately operated railways tend to be more efficient, but they need sufficient revenue**
- **Private companies are unlikely to invest heavily in an existing passenger railway**
- **Manufacturers and infrastructure contractors will build a new system. Without a generous subsidy, they will seldom operate the system for more than the warranty time**

## Conclusions

**Regional and Intercity Trains have a Transport Role but:**

- **Can only be justified where the population size requires frequent service**
- **For success there has to be a 'Rail Mentality'**
- **People prefer to ride a train and not a bus, but the bus is cheaper and usually more frequent**
- **Legislation against cars is almost a necessity for financial viability**
- **An excellent urban transport system is a necessity**

## Conclusions Continued

- Revenue from property management and development around stations is a necessity
- Must have consistent source of subsidy
- Regional railways should be subsidized by the region in which they operate
- On most routes, high speed is less important than frequency

**With all this, maybe regional and intercity passenger trains make economic sense**

**“It does not matter how fast  
the intercity trains are so  
long as they are frequent, on  
time, and LOOK as though  
they go fast!”**

**Quote of a United States State Governor**