

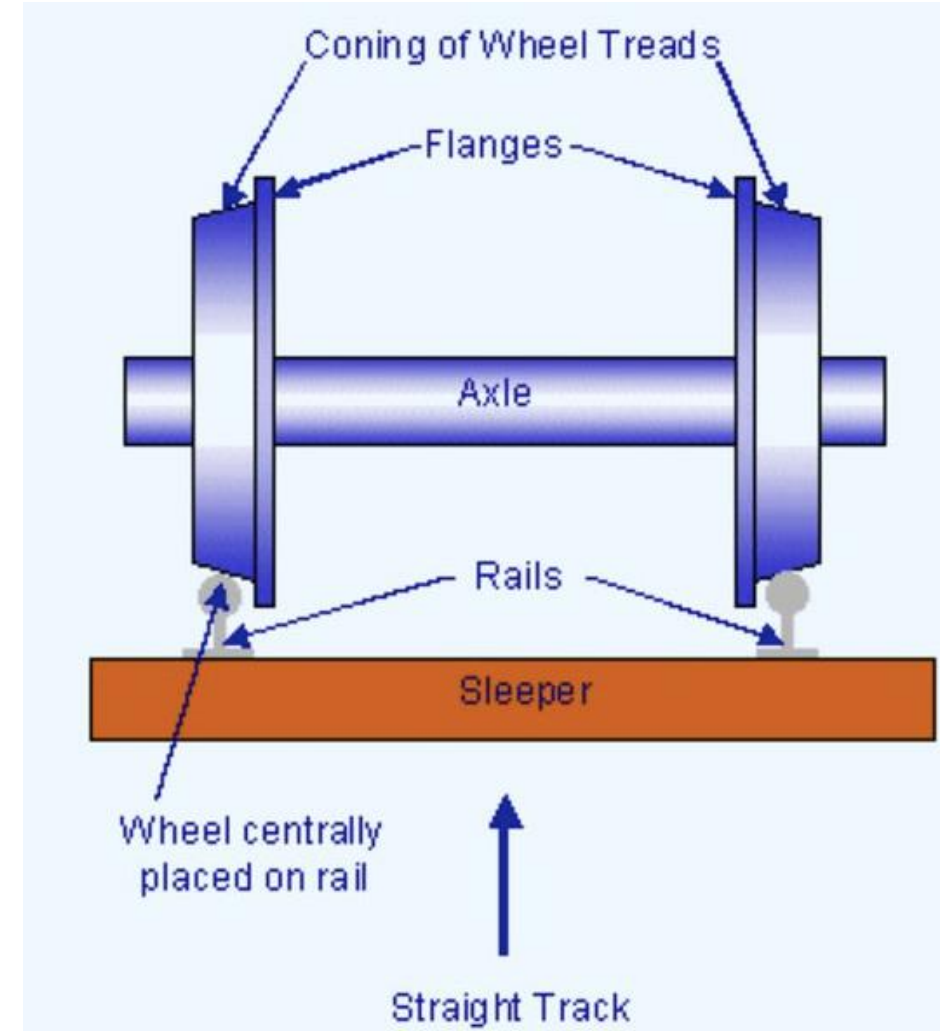
3rd JTTRI Global Seminar; What Does the Future Hold for European Railway Policies?  
Comparisons between Japanese and European Railway Policies 22 January 2024

## Keynote address on Railway situation and present policies: UK, EU and comparisons with Japan

Imperial Collage London Future Rail Research Centre Chair,  
Professor Emeritus Roderick A Smith,  
formerly Chief Scientific Advisor for the Department for Transport

What are the particular features which define a railway?

1. Specialist track
2. Accommodates public traffic
3. Conveyance of passengers
4. Traction system permits speed
5. Control system to order operation
6. Some measure of political control



# **Began with Liverpool to Manchester Railway 1830**

**Father George Stephenson**

**Social life and politics were revolutionized by  
the 19c railway**

**Fed the Industrial Revolution**

**Improved volume and cheapness of existing  
transport**

**And conquered time and distance**



Rapid growth in Europe:  
eg. Bradshaw's Continental Guide published in 1853

And USA

Baltimore and Ohio Railroad (1830 -1987)

Japan later:

Shinbashi to Yokohama opened Oct 14 1872

Private capital, laissez faire in UK and USA

Different systems in Europe:

State in France and Germany (and later all eastern Europe)

Italy mixed until unification

Governments soon realized the strategic  
and military importance of railways

# Baltimore & Ohio Railroad

RE-OPENED.



THIS GREAT NATIONAL THOROUGHFARE

IS AGAIN OPEN FOR

## FREIGHTS & TRAVEL.

The Cars and Machinery destroyed are being replaced by

NEW RUNNING STOCK,

With all recent improvements; and as the

Bridges and Track are again in Substantial Condition,

The well-earned reputation of this Road for

## SPEED, SECURITY and COMFORT

Will be more than sustained under the re-organization of its business.

In addition to the *Unequalled Attractions of Natural Scenery* heretofore conceded to this route, the recent *Troubles upon the Border* have associated numerous points on the Road, between the Ohio River and Harper's Ferry, with painful but instructive interest.

### CONNECTIONS

At the Ohio River, with Cleveland and Pittsburg, Central Ohio, and Marietta and Cincinnati Railroads; and through them with the whole Railway System of the Northwest, Central West and Southwest.

At Baltimore with Five Daily Trains for Philadelphia and New York.

TWO DOLLARS ADDITIONAL ON THROUGH TICKETS

To Baltimore or the Northern Cities, give the

Privilege of Visiting WASHINGTON CITY en route

This is the ONLY ROUTE by which Passengers can procure *Through Tickets and Through Checks to or from WASHINGTON CITY.*

W. P. SMITH, Master of Transportation, Balt.



The  
Edwardian  
Zenith

Then the  
First  
World  
War







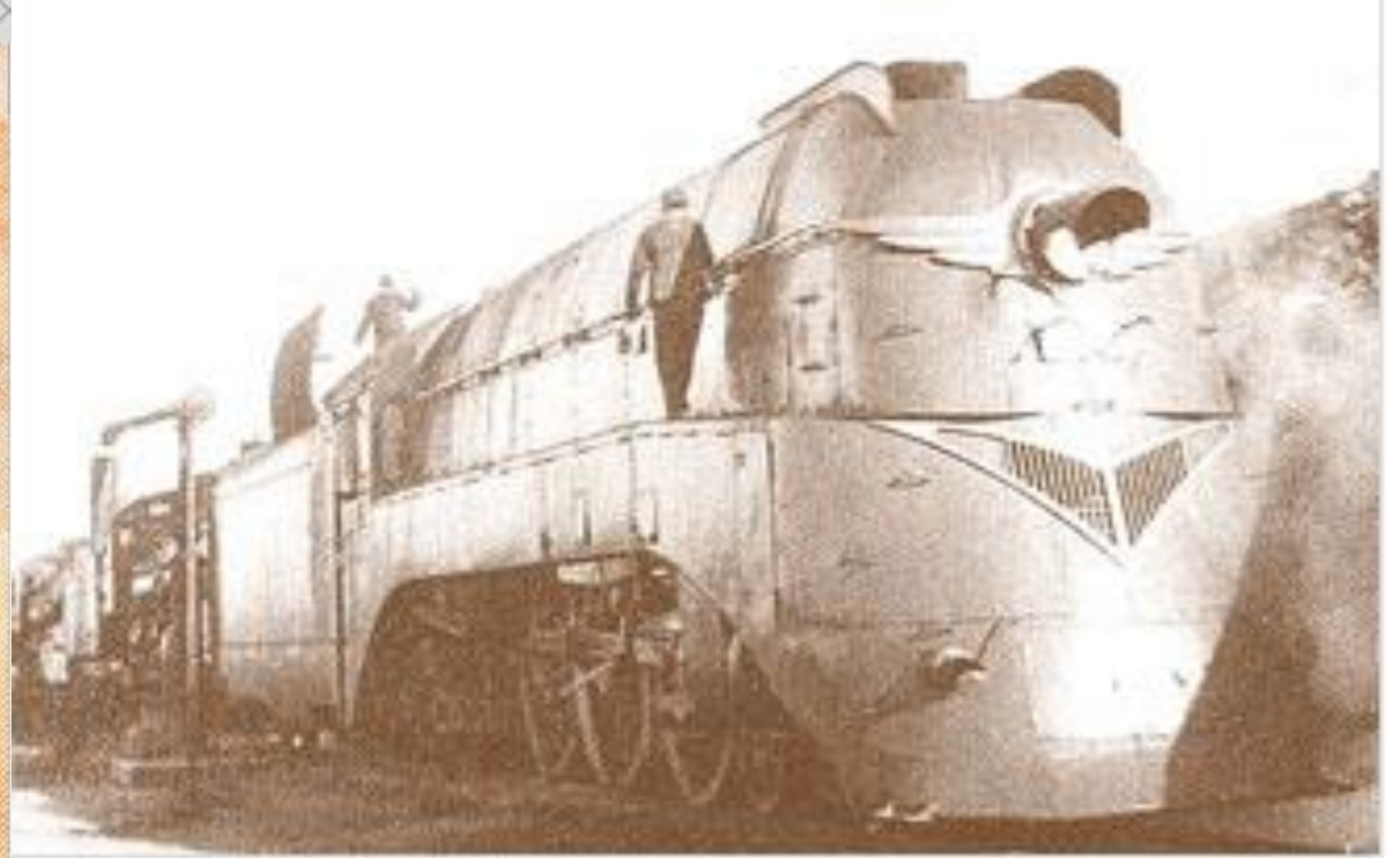
The 1930's the age of streamlined steam  
Mallard (below) made world steam speed  
record of 126 mph 203 kph on 3 July 1938

Grouping: 1 Jan 1923

The Big Four  
GWR, LMS, LNER, SR,  
formed from 120 small  
companies







## Mantetsu

From 1934, high-speed, air-conditioned luxury Pashina type loco by Kawasaki (2m wheels) was the “Yokozuna” of Japanese stream

