Rail infrastructure management and track access charges in Sweden

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Outline of presentation

- Current situation in Sweden
- Calculating ”direct cost” – our method
- Review of the TAC-system

1. Current situation in Sweden

- Trafikverket (established in 2010)
- long-term planning of the transport system (all 4 modes of transport)
- construction, operation and maintenance of the state road network and national railway network


Trains that run on time


Navigable roads


Current traffic information


Driver exams at 139 locations


38 ferry routes on sea and inland waterways

Four-stage planning principle

1 Rethink

Measures that can influence the need for transportation and choice of transport mode

2 Optimise

Measures that rationalise the use of existing infrastructure and vehicles

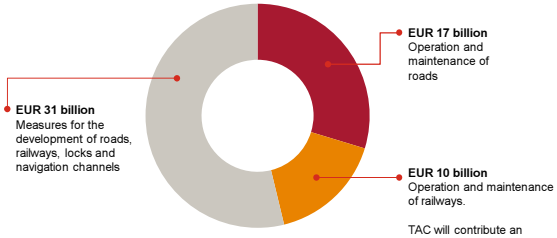
3 Rebuild

Limited reconstruction measures

4 Build new

New investments and major reconstruction measures

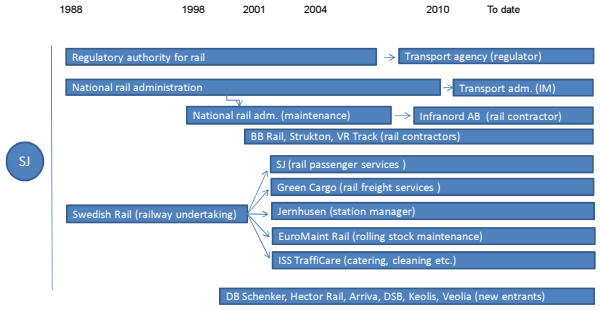
National Transport Plan 2014–2025 – a government framework of EUR 58 billion



The rail infrastructure

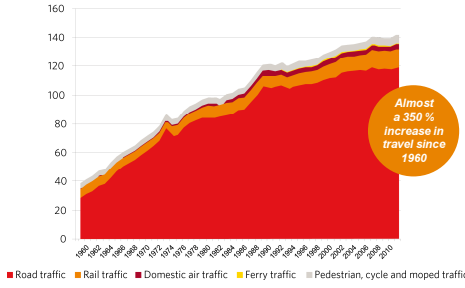
- 11,900 km of railway line
- 85 % electrified
- 70 % single track
- 560 stations for boarding and alighting
- High-speed on regular track (max. 200 km/h)
- No dedicated track for high-speed. From 2028 a few track segments will enable 320 km/h. Will there be investments in vehicles for that speed?

Rail market opening step by step



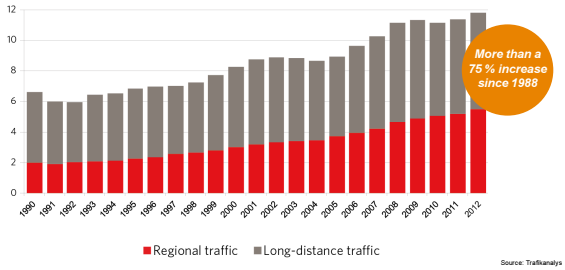
Transport performance

Passenger transport in Sweden, billion passenger-kilometres



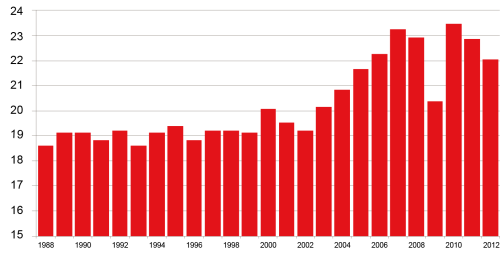
Passenger transport

Billion passenger-kilometres on the railways

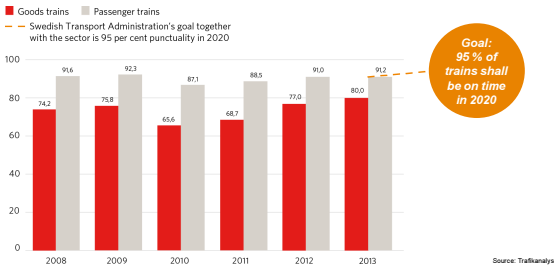


Freight transport

Billion tonne-kilometres on the railways



Punctuality for goods and passenger trains that arrived no later than 5 minutes after the scheduled arrival time (%)



