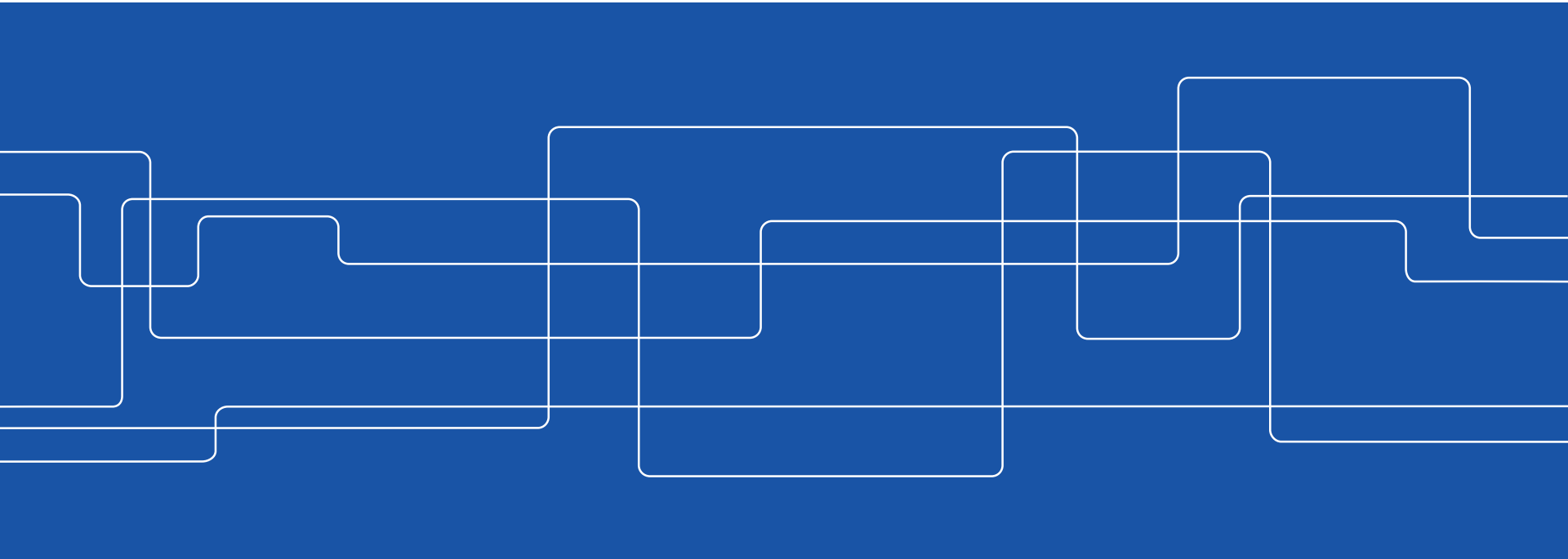




# Market and economy for night trains to Europe

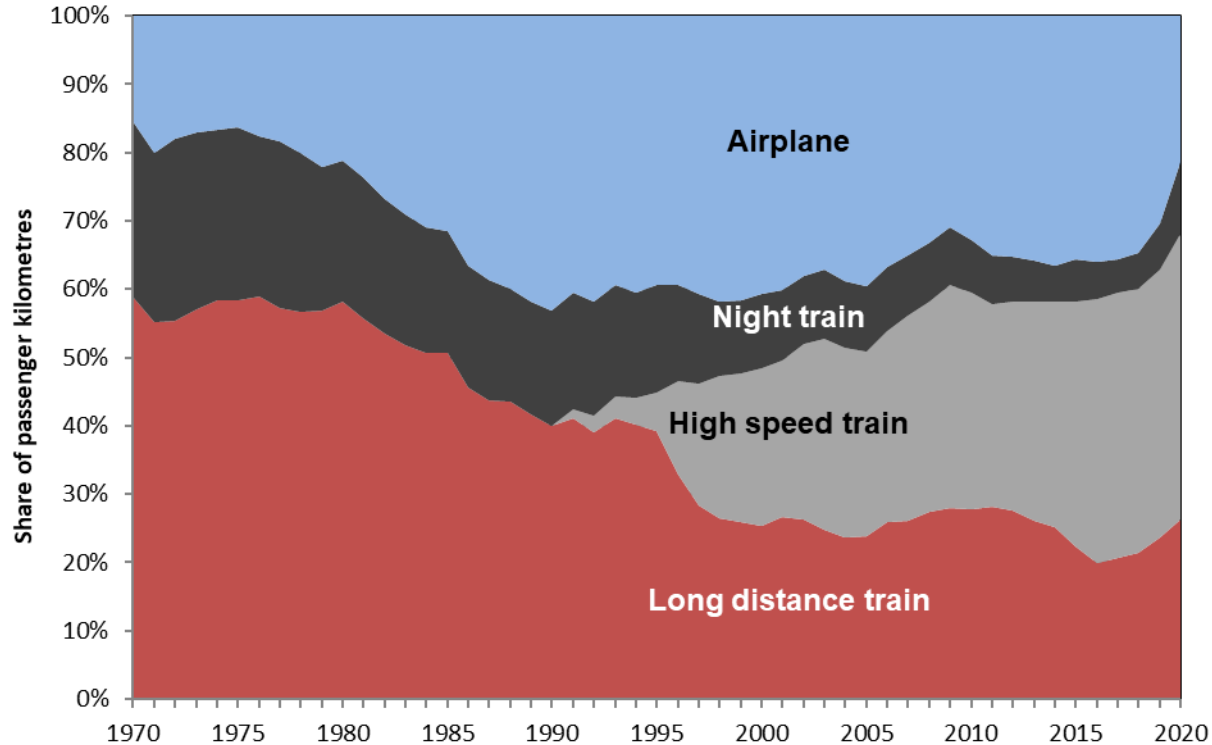
Bo-Lennart Nelldal, Professor Emeritus, KTH Railway Group