SEPARATION

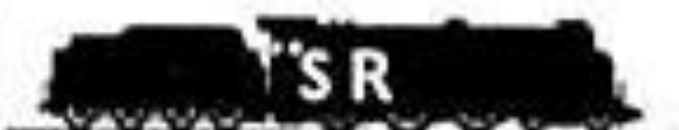
AMALGAMATION

UNIFICATION

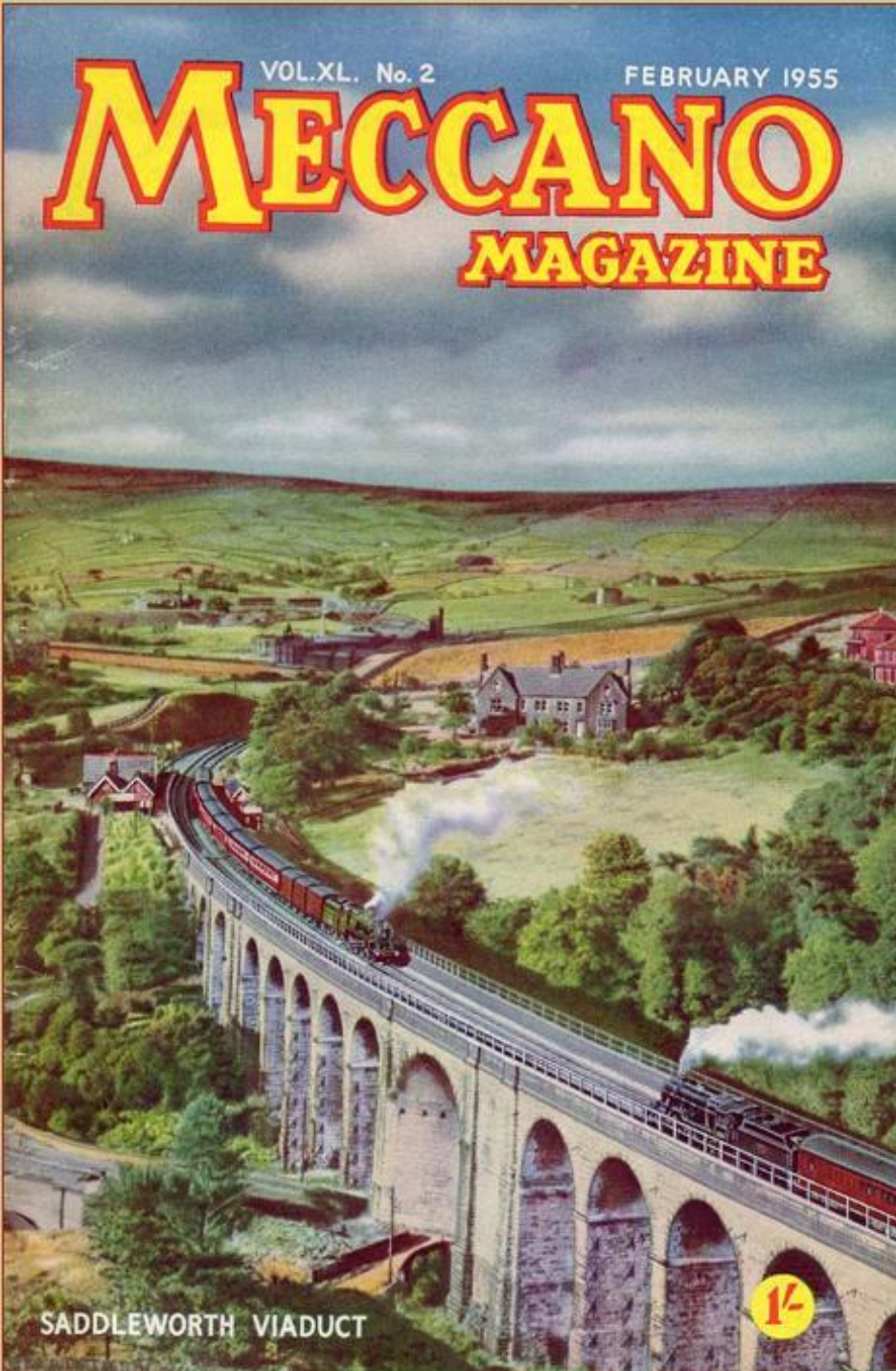
1923

1948

120  
DIFFERENT  
RAILWAY  
COMPANIES



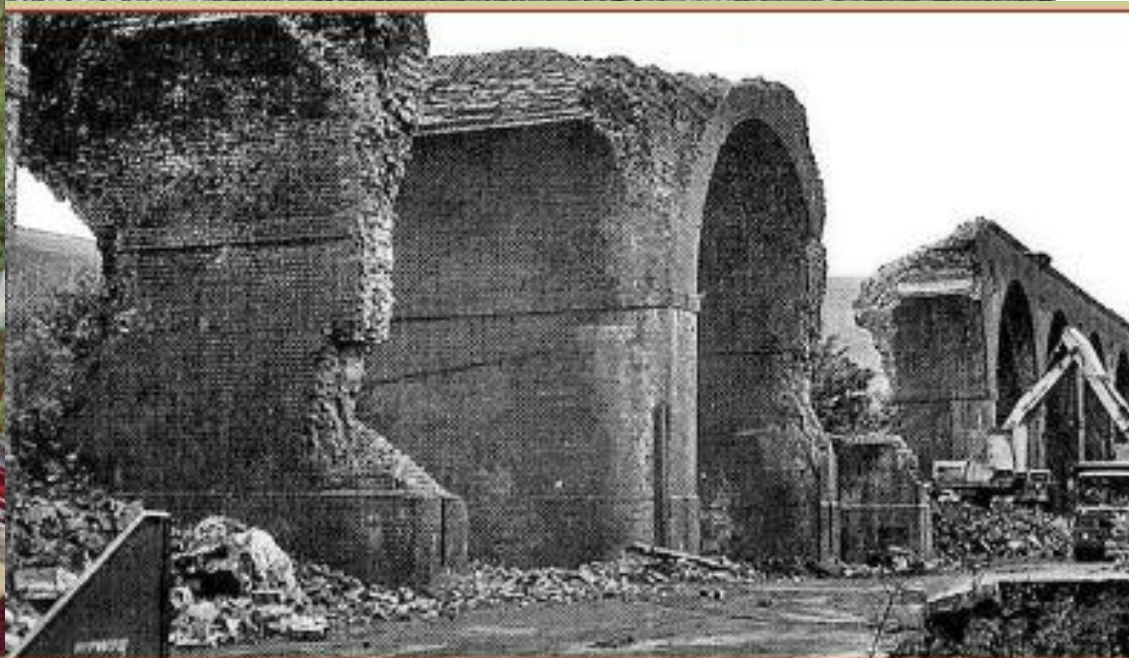




Some personal  
Background

Born 1947

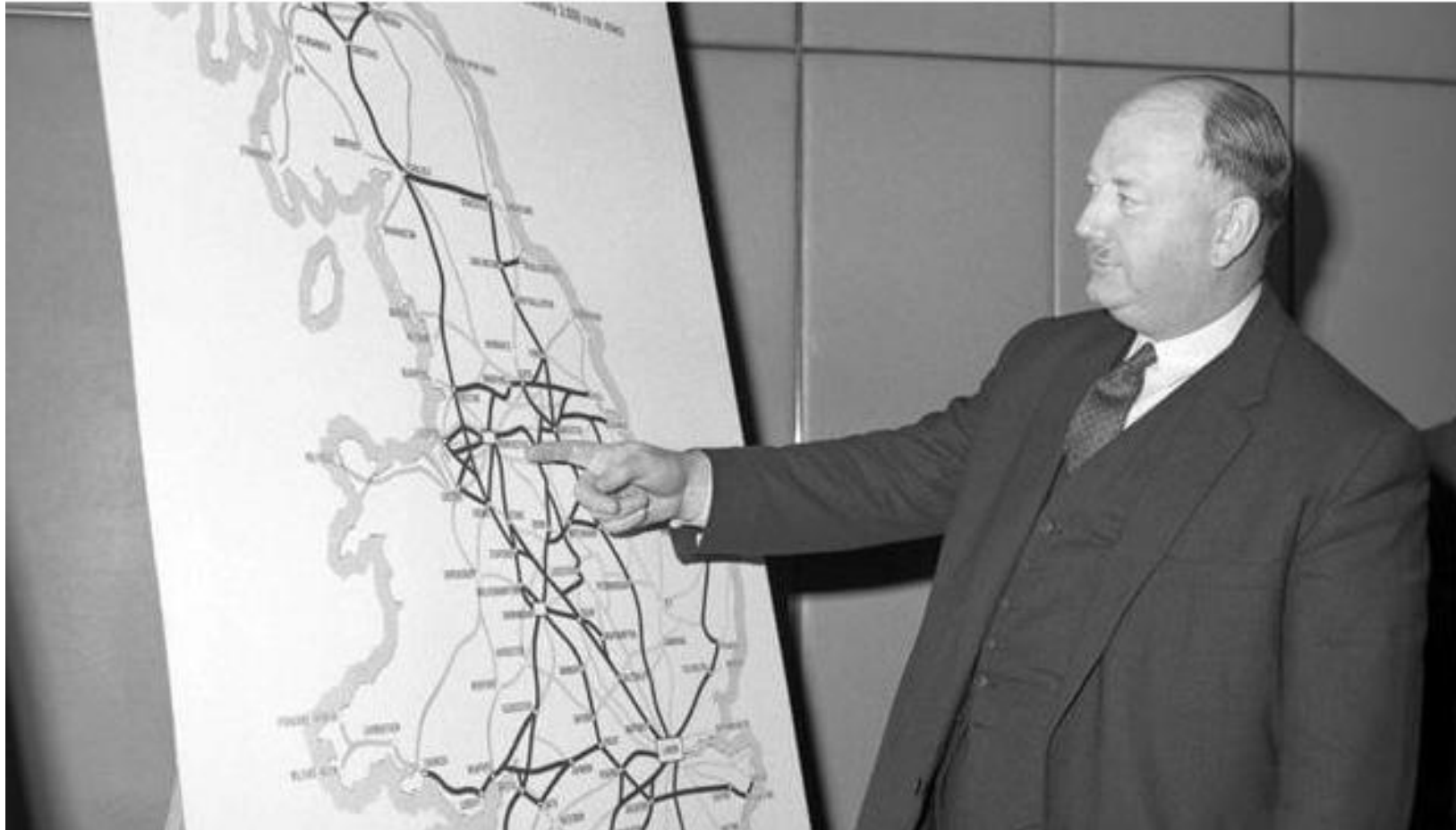
My introduction to  
RAILWAYS  
1951-





# The decline of rail's fortunes in the 20th century had begun long before the Beeching report

Between the wars over 1,300 miles of unprofitable railway had been closed by the railway companies. The demands on rail made by WWII provided a brief respite from the closures, but between the nationalisation of the railways in 1948 and the publication of the Beeching Report in 1963 an additional 3,000 miles of railway had been withdrawn by the BR Regions themselves.





# BEECHING CUTS

**BEFORE**



**AFTER**



**BRITISH RAIL  
NETWORK BEFORE  
AND AFTER THE  
BEECHING CUTS**









## Post war Europe

Common market EEC, later EU

Originally a Western Europe Club

In the last twenty years much expanded to Eastern states

Many technical rail achievements, in France particularly

In 1960's TEE network, very Western Europe

France started high speed rail TGV in 1981  
(17 years after the shinkansen)

Germany, Spain were to follow

But individual railway identities remain 13

# Post War European Integration

1957 Formation of EEC “The Six”, Germany, France, Italy, Netherlands, Belgium, Luxemburg

1973 Denmark, Ireland, UK join

1981 Greece joined

1985 Schengen Agreement “Open Borders”

1986 Portugal and Spain joins 1990 Fall of Eastern bloc, East Germany joins as part of re-unified Germany

1993 Masstricht Treaty: EU born

2002 Euro introduced

2004 big enlargement when Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia joined the union

2020 UK exits the EU

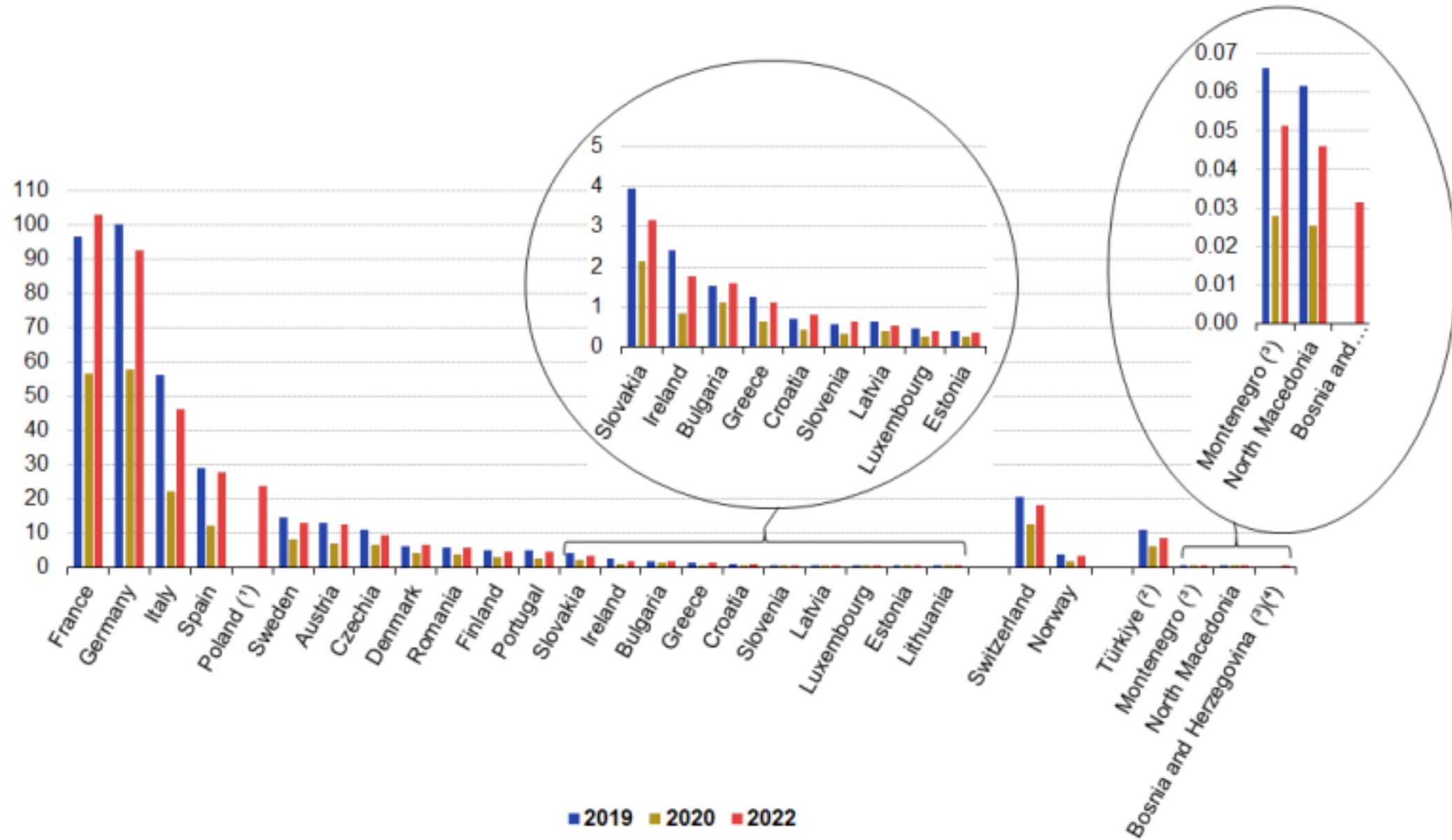
Now 27 member states, 450m people, 4.2 m km<sup>2</sup>, ~ 6% world population