2. Calculating ”direct cost” - our method

- Art. 31.3. "*…the charges for the minimum access package …shall be set at the cost that is directly incurred as a result of operating the train service.*" Implemented in our national railway law from 2004
- According to the government bill “direct cost” = short run socio-marginal cost
- Direct cost = costs directly incurred from a train service. To charge less would be a discount. To charge more would be a mark-up and mark-ups should be subjected to segment analyses. Direct costs cannot be weighed against ability to pay or the level of public subsidy.
- This requires every IM to calculate these costs. In SE the railway act does not stipulate a particular methodology to be used. (We have number of small IMs too.)
- We use statistical econometric models (top-down). Ideally this should be combined with bottom-up engineering models.
- Choice of method will depend, inter alia, on tradition, availability- and quality of data

How do we calculate direct costs ?

Step 1. Data collection

No single database – combination of several data sources.

- Cost data (Cost accounting system separating operation, maintenance and renewals).
- Traffic data (TrafficStatistics, including number of trains, train-kilometres, tonne-kilometres divided into passenger and freight).
- Infrastructure data (TrackInfoSystem including age of track, single or double track, number of switches and their age, length of the track, curvature, sub-structure).

Network is divided into ~ 250 sections (a section being the track between places of operation; e.g. switches).

How do we calculate direct costs ? (cont.)

Step 2. Compilation of data – sample sheet

Track section	Year	Track section length, meter	Line	Total number of trains	Station - dummy	Rail age	Maintenance costs, EUR
1	2006	142 937	2	11 913	0.0	12.50	3 759 140
1	2007	142 720	2	11 931	0.0	9.00	3 807 894
1	2008	142 625	2	10 281	0.0	6.95	5 148 030
1	2009	142 625	2	9 913	0.0	3.16	3 630 902
1	2010	142 535	2	-	0.0	4.17	5 780 388
1	2011	139 676	2	8 709	0.0	4.89	4 849 593
2	2006	12 595	2	12 521	1.0	9.60	1 254 565
2	2007	12 595	2	12 496	1.0	10.58	1 016 759
2	2008	12 372	2	10 733	1.0	11.28	1 982 762
2	2009	-	2	10 475	1.0	11.28	1 412 309
2	2010	12 214	2	11 495	1.0	12.28	1 088 147
2	2011	13 326	2	3 732	1.0	11.98	1 038 684
10	2006	41 650	7	162	0.0	12.28	-
10	2007	41 672	7	12	0.0	13.28	451
10	2008	41 672	7		0.0	14.28	265
10	2009	41 672	7	44	0.0	15.28	238
10	2010	42 242	7	870	0.0	15.89	482
10	2011	42 876	7	49	0.0	16.88	64

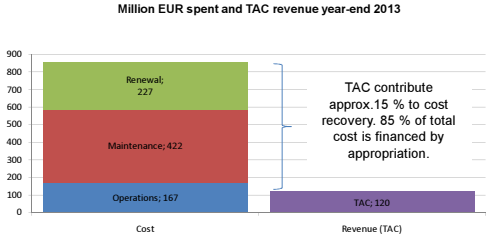
How do we calculate direct costs ? (cont.)