2021-05-20



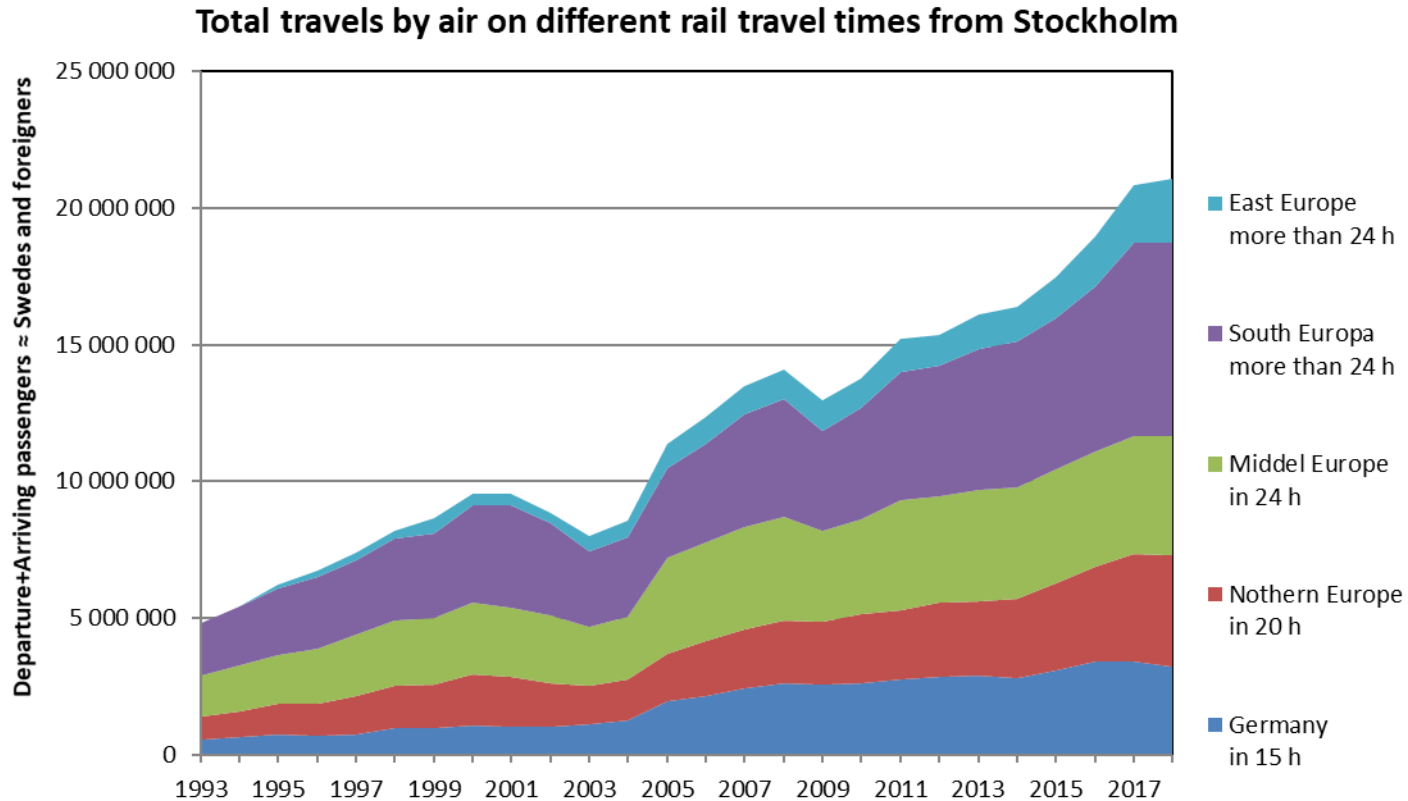
# Night train market in Sweden

## Long distance rail and air transport - market shares



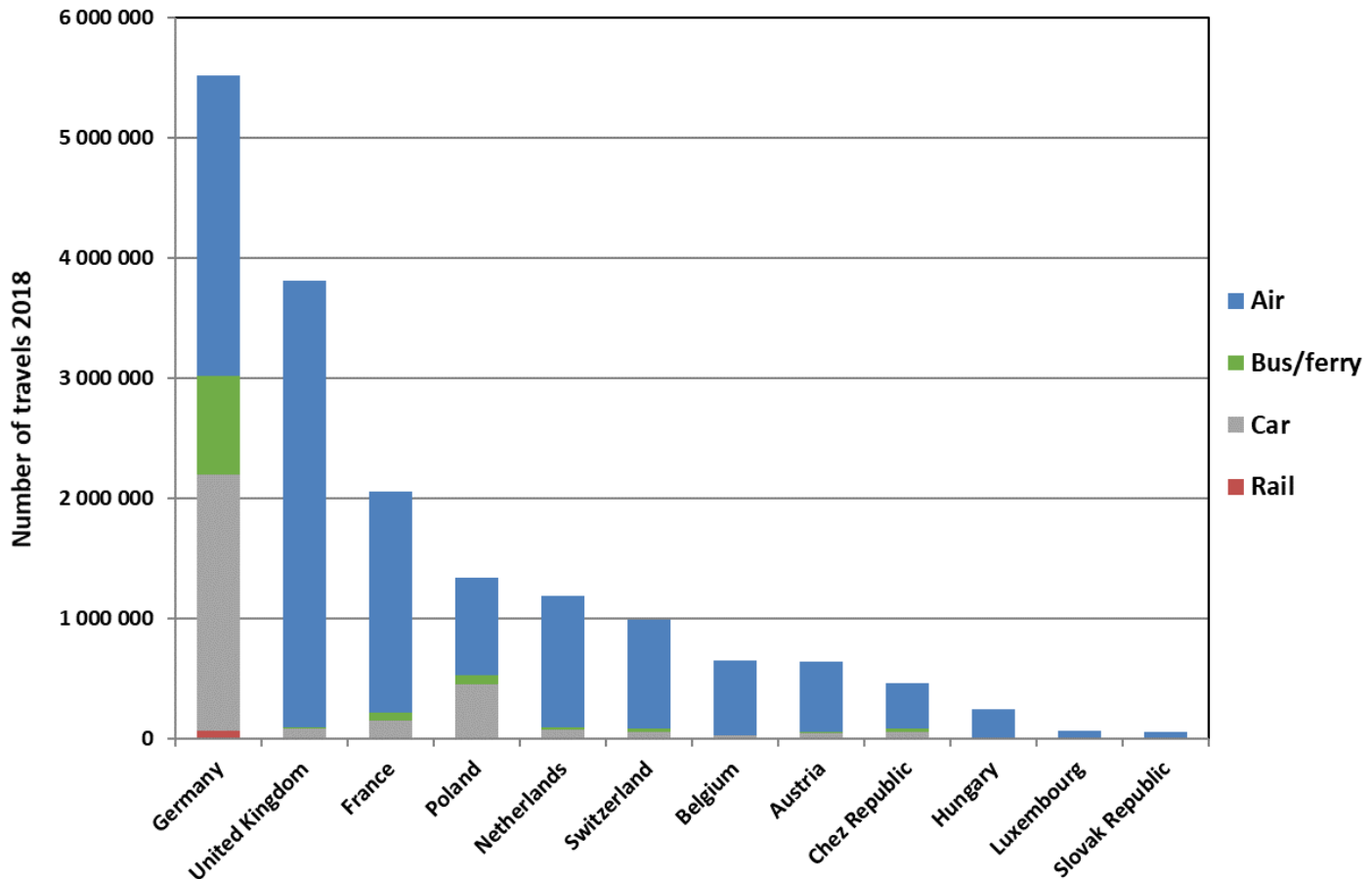
- Long distance rail has lost market shares to airplanes until 1990
- From 1990 high speed rail has taken market shares from airplanes
- Night trains has been pressed between airplanes and high speed rail
- In 2020 rail gained market shares because of the Corona pandemic

# Travels between Sweden and Europe by air



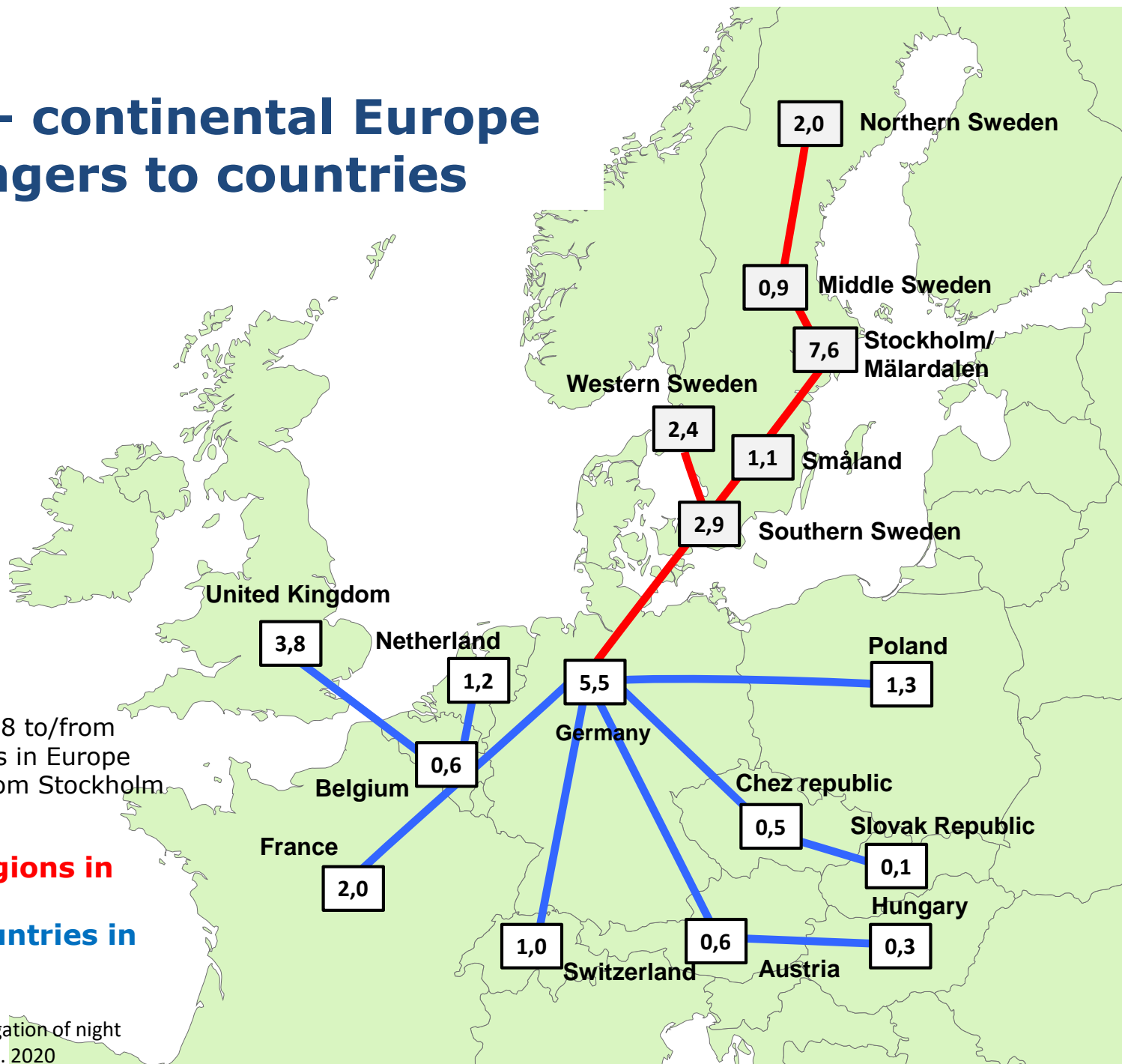
- Travelers by air has increased from 5 to 22 billions or by 4 times since 1993
- Of this 13 billions are to countries within 24 h rail travel from Stockholm
- Add to this 4 billions by car or bus
- Air travel has increased so fast because it has been much cheaper