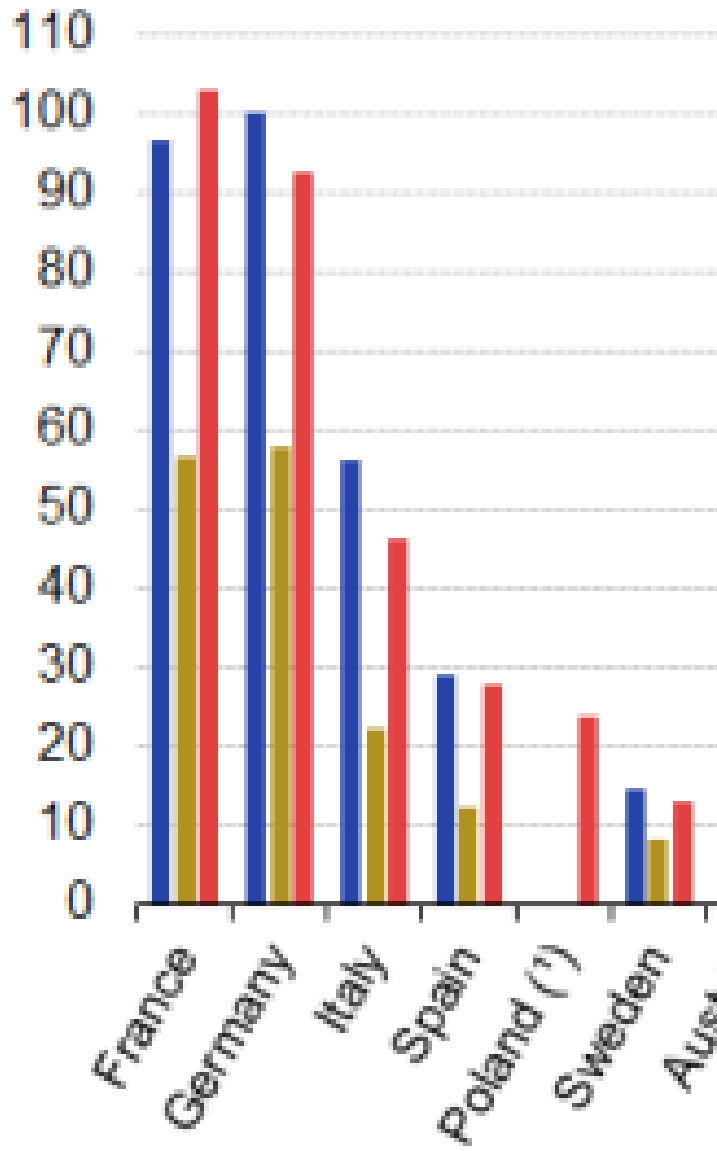


# Rail passenger transport for main undertakings, 2019, 2020 and 2022

(billion passenger-kilometres)



Source: Eurostat ([rail\\_pa\\_typepas](#)) and ([rail\\_pa\\_quartal](#))



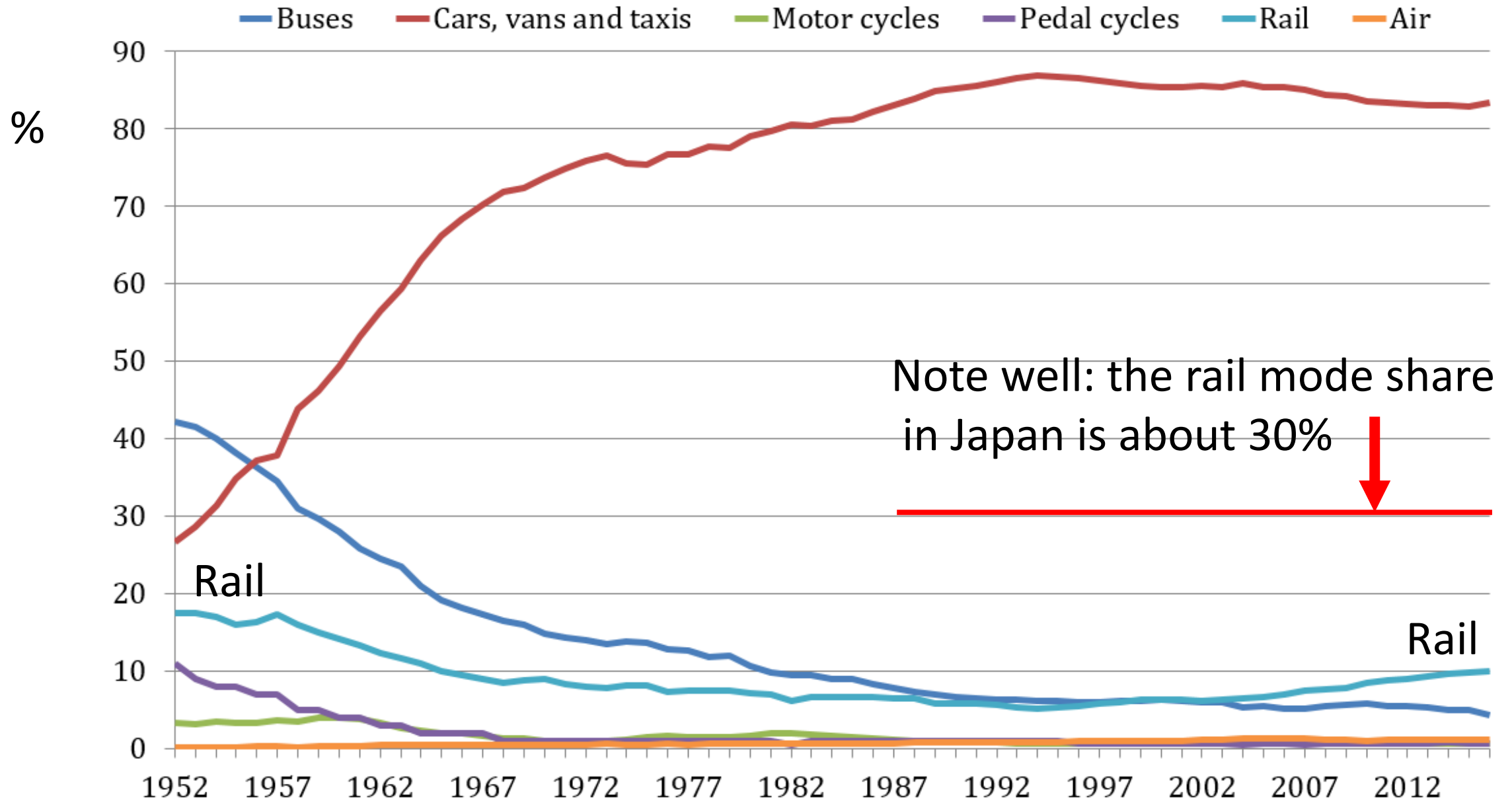
UK  
 ←  
 Europe: big 3 (4)  
 France, Germany, UK  
 Then Italy, Spain, Poland  
 Then the rest

Note Japan at 450 is way off the top of the scale

Unit bn passenger km / year



# Development of UK Transport Mode Share



**REGIONAL<sup>≡</sup>**  
**RAILWAYS**



**Network** SouthEast

*INTERCITY*





# STRUCTURE OF THE RAIL INDUSTRY

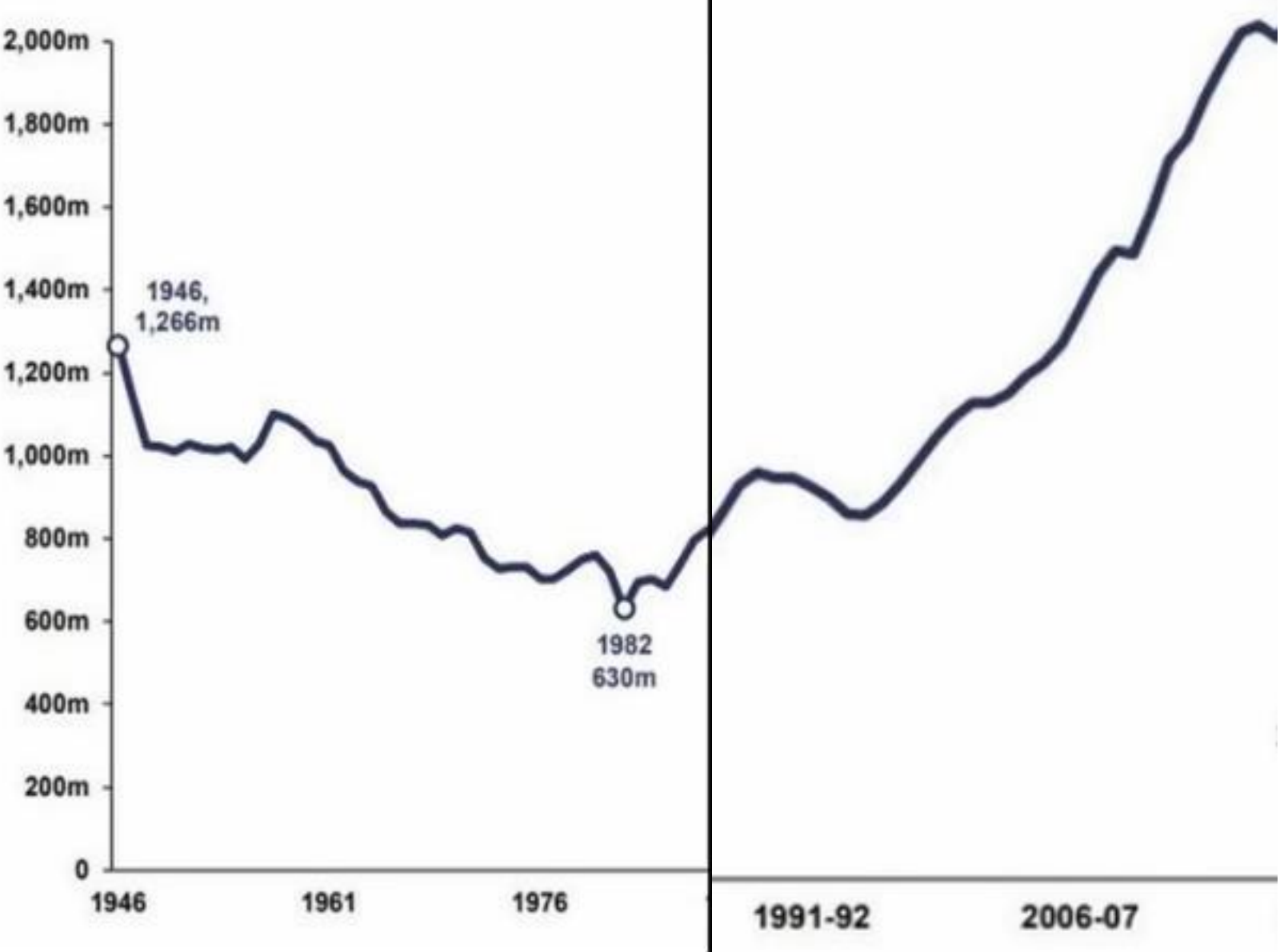
## Railways Act 1993 - Privatisation of British Railways