- Step 3: Make a model of reality (regression model explaining how traffic affects costs)
- Step 4: Calculate cost elasticites
- Step 5: Calculate predicted average cost per gross tonne km
- Step 6: Calculate marginal costs (MC=elasticity * average cost per track section)
- (Step 7: Generate weight adjusted MC)

Results from cost calculations and charges

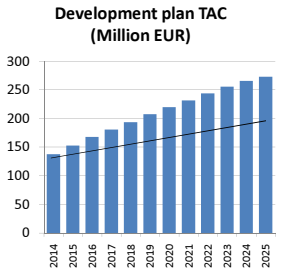
Type of cost	Data collection for years	Cost (€ in current price level)
Maintenance	1999-2002	0,53 EUR / train-km
Operations	1999-2006	?
Track renewals	1999-2009	0,47 EUR / train-km
Total direct cost		**1 EUR / train-km**
Avg. charge in 2013		**0,8 EUR / train-km**

How much do we spend on infrastructure management and how do finance it?



3. Review of the TAC-system

- Adapt the charges to "direct costs"
  - charges have increased 10-20 % annually since 2010
  - towards the end of the period the increase will be more in line with inflation
- Differentiate the charges
  - asset management (track friendly vehicles)
  - efficient use of the infrastructure
  - Improvement of the quality of rail services in terms of punctuality and cancellations (performance scheme)



Current charging components

Component	Objective	Unit	Charge (€) 2014
Track charge	Wear and tear	Grossetonne-km	0,0005
Train path charge - low - medium - high	Train path quality	Train-km	 0,04 0,09 0,49
Mark-up for passenger segments	Financing of special services	Grossetonne-km	0,001
Passage charge	Congestion	Passage (3 largest cities)	27
Accident risk	Social cost	Train-km	0,09
Emission charge	Environmental cost	Litre diesel	0,07-0,16

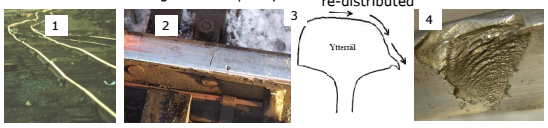
Asset management – the wear and tear

Forces from vehicles and cargo is composed by dead weight, curve forces, impact forces and friction forces – depending on vehicle-, track- and operational parameters

The components of the track cracks and finally breaks, which is called *component fatigue*

Settlement in the track formation and ballast worsen the geometric quality

Wear of rails when material is removed or re-distributed



Vehicle parameters influence on the ”wear and tear”

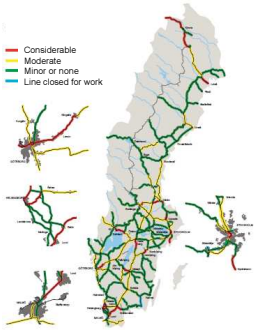
Vehicle parameters	Elasticity 10%
Axle weight	31
Number of axles	12
Distance between axles	7
Bogie characteristics (suspension-steering etc.)	4
Speed	3
Unsprung mass	1

- An increase of axle weight by 10 % may increase wear and tear by 31 %.
- Cosiderable difference between vehicles and train types.
- Few incentives for TOCs to invest in track friendly vehicles.
- Maintenance costs can increase considerably if vehicles complied only with minimum requirements.
- We have no influense on vehicle approval

Capacity constraints

Growth of rail transport and insufficient investments has resulted in capacity constraints.

- Capacity usage is measured by track section
- Annually for 24 h and 2 max h
- Based on UIC-standard
- 81–100 % (red = considerable usage)
- 61–80 % (yellow = moderate usage)
- 60 % and lower (green = minor usage)
- We want the charging structure to reflect the capacity constraints



Mark-ups based on priority in the capacity allocation process ?

- We have a set of pre-defined priority criteria in the Network statement.
- Criteria are based on requirements on speed, sensitivity in a logistic chain, flexibility, refining, volume etc.
- The trainplan is constructed (partially) based on those criteria.
- The preferences of commuter services in big cities and high-speed trains are met first. Others may not have their requests fully met.
- The ability of different train service to meet their customers needs are different, but currently they pay the same charges.
- We consider a mark-up for high-priority trains.