# Rail market between Sweden and Europe



- Rail are not a realistic alternative for countries more than 24 h away
- Countries like Spain; Portugal, Greece are excluded
- In these countries air plane market share is almost 100% and charter dominates
- The other countries are more or less possible to reach by train

# Sweden - continental Europe Passengers to countries



**2,4** To/From regions in Sweden

**2,0** To/from countries in Europe

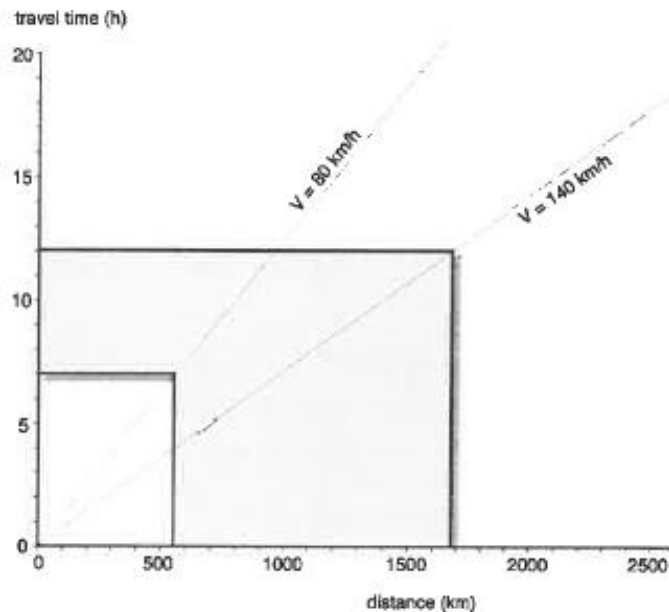
# Available market for night trains

Depending of time window and average speed

## Narrowest markets

- Departure in the late evening (20:30 – 22:30)
- Arrival in the morning (6:30-8:30)

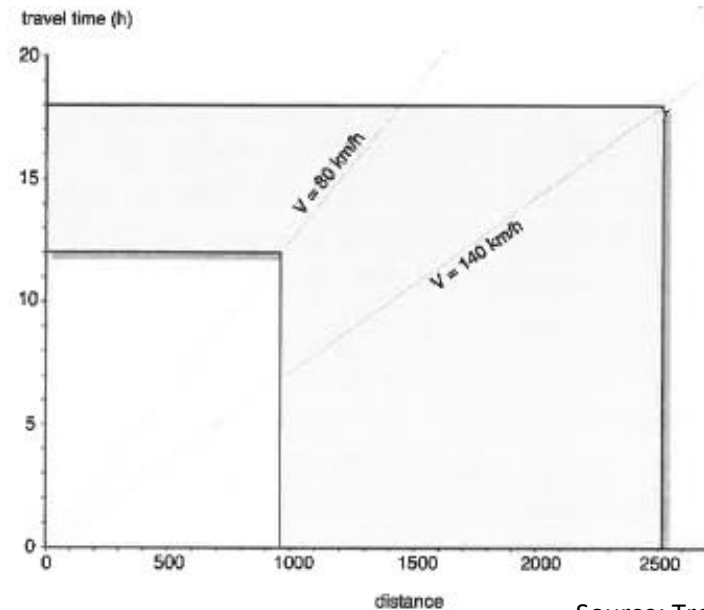
→ Range 600 – 1700 km



## Widest market

- Departure after work (16:30 – 20:30)
- Arrival before lunch (8:30-11:30)