Broken up into multiple companies

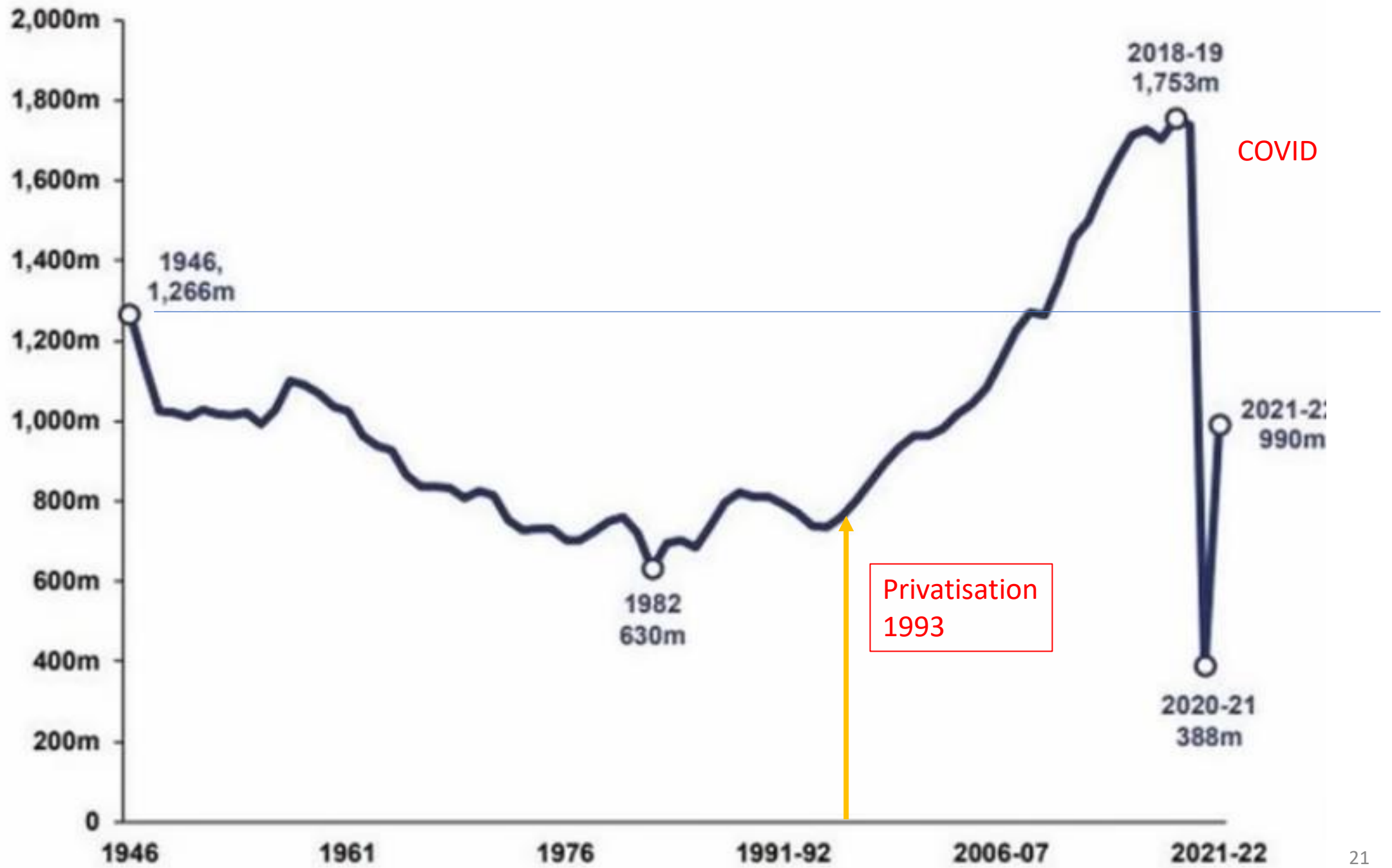
- Infrastructure owner/operator – originally Railtrack, now Network Rail. Private company wholly owned by UK Government.
- Rolling Stock Leasing Companies (ROSCOs) – own the vehicles and offer vehicles and financing to operators.
- Train Operating Companies (TOCs) – bid for and operate franchises offered by Government. Direction of payment may depend on profitability!
- Freight Operating Companies (FOCs).

Key features: complex, not vertically integrated, many parts, a lawyers paradise at the interfaces

# UK rail passenger journeys (millions)









## The tapestry of rail operators

Tickets only valid for a single operator, Walk on tickets can be very expensive. Tickets are complicated and variously priced

The timetable is not enforced between operators

Senior management only rarely railway people, but extremely well paid

Little importance attached to operators delivery record

Industrial relations lamentable, US AND THEM

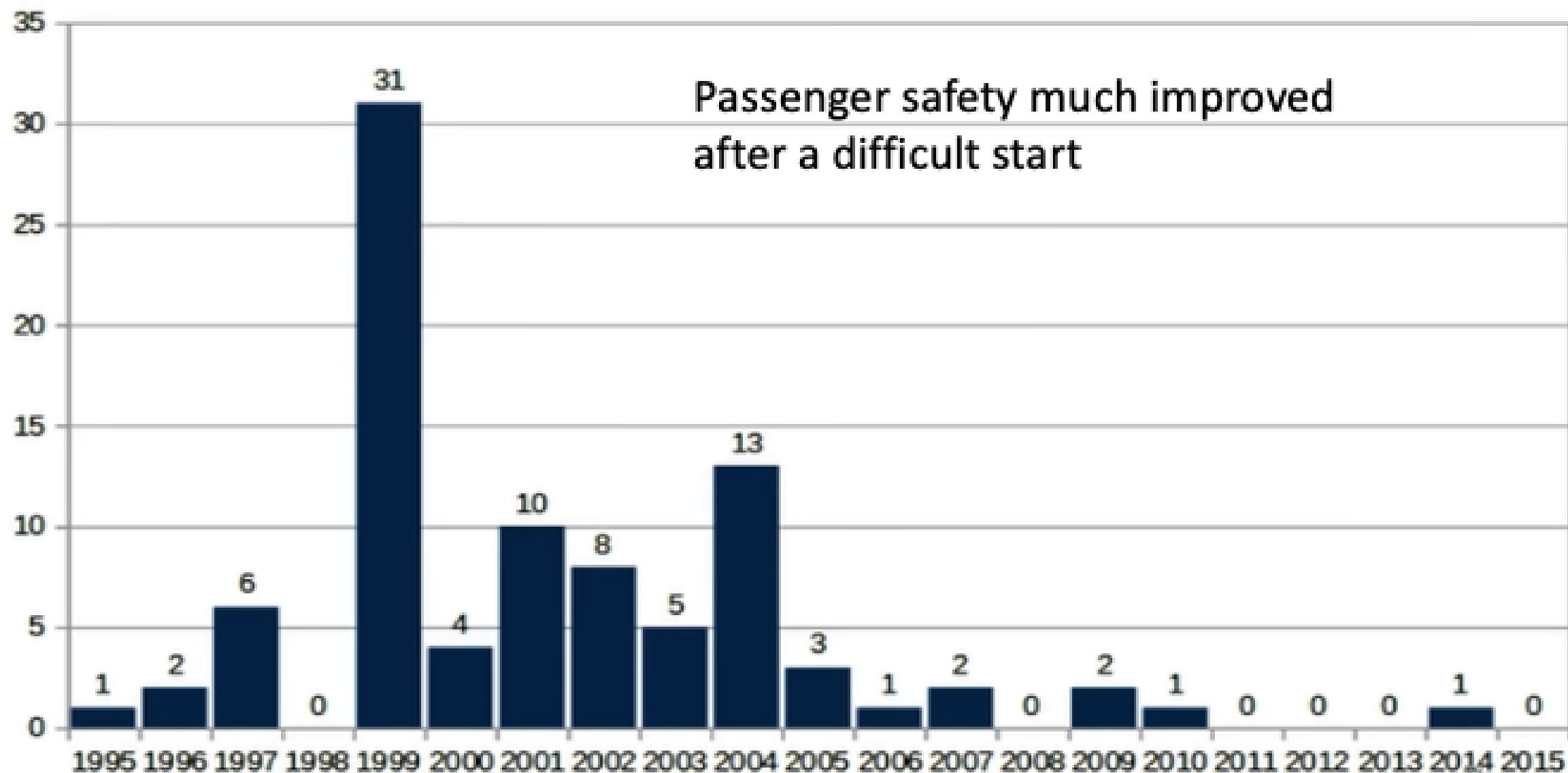
Profitability is poor, risk always transfer to Government

Punctuality? Cancelations many, reliability?

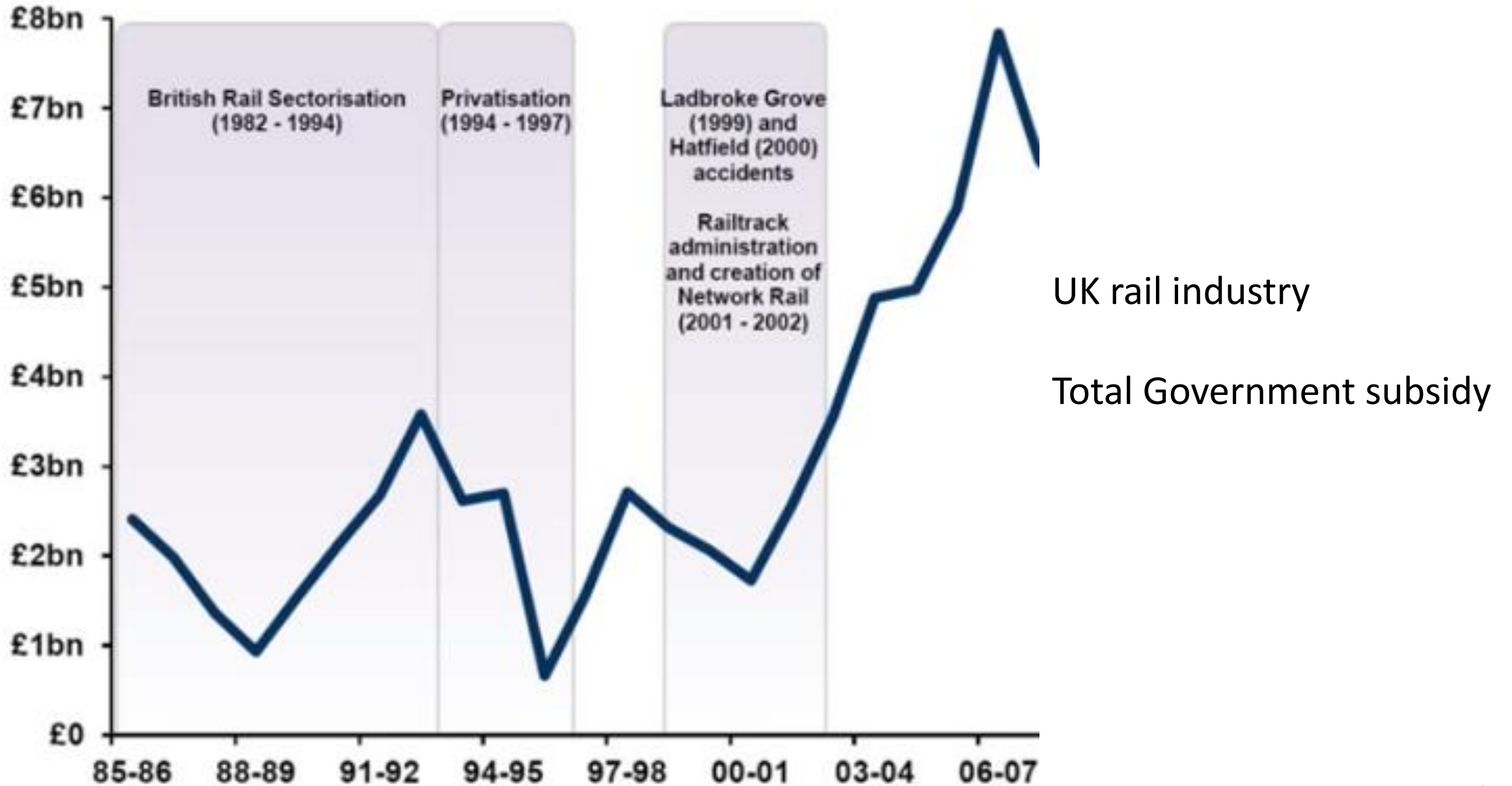
**Government subsidy is much great than BR times**