→ Range 900 – 2500 km

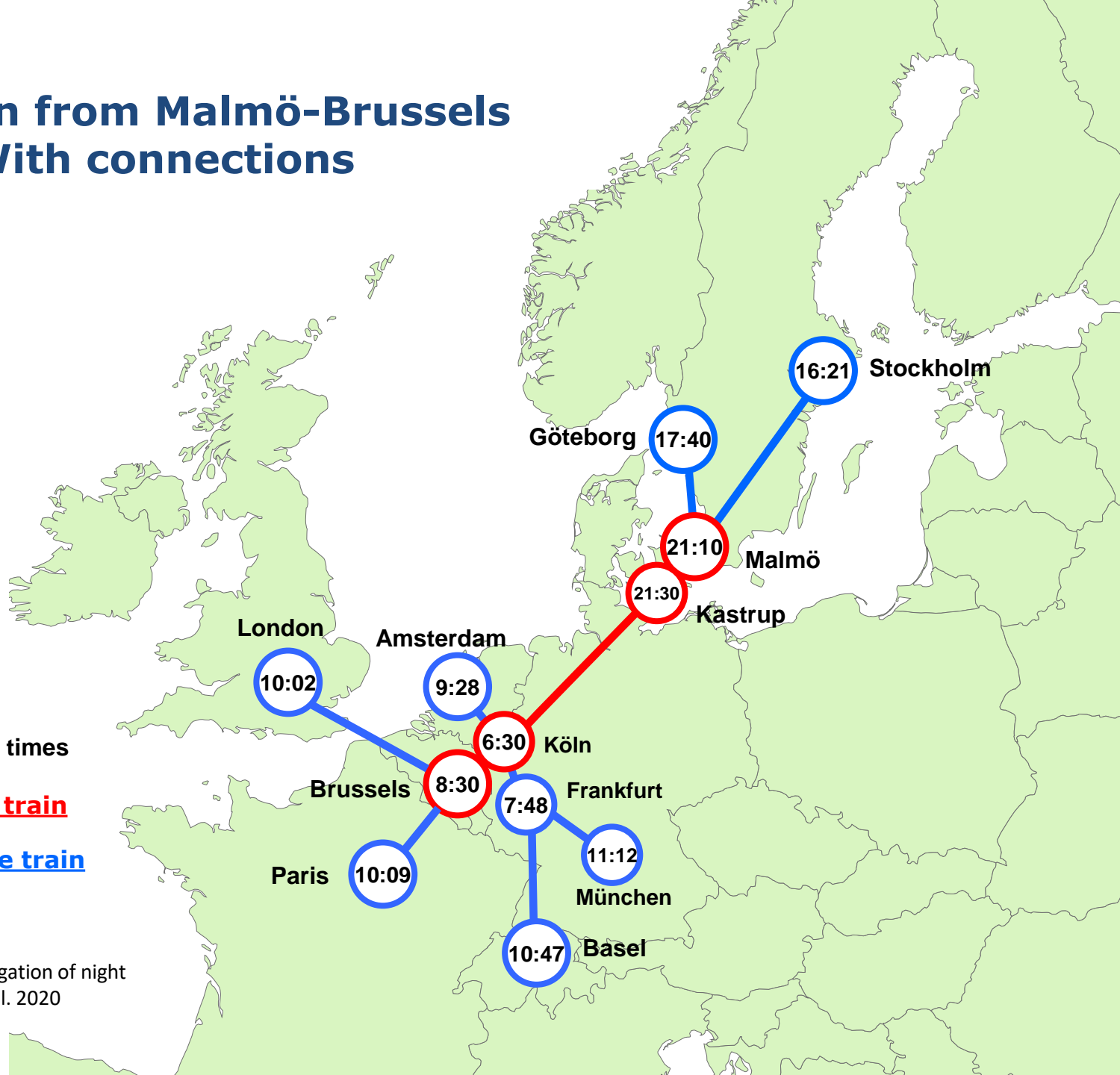


# Night train from Malmö-Brussels - With connections

Departure and arrival times

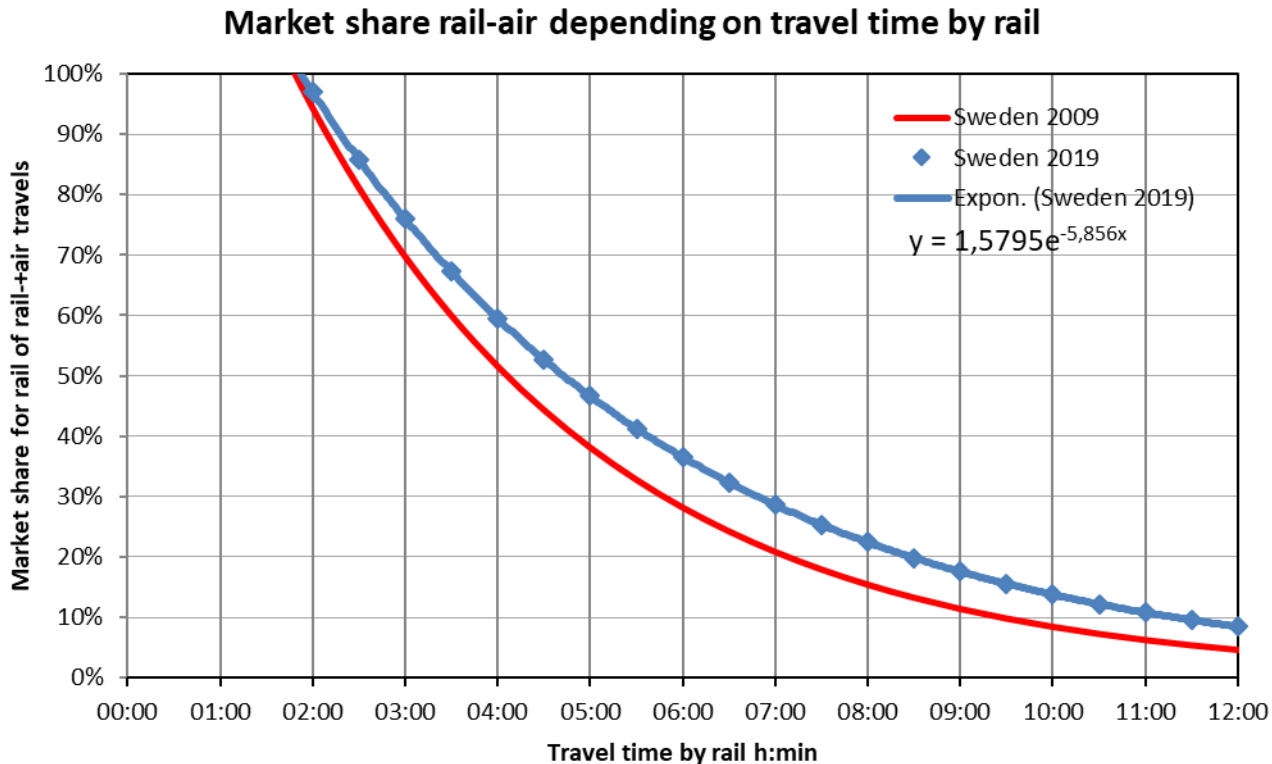
**21:10** With direct train

**10:02** With change train



Source: Trafikverkets investigation of night trains to Europe, Nelldal et.al. 2020

# Modal split rail-air depending of travel time by rail

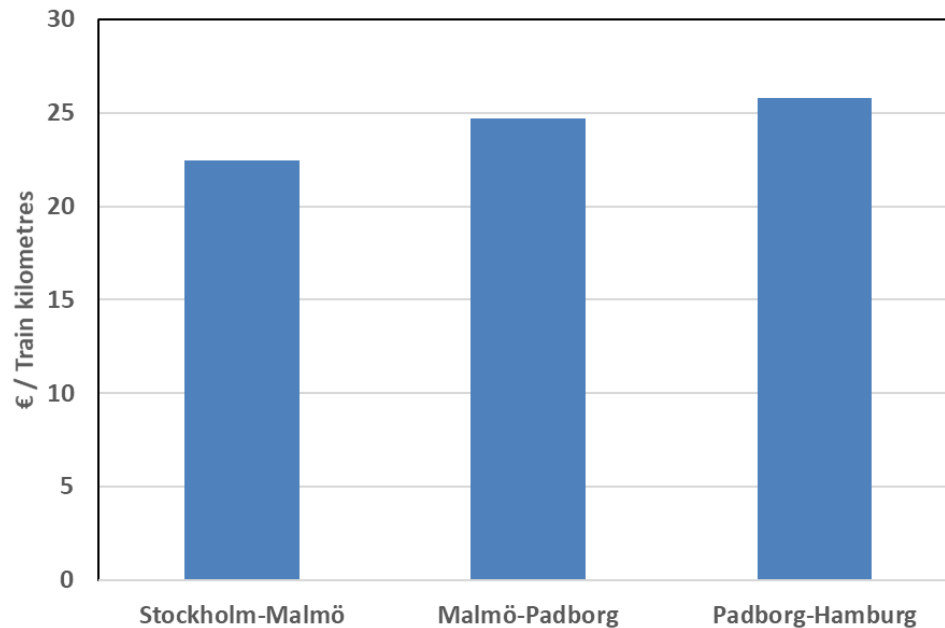


- This curve is often used to explain the effects of high-speed rail
- In Sweden there are also night trains to the northern country with long travel times
- Compared with 2009 the curve for 2019 has shifted to higher market share
- Probably an effect of more environmental-friendly behaviour of travellers



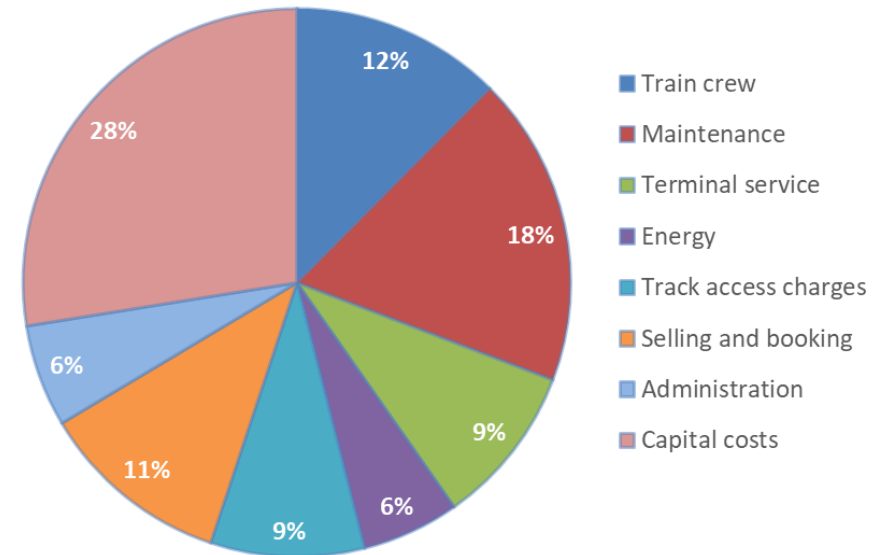
# Costs for night trains

Costs for operating a night train from Stockholm to Hamburg



The cost is approx. 22 € / train kilometres in Sweden, more in Denmark depending on bridge charges and even higher in Germany depending on track access charges

Cost structure for night trains



The capital costs have the highest share with 28 % then maintenance with 18%. Sleeping cars are relative complicated. Terminal service is washing and tidy up wagons.

Source: Calculations with KTH costs models for Trafikverkets investigation of night trains to Europe. New equipment.



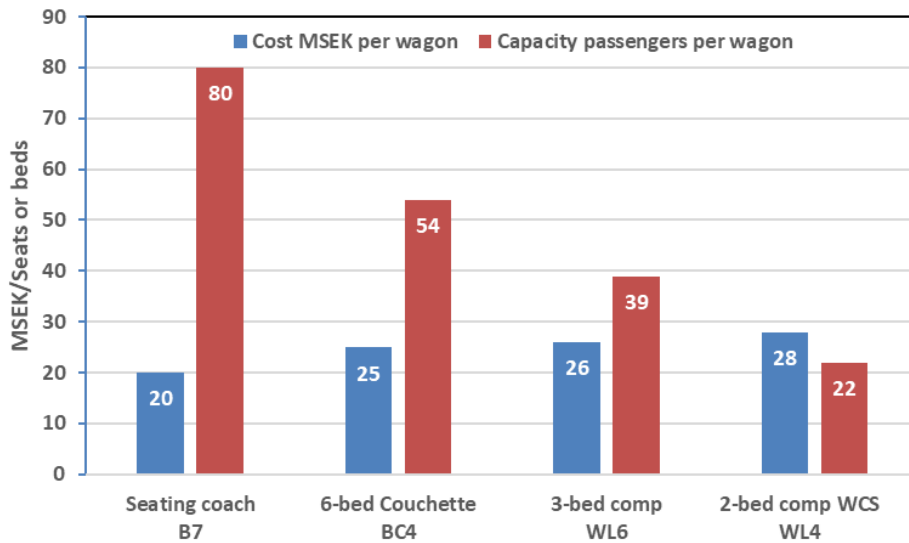
# Why are night trains unprofitable?

**It is difficult to get night trains profitable depending on**

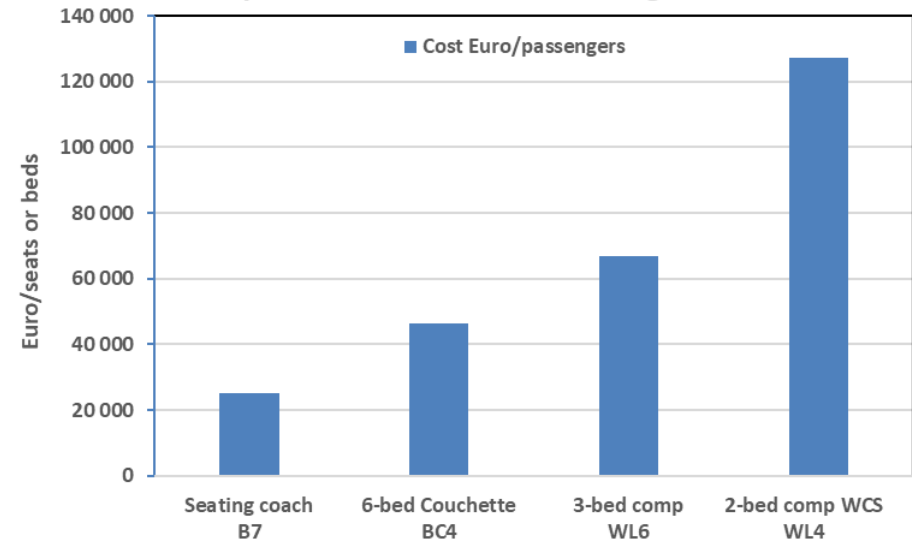
- The wagons are only used once per day → high capital costs
- Complicated wagons → high operating costs
- Few passengers per wagon → low revenue
- Complicated mix of passengers → Low occupancy rate
- Competition from low-price air lines → Low market price

# Costs for wagons and per passenger

## Cost - Capacity for wagons - Swedish night train



## Cost per bed or seat - Swedish night train



- The cost for sleeping cars are much higher than an ordinary seating coach
- The capacity is much lower
- The cost per passenger is 2 – 6 times higher



# The occupancy rate is lower in Night trains

## Booking of night trains:

- Booking of compartments
- Booking of beds, sometimes for male or female
- Can only be used once/trip
- Sometimes not whole the line

Example:

$$75\% \times 67\% \times 90\% = 45\%$$

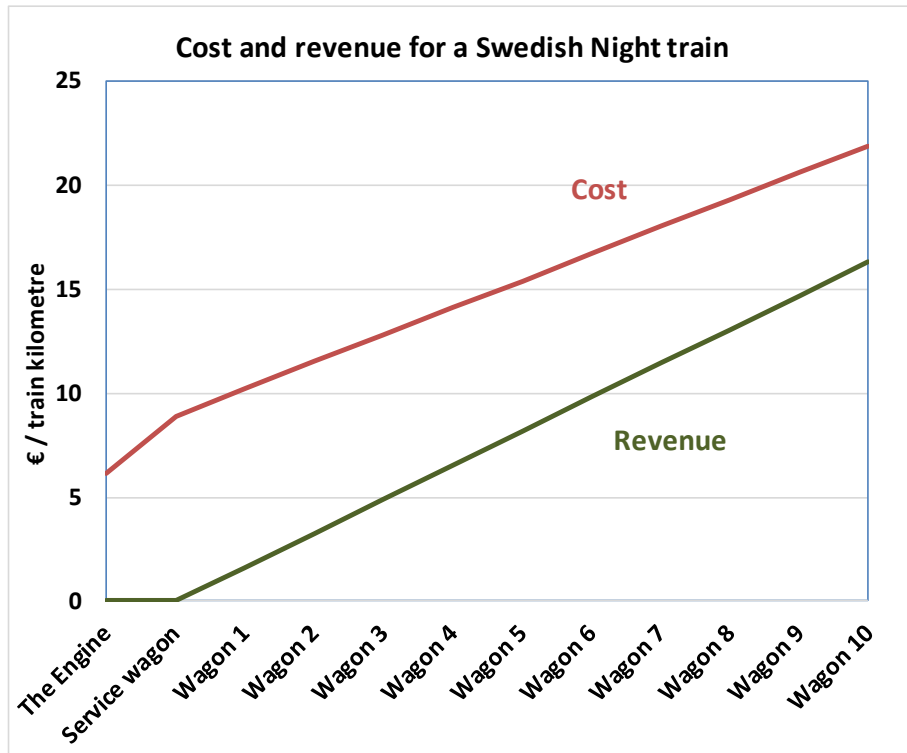
## Booking of day trains:

- Booking of seats
- No problem with male or female
- Can be used more times
- Sometimes not whole the line

Example:

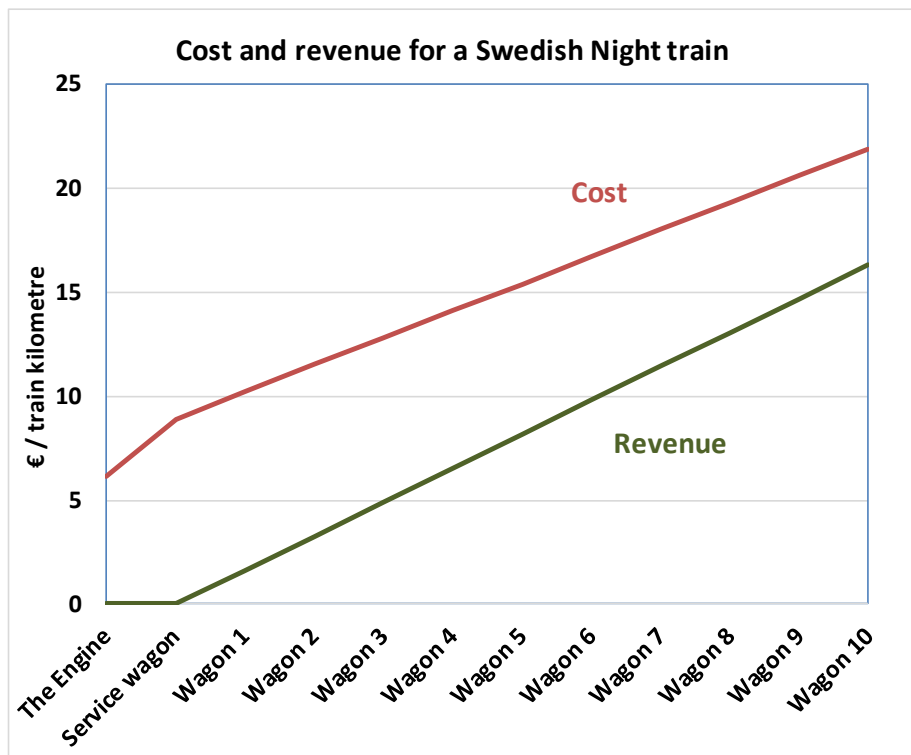
$$75\% \times 90\% = 68\%$$

# Night Train profitability

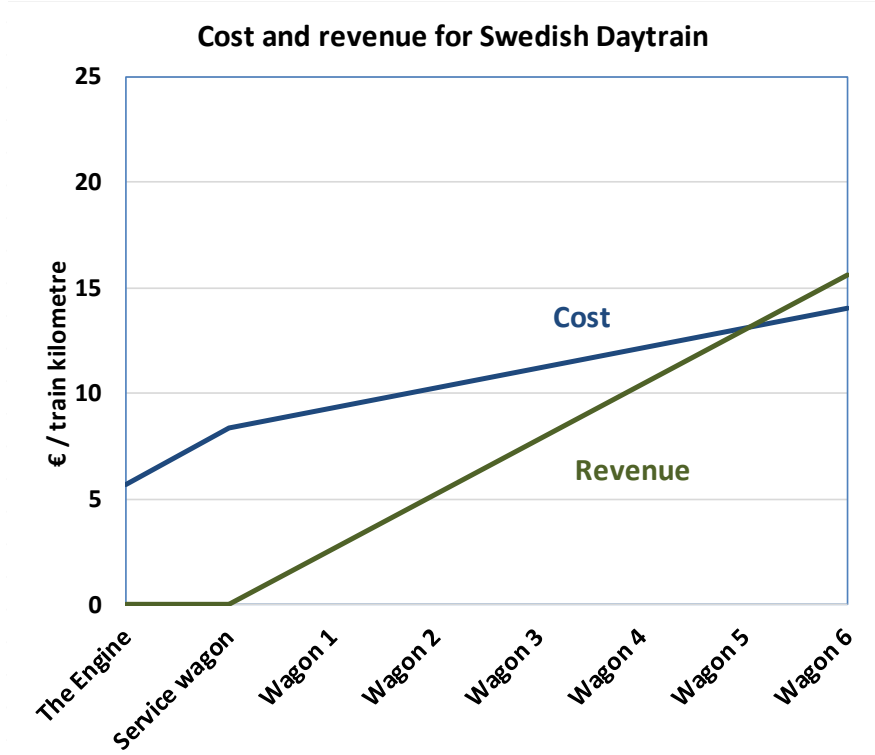


- The cost is 22 € / train kilometre for 10 wagons
  - The capacity per wagon is 40 pass in average
  - The occupancy rate is 50%
  - The average revenue is 0,08 € / passenger km
- There is a need for 30 wagons to get profitable

# Night Train profitability ... and Day Train



- The cost is 22 € / train kilometre for 10 wagons
  - The capacity per wagon is 40 pass in average
  - The occupancy rate is 50%
  - The average price is 0,08 € / passenger km
- There is a need for 30 wagons to get profitable



- The cost is 14 € / train kilometre for 6 wagons
  - The capacity per wagon is 60 pass in average
  - The occupancy rate is 65%
  - The average price is 0,07 € / passenger km
- There is a need for 5 wagons to get profitable



# How can profitability be improved?

## And why Night trains can exist in short term:

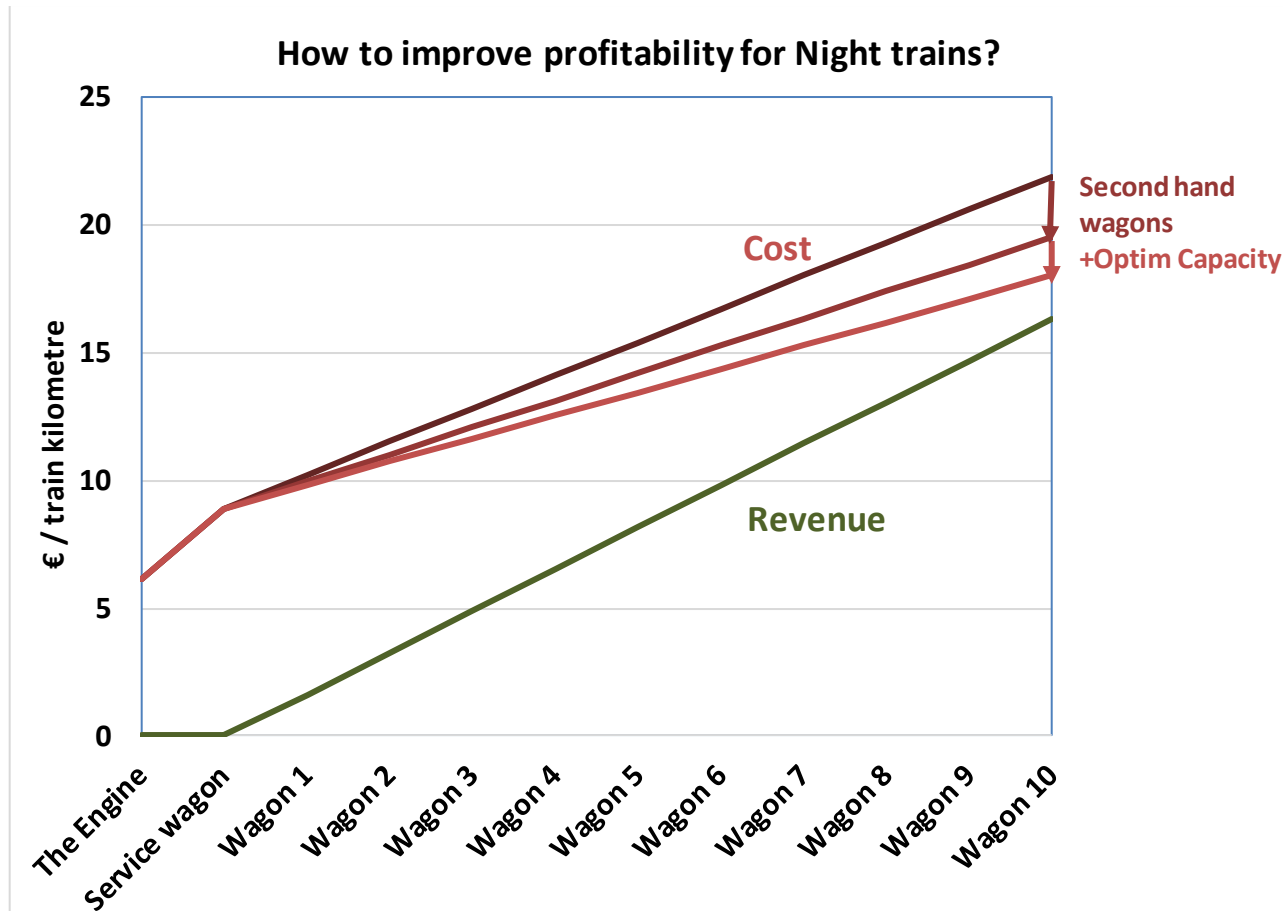
- Use of second hand wagons with less capital costs
- Adjust the capacity to the demand by season and weekday
- Use yield management to get higher occupancy rate
- Higher willingness to use train to reduce green house gases
- Desirable: A booking system which is easy to use for all Europe