## Deaths from accidents on UK railways & stations

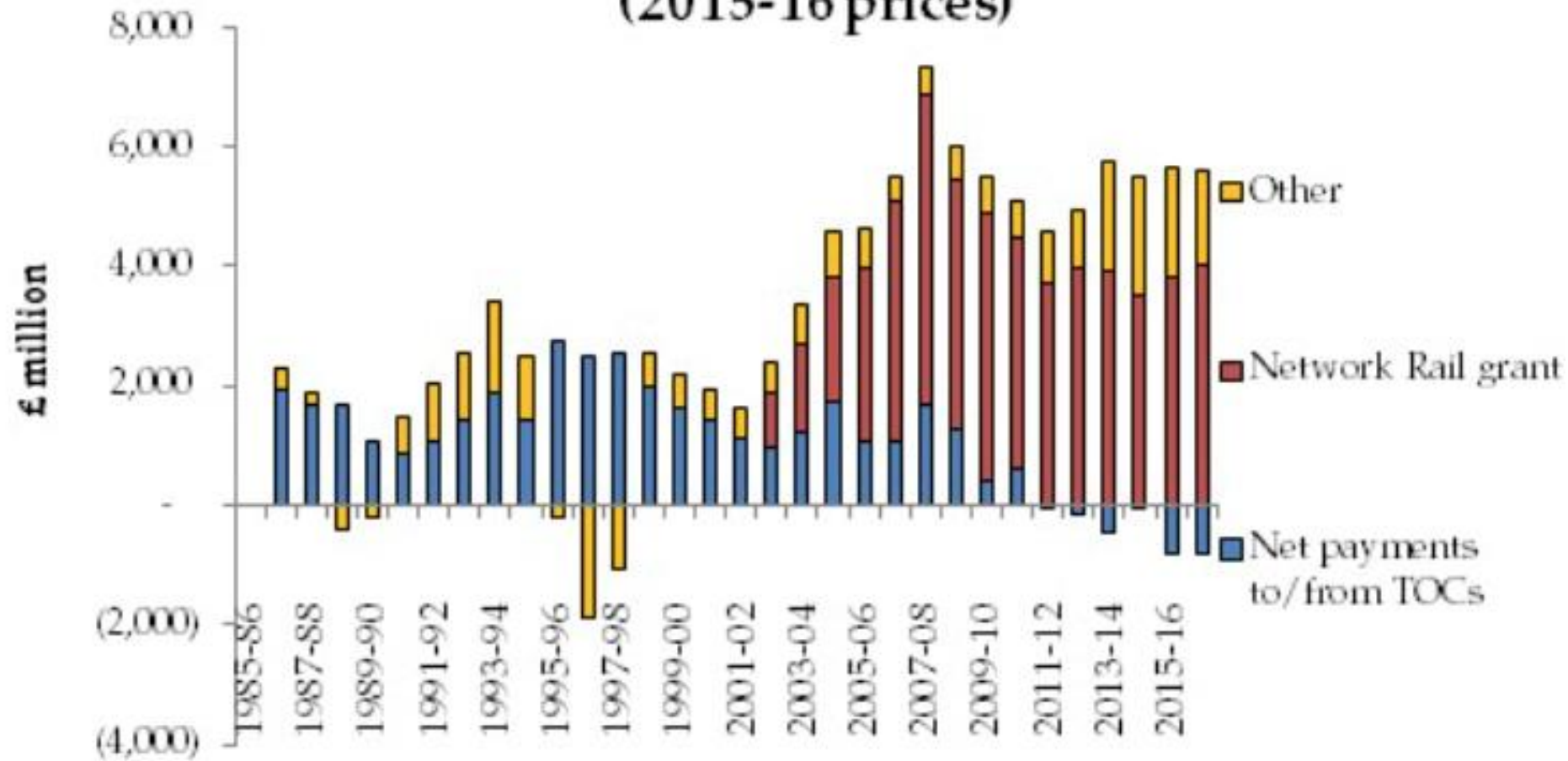


# Total Subsidy





## Total government support to rail sector (2015-16 prices)





# EURO STATE BUFFET





# EU Rail policy explained

The expansion and harmonisation of the EU's rail sector has slowed down over the years because of

- traditional fragmentation of the European railways due to complex stand-alone national systems
- low efficiency, flexibility and reliability of the service, in particular for freight

EU has adopted between 2001 and 2016 four railway packages which aim to:

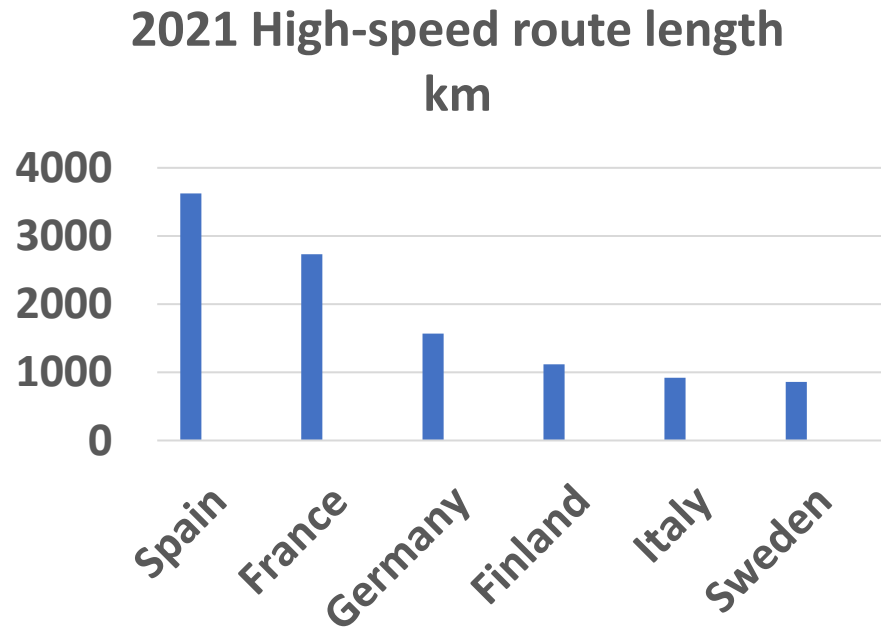
- open the railway market to competition
- increase the interoperability of national railway systems
- define a framework for a single European railway area
- the liberalisation of the rail market

The packages share common provisions:

- the licensing of railway undertakings and train driver certification
- safety requirements
- the creation of the European agency for railways and rail regulatory bodies in each member state
- rail passenger rights

# Sustainable and smart mobility

As part of the European Green Deal, the European Commission presented its sustainable and smart mobility strategy in December 2020. The strategy outlines the EU's goals for the transport sector for the coming decades: making mobility green, smart and resilient. For the rail sector, the strategy calls for a **doubling of high-speed rail by 2030** in the EU.



- > 200 kph upgraded lines
- > 250 kph dedicated lines

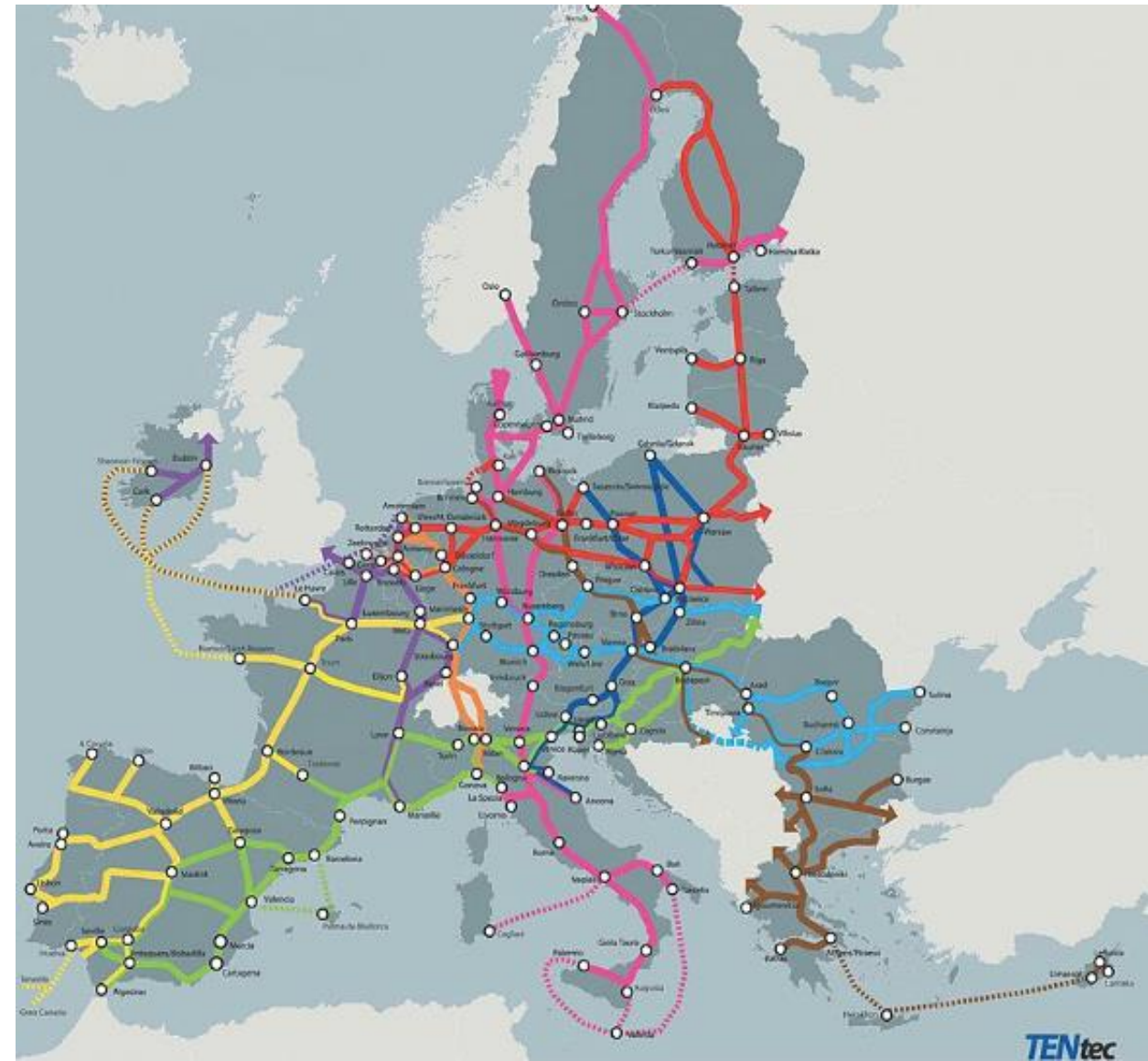
A more sensible target would be the doubling of **passenger use** of high speed rail



# Trans-European Transport Network (TEN-T)

In the wider context of the EU's transport policy, including rail transport, the Trans-European Transport Network (TEN-T) aims to create a network of nine core corridors connecting railway lines with roads, inland waterways, maritime routes, ports and airports across the EU. The goals are to:

- connect EU countries to facilitate the cross-border transport of people and supplies
- contribute to territorial cohesion
- ensure interconnectivity between modes of transport
- support the transition towards sustainable transport



## Connecting Europe Facility

The EU's rail policy is supported by a number of financing programmes, including the Connecting Europe Facility which funds strategic investment projects in the areas of transport, digital and energy.

The regulation applies retroactively from 1 January 2021. The transport sector will receive the bulk of the funding (about €25 billion out of €33 billion), of which by far the largest share will be dedicated to rail.

### Why?

The European Environment Agency (EEA), estimates that air passenger transport emits, on average, 160 gCO<sub>2</sub> per pkm, whereas rail passenger transport is only 33 gCO<sub>2</sub> per pkm (well-to-wheel, excluding infrastructure-related emissions).

With a high share of electrified tracks (57% of the EU's rail network in 2020) and an increasing share of renewable energy in the electricity mix (38% of the EU's production in 2020), the environmental footprint of rail is expected to decrease further.

Given its potential to reduce CO<sub>2</sub> emissions, the EU's policy is clearly supportive of rail travelling. The 2019 European Green Deal and the 2020 Sustainable and Smart Mobility Strategy have put rail passenger transport front and centre in a bid to decarbonise the EU's mobility system.

Issues: the liberalisation of air transport has directly led to problems for the rail industry

Rail best card is its greenness, followed by safety. But the public remain largely unimpressed by these credentials.

But the biggest growth in demand will come from Eastern Europe where the aspiration is to own a car



Airline travel really took off between 2014 and 2019 due to the rise of low-cost carriers and the popularity of leisure trips, particularly in the intra-EU flight segment.