## → In long term: Develop new concepts with:

- Higher capacity per wagon
- More flexibility
- Higher customer value

# How can profitability be improved?

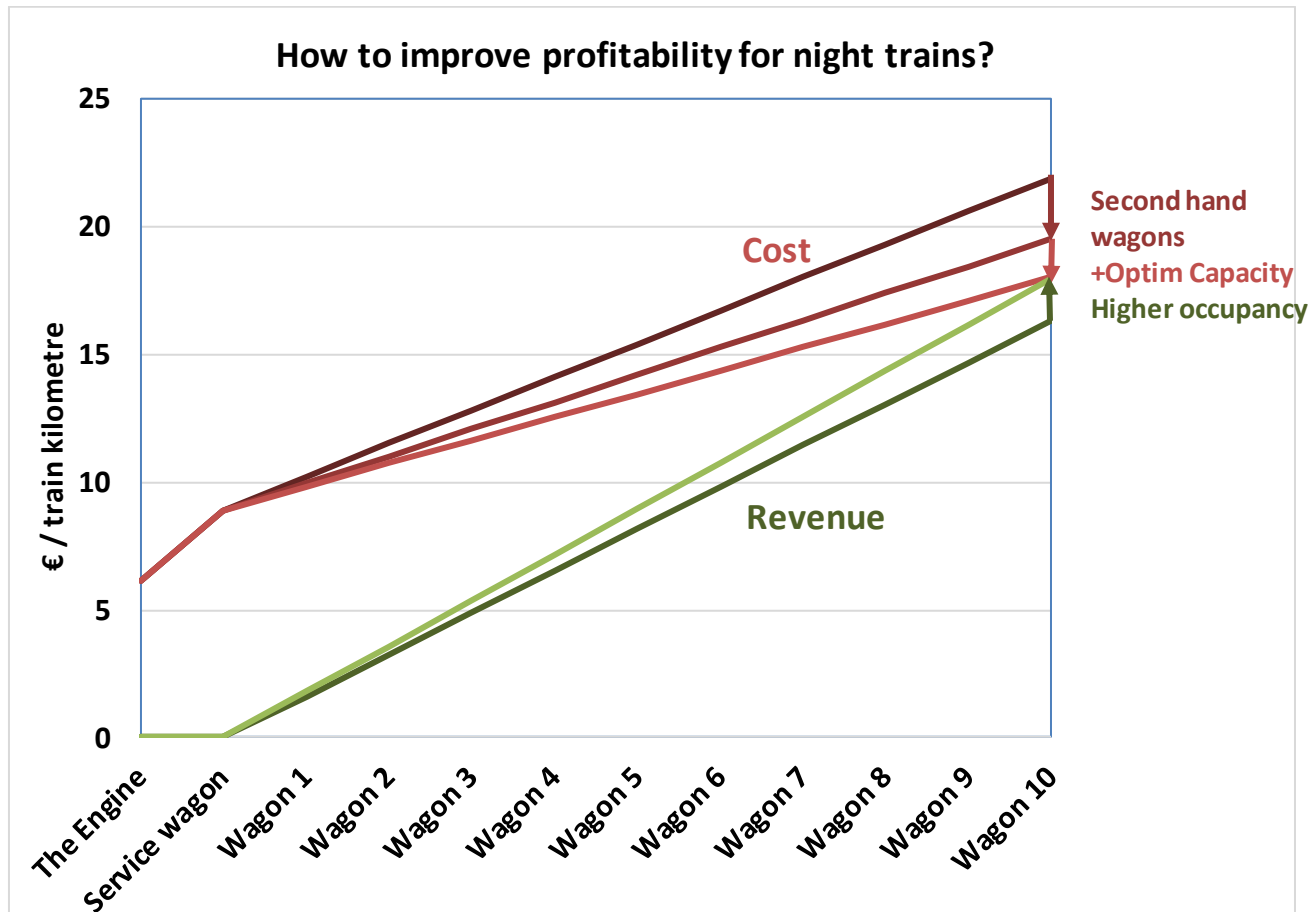
## - From the cost side



- To use refurbished second hand wagons can reduce the capital costs
  - To optimize the capacity according to the demand can also contribute
  - This can reduce the total cost with approx. 20%
- There are also risks of increasing the costs!



# How can profitability be improved? - From the revenue side



- To increase the occupancy rate with yield management can rise the revenue
  - General higher prices is a risk because of price elasticity
  - The sky is the limit – the market price are determined of air travel
- With proper management it is possible to get night train profitable – but not easy

# Combined day and night train - Simple and available solution



**Ordinary Couchettes  
with compartments  
with seats which can  
be shifted to beds**

**Ex SJ BC4  
Veolia BC2**



# Efficient double deck sleeping wagons

## - VR Finnish state railways sleeping wagon



1 class compartment with 2 beds and WC and shower in the compartment



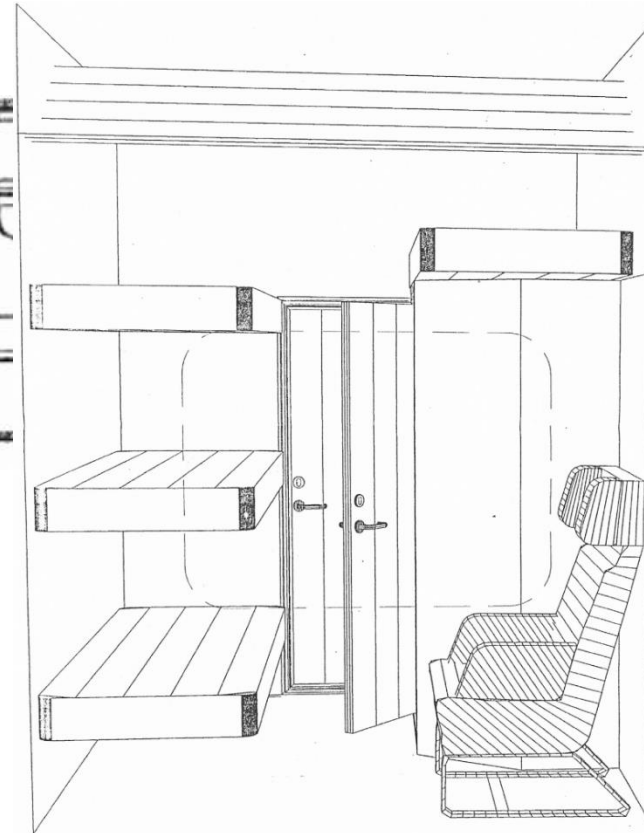
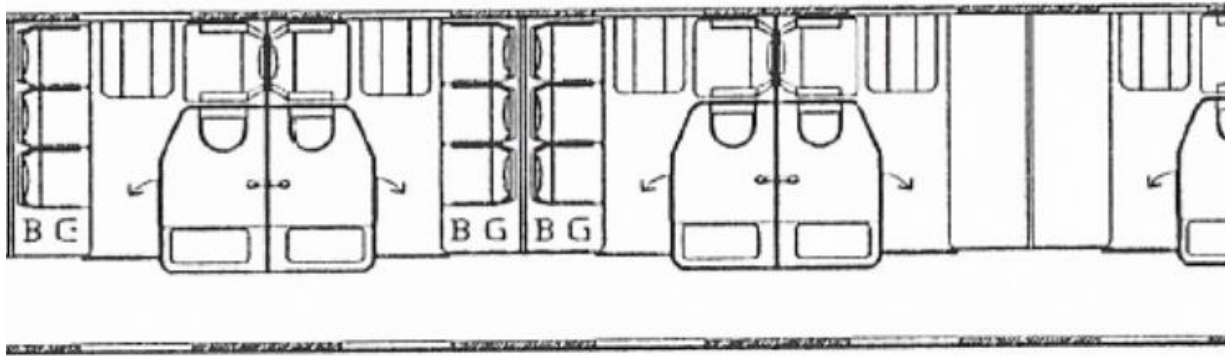
2 class compartment with 2 beds. It is possible to open between two compartments to get a 4 bed compartment. WC and shower in the corridor