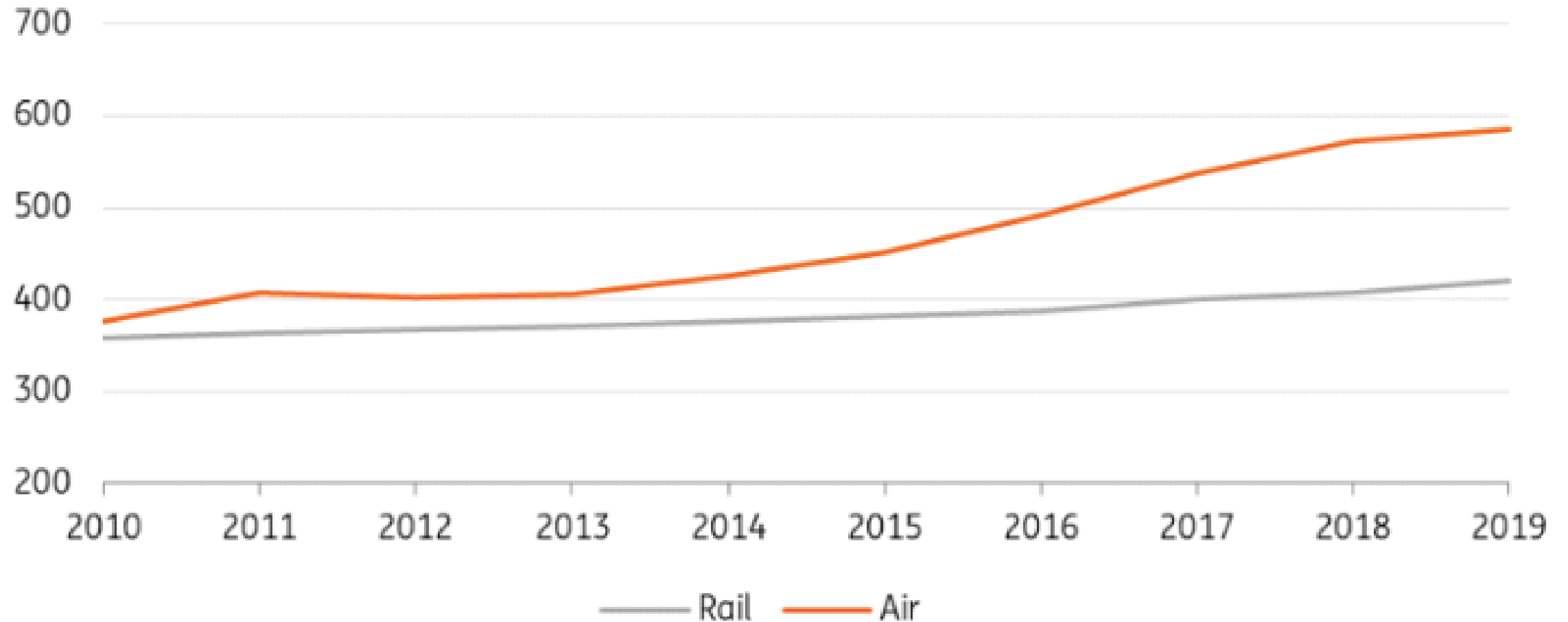
**Essentially, the widening gap between air and rail transport was driven by cheap flights.**

Over the last decade and before the start of the Covid-19 pandemic, air travel in Europe expanded at a much faster pace than rail travel. While air transport increased from 377 billion passenger-kilometres (pkm) in 2010 to 586 billion pkm in 2019 (+5.5% average annual growth rate), rail transport rose at a much more modest rate, from 358 billion pkm to 421 billion pkm (+1.8% average annual growth rate).