Capacity: 40 – 70 beds per wagon depending on standard

# Vision 1: More flexible conventional coach

## Combined business and leisure wagon



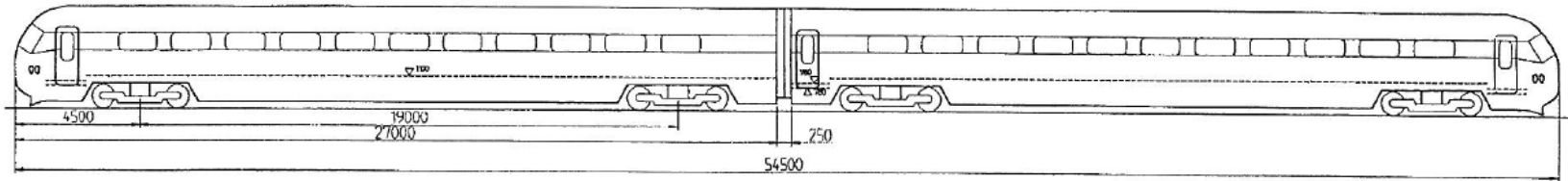
**Compartments: 10 with WC and shower**

**Alternatives:**

- **10 single beds for business**
  - **20 double beds for pairs**
  - **30 triple beds for families**
  - **40 four beds families, groups or couchettes**
- or**
- **40 seats for day-travels**

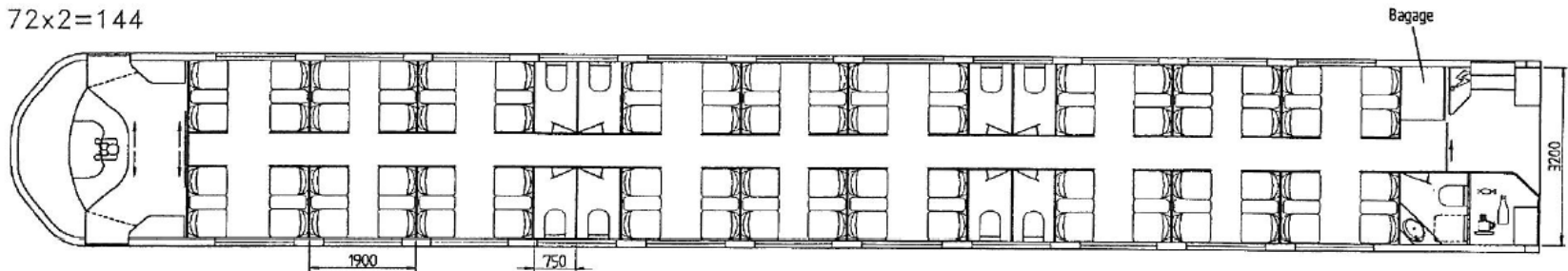


# Vision 2: Combined day- and night EMU train

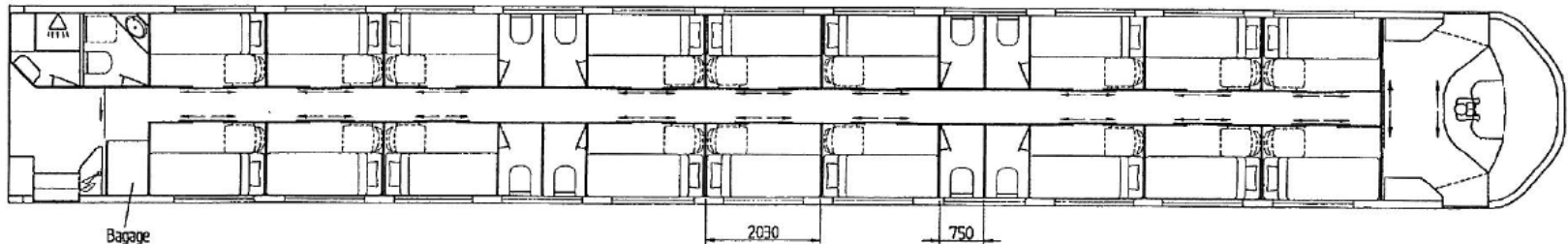


## New 3,60 m wide-body train – Gröna Tåget

72x2=144



36x2=72



### Antal platser:

Nattutförande: 2 vagnar, 72 pl; 3 vagnar, 108 pl

Dagutförande: 2 vagnar, 144 pl; 3 vagnar, 216 pl

DagoNattåg

version med gaveldörrar



## Reality

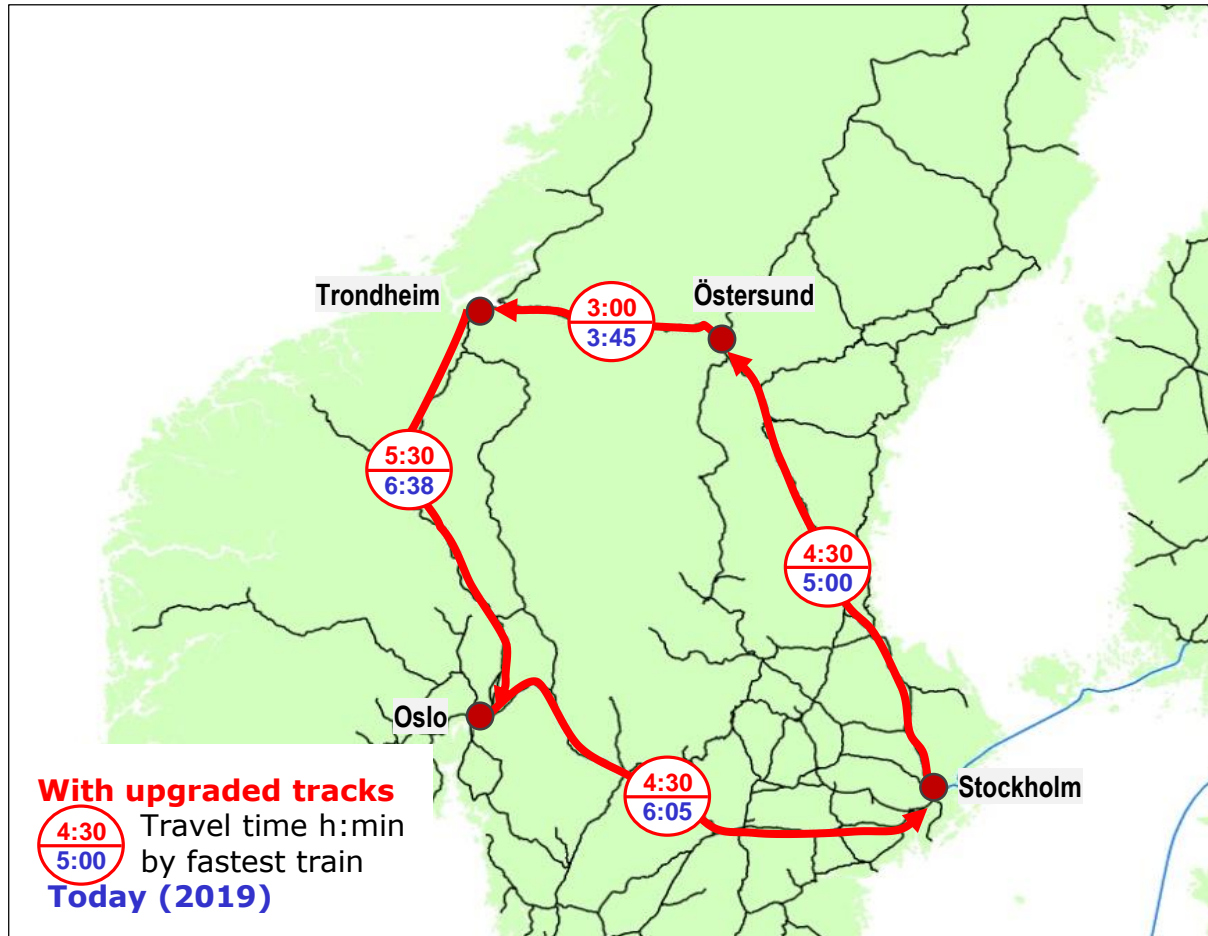
**Chinese  
day- and night train  
Electric Multiple Unit  
16 wagons  
for 250 km/h**

Wide-body train (3,35m) developed from  
Bombardiers Regina-train manufactured  
in China  
Compartment with 4 beds at night or 6  
seats on day-time  
Capacity: 640 beds or 960 seats



# Scandinavian Express Loop

## Combined day and night train





# Thanks!

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Home page:  
[www.railwaygroup.kth.se](http://www.railwaygroup.kth.se)





# Literature

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