# Rail passenger transport in the EU has lagged significantly since 2010

Bn passenger-km



# Route of HS2

Line to Manchester could be as late as 2041

Joins existing west coast mainline

Leeds

Manchester Piccadilly

Manchester Airport

Crewe

Eastern route linking Birmingham to Leeds scrapped

East Midlands Parkway

East Midlands Airport

Birmingham Curzon Street

Interchange

Birmingham Airport

— HS2 Phase 1. Under construction  
— HS2 Phase 2. Some early work under way

Line into central London delayed until as late as 2041

London Euston

Old Oak Common



50km

WALES



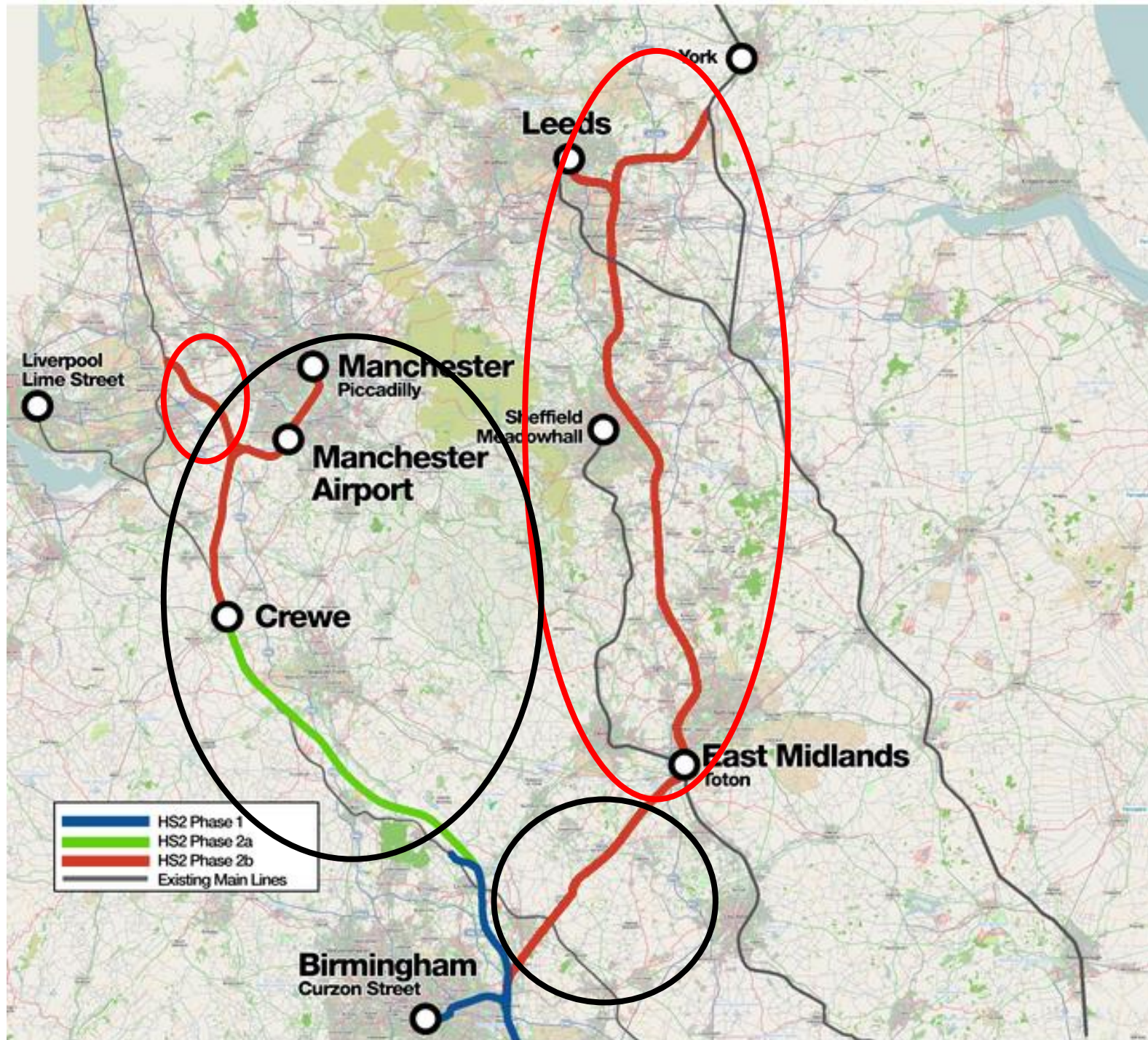
Jan 2009  
Creation of HS2 Ltd

May 2020  
Construction begins

Nov 2021  
Eastern link to end in  
East Midlands

Dec 2021 Trains to be  
Bult by Hitachi/Alstrom

June 2022 WCML  
Link scrapped



March 2023  
Euston delayed

Oct 2023  
Manchester link  
Scrapped  
Also link to Euston  
Taken from Hs2 Ltd

Purchased land to  
be resold

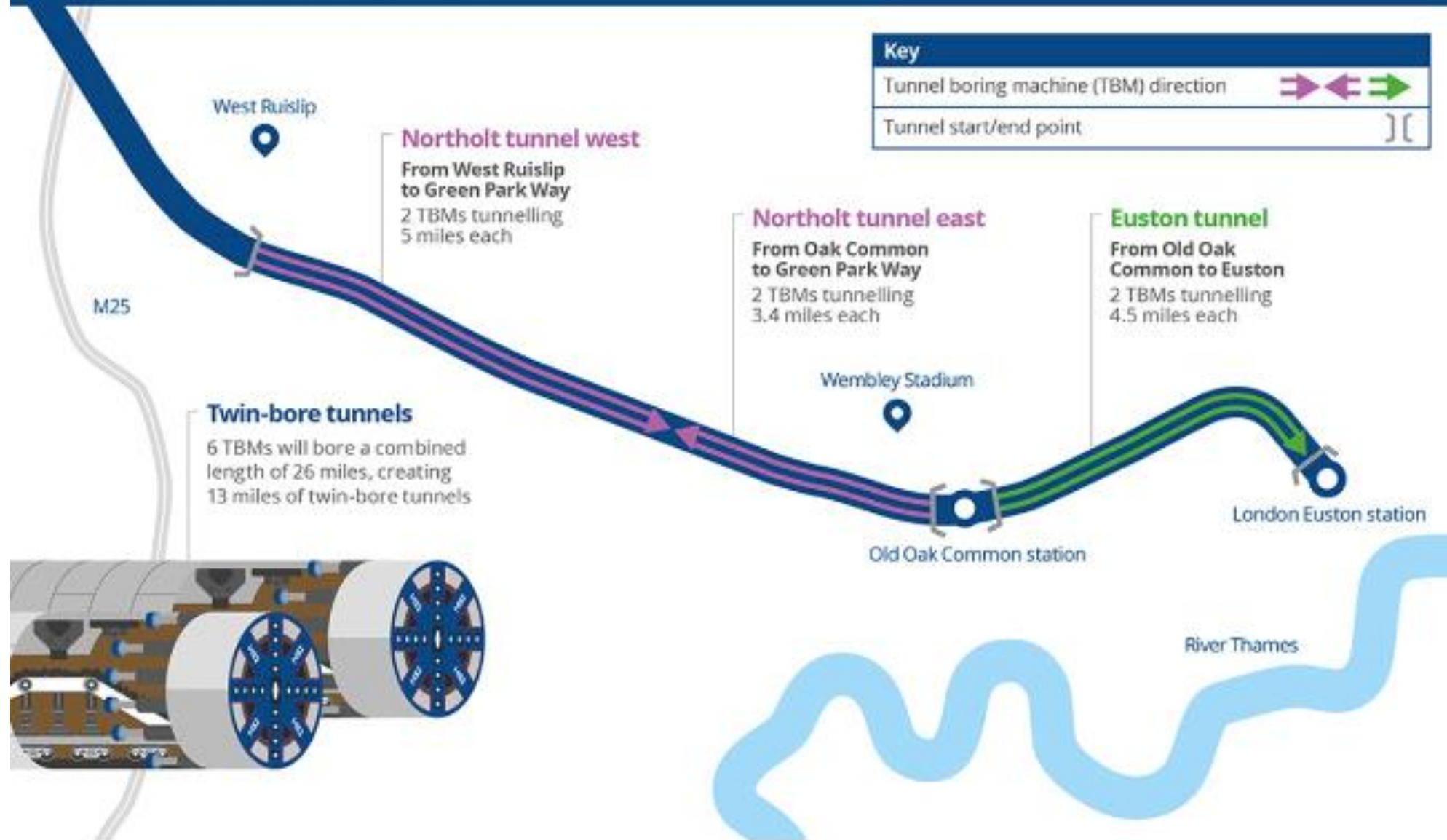




# HS2 tunnels: London

26 miles of tunnelling

# HS2





Cut and cover 'Green' tunnel construction

Chipping Warden, Northampton shire

5,020 segments made in Ilkeston Derbyshire

Tunnel has two arches 8.4m high,  
20.3m wide

There are 5 such tunnels on the route









Order placed for 54 train sets

Alstom/Hitachi £2.8bn, including 12 years of maintenance

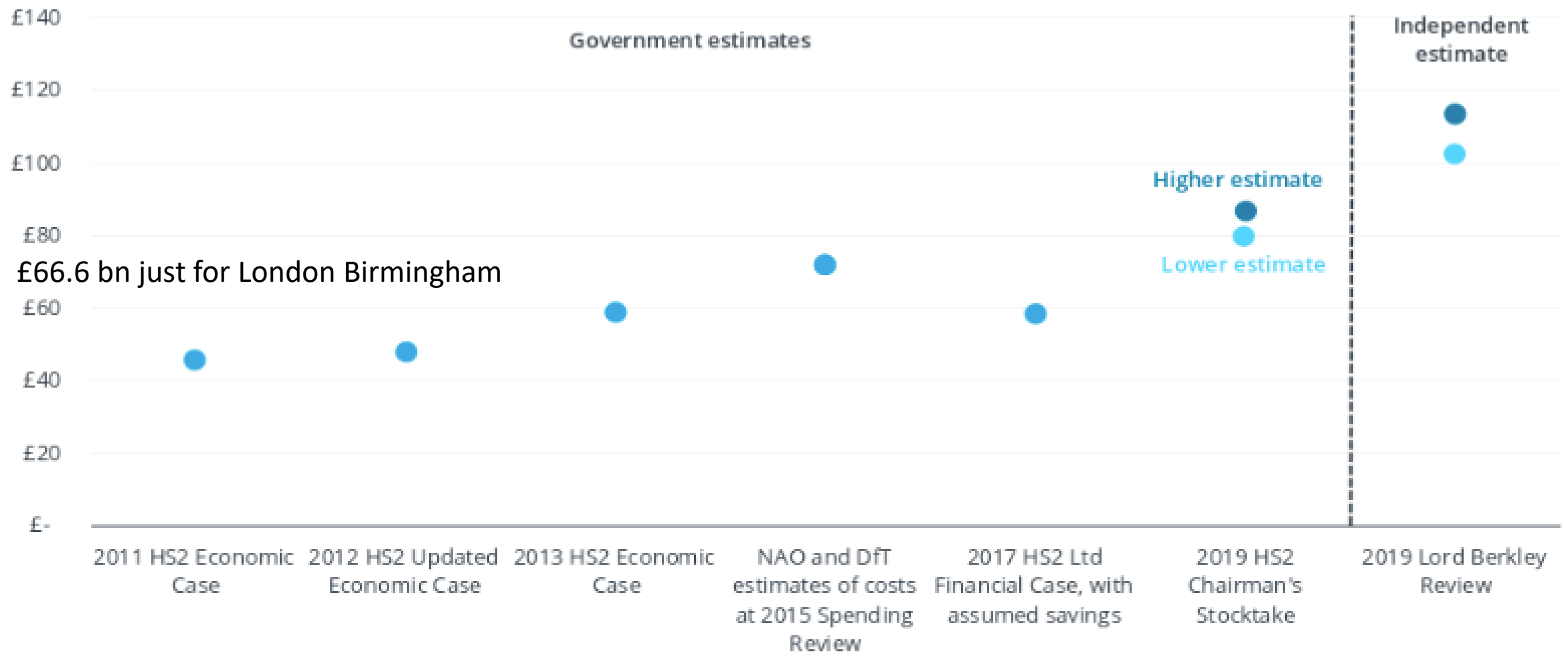
400m long 350 kph, designed for 35-year-life

Capacity 1000 passengers

## Rolling stock folly and uncertainty

- To operate on HS and normal track
- Dual mode power
- High axle loads
- No tilt, so slower than existing on classic track
- 400m trains too long for existing platforms

# High Speed 2 costs, 2020 prices



£66.6 bn just for London Birmingham

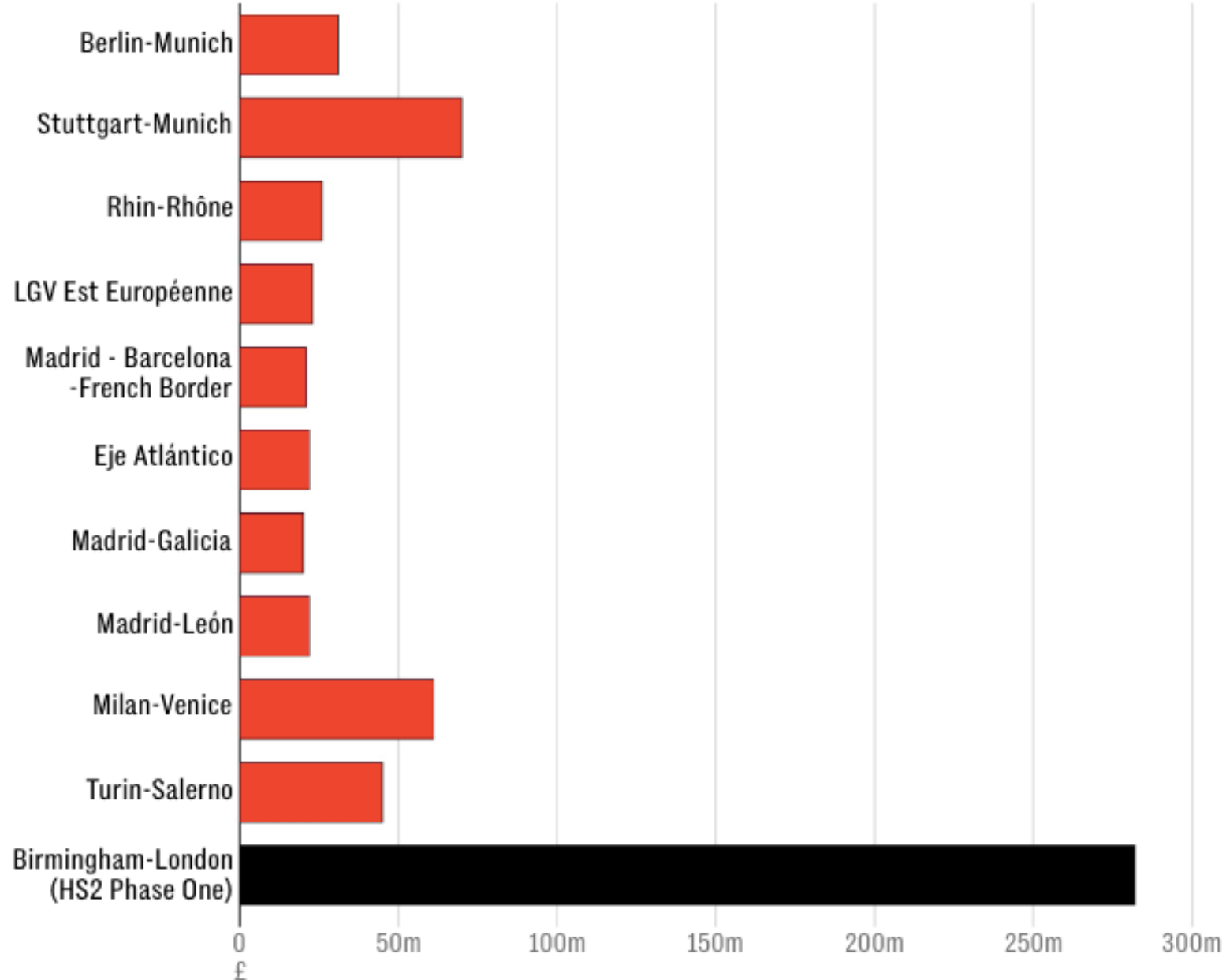
Source: Institute for Government analysis of House of Commons Library, High Speed 2: the business case, costs and spending; HS2 Ltd, Chairman's Review; Lord Berkeley, A review of High Speed 2: Dissenting report, 2019



10 Jan 2023 HS2 Chair Sir John Thompson, increase because initial budget set too low and recent high inflation.

# The crazy cost of HS2

Cost per mile of track (£m)





## **Why was HS2 scrapped?**

Huge inflation in costs

Government depends on so called “Red Wall” seats in North, need rapid action to recover popularity

No clear overview in Government why HS2 was needed

**No efforts had been made to win “hearts and minds”**

## **Reaction from Sir John Armitt, Chair of the National Infrastructure Commission**

Very disappointing.

You have to have a vision, you have to know where you are trying to go.

And you have to get people to buy into that vision



# **NETWORK NORTH: TRANSFORMING BRITISH TRANSPORT**

Presented to Parliament  
by the Secretary of State for Transport  
by Command of His Majesty

October 2023

## THE FUTURE?

The only function of economic forecasting is to make astrology look respectable. *J K Galbraith*

**THE FUTURE** has a history.

The good news is that it's one from which we can learn; the bad news is that we very rarely do. That's because the clearest lesson from the history of the future is that knowing the future isn't necessarily very useful.

But that has yet to stop humans from trying!

Amanda Rees U of York

**Yes, it extremely difficult.**

THE FUTURE is determined by, for example:

Human actions. eg. Ukraine, Israel and Hamas

Possible pandemics: who predicted Covid?

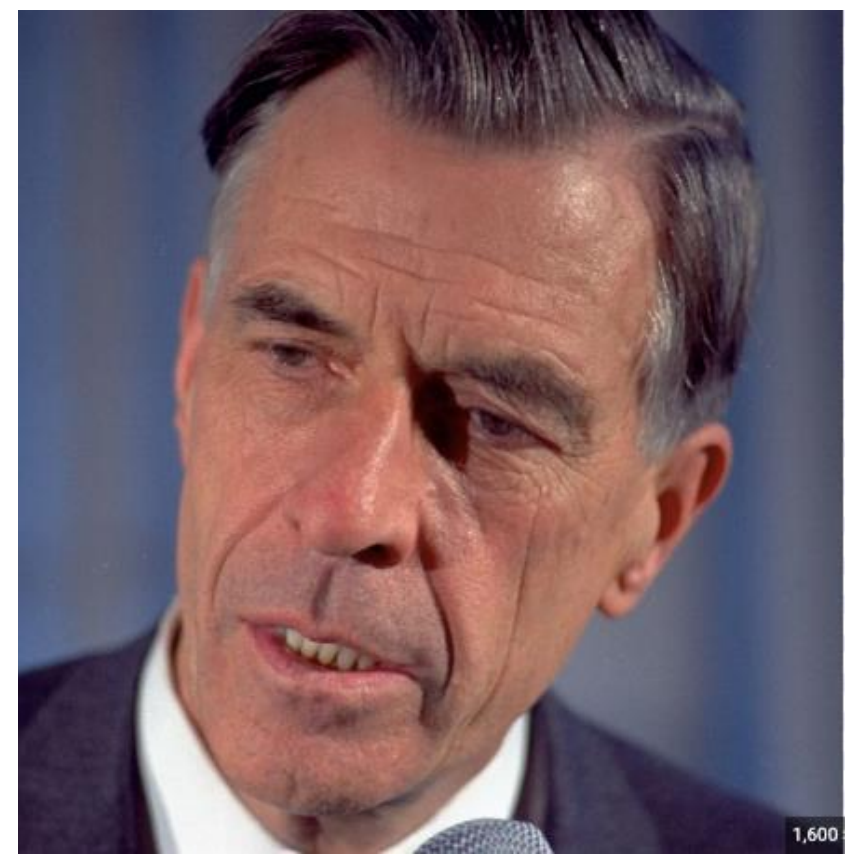
The climate and its rapid change

Technology

Politics

The unexpected

**Exclude the living diversity of human experience at your peril!**





The next 20 years will likely see advances in renewable energy, electric vehicles, and carbon capture technologies to help combat climate change. Will fusion become practical? The timeline for these advancements will depend on political will and investment in research and development.

## Future railway trends

- Automation- particularly autonomous driving
- De-carbonisation- more electrification, green electricity generation, batteries, hydrogen
- New Technologies- data analytics, AI, real time health monitoring
- Enhanced services- improving customer satisfaction
- Harmonisation of train control systems eg. ETCS

All these lead to improved service, increased efficiency, improved customer experience, lower costs, increased capacity

## All making the switch to rail more attractive

One prediction from the author:

**Hyperloop will play no significant part in the future**

## UK rail future

Promised reform “Great British Railway”  
Postponed because of forthcoming general election

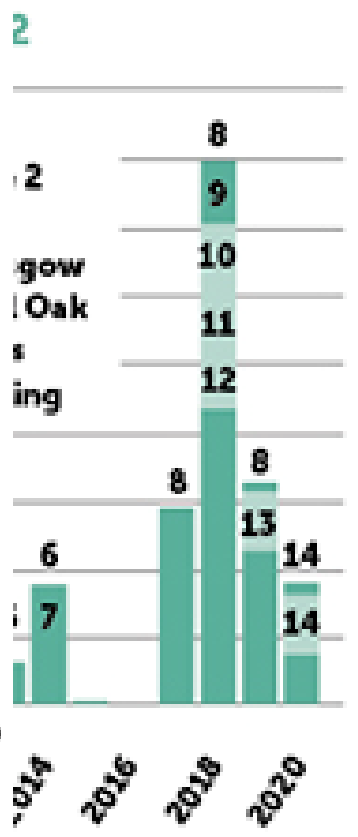
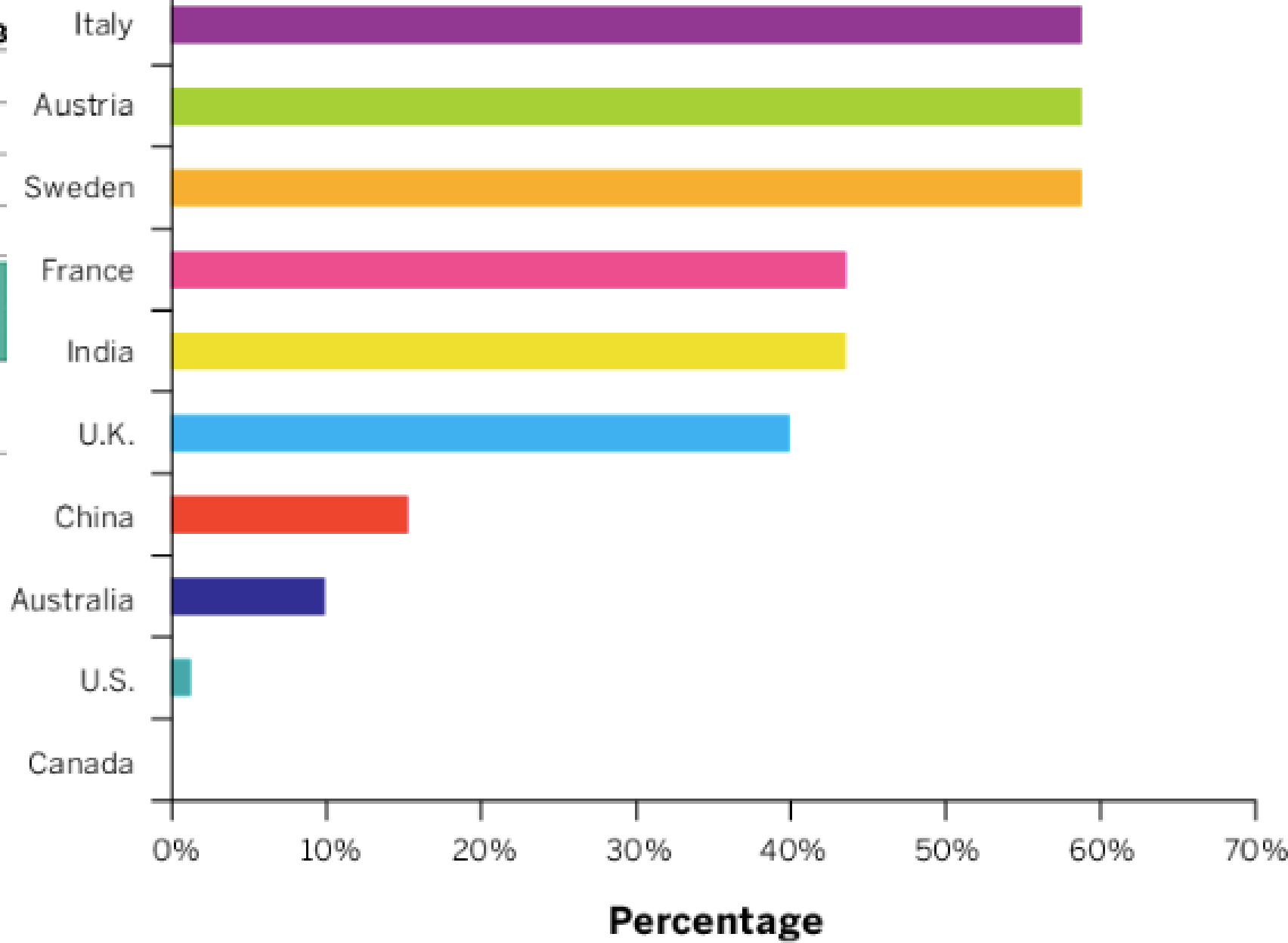
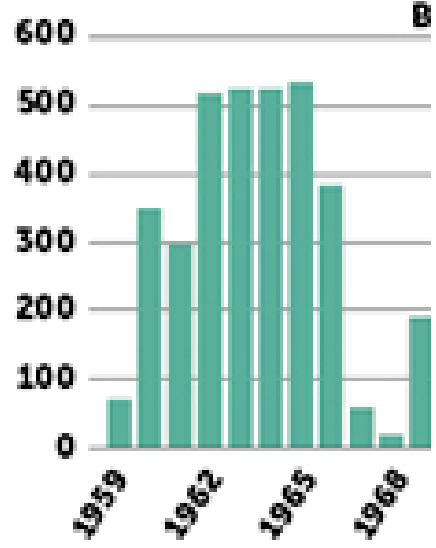
What is needed?

Clear vision for what is expected of the railway  
Continuity of planning for electrification, rail vehicle building  
An answer to how is the railway to be paid for and by whom  
Reduction of fragmentation

For passenger

Reliability, accurate delivery of the timetable  
Simpler and cheaper fares  
Better recovery from perturbations  
Resilience for effects of climate change

25kV electrification



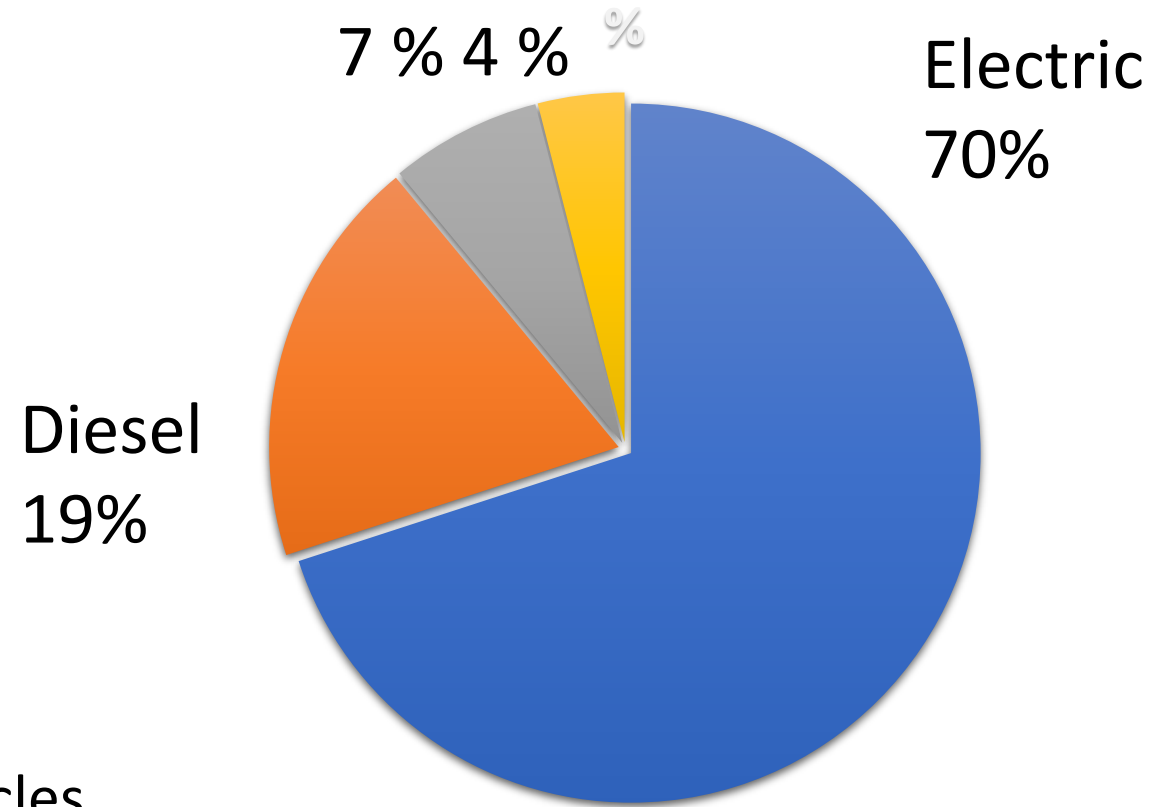


•As of 31 March 2023, there were 15,220 railway vehicles registered in operation for all passenger train operators. Of these, 70% were electric, 19% were diesel, 7% were bi-mode and 4% were locomotive hauled.

•The average age of rolling stock for all passenger train operators as of 31 March 2023 was 16.7 years.

•Normal life is between 30 and 40 years

In the current fleet, over 65% of the vehicles have been built since privatisation (1997 or after). Over a third have been built in the last 10 years, and just 4% were built before 1980.



HOME NEWS

# Japanese firms withdraw from Malaysia-Singapore high-speed rail project

By Mary Alavanza

JANUARY 14, 2024



## Japanese to sell off £500m of UK rail assets

Mitsubishi HC Capital is expected to offload its interests in HSI and East Midlands Railway



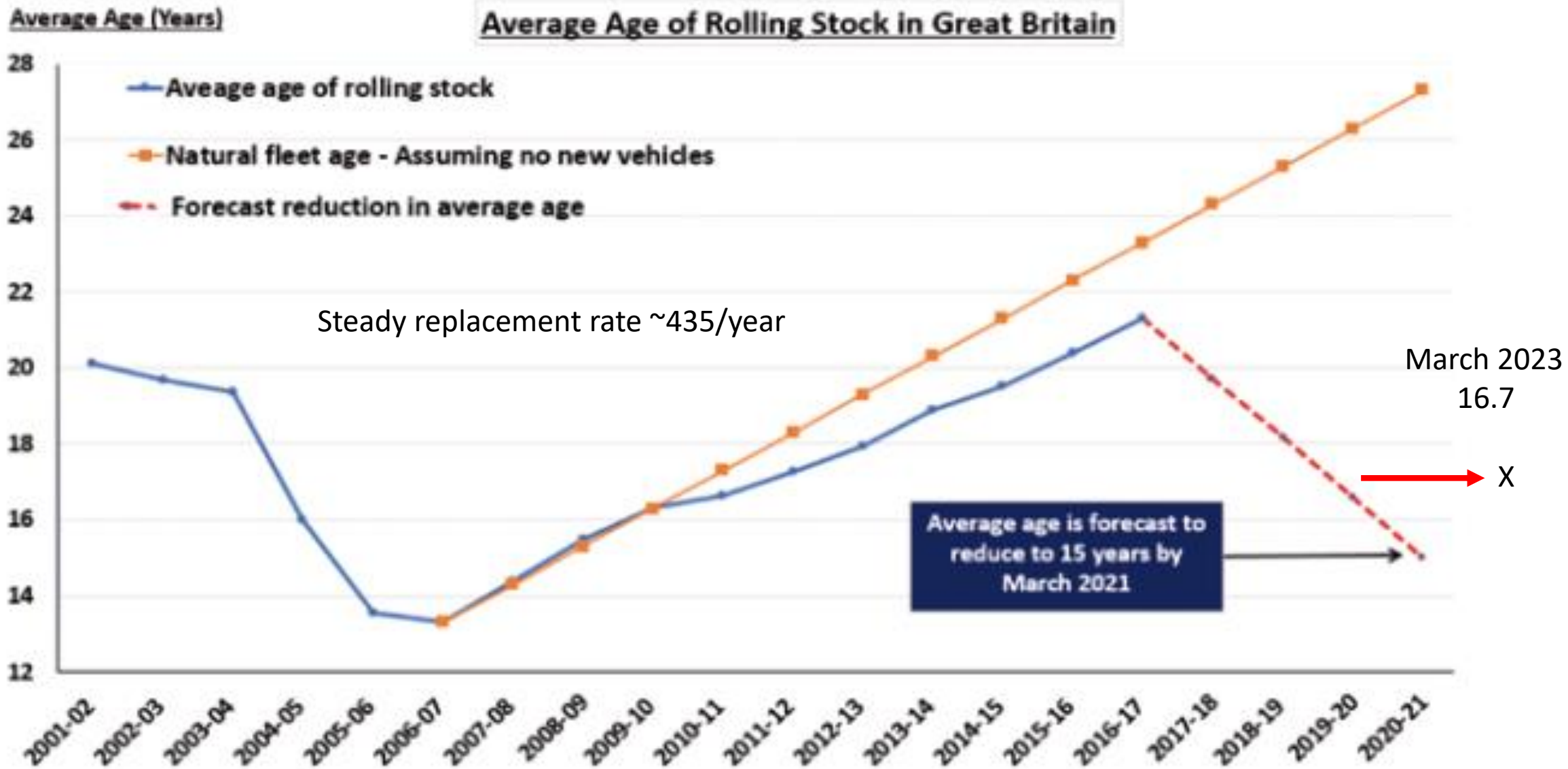
## Post Office was warned about Fujitsu IT software 13 years before Horizon scandal

EXCLUSIVE

The regulator of Fujitsu's benefits system claims the £1.5bn IT project suffered data errors like those that later hit the Horizon software



# National Fleet Average Age Forecast



Source: Analysis from TOC, RDG and ROSCO data for the end of March 2017



## What of the future of Europe?

- Many previously strong economies are struggling, including, Germany, France, Italy
- There is political uncertainty, possibly unrest, in many countries
- Immigration internally and from outside is causing huge pressures leading to
- Increasing nationalism and protectionism
- Increasing concern about financial input and output to the “Club”
- The leadership of the EU needs to be sensitive to these issues or there may be more resignations
- Transport policies are very well intentioned, but somewhat idealistic and unrealistic
- **The big question:.. Who will pay??**





Thank you for being such an attentive audience

I look forward to questions and our panel discussion

Allow me to draw your attention to the reading list  
and my contact:

[roderick.smith@imperial.ac.uk](mailto:roderick.smith@imperial.ac.uk)