Centre for Transport Studies

STOCKHOLM

Evaluation of BRT-projects in Sweden

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Buses in Sweden

- Denigration (and bad management) of buses relative to rail lines.
- Cost of rail infrastructure is massive
- Average load in <30 percent
- Tendency to run too much PT in off-peak
- No peak pricing although wide-spread notion of lack of capacity
- 50% subsidization
- Target: increase the PT a factor 2

- 56% of all PT trips in Sweden made by Stockholm travelers. Stockholm in peak hour 80%.
- Share of PT in Sweden 20%.
- Also high income people patronize PT.

How do we achieve a good value for money?

- How to curb cost increase but increasing ridership?
  - Public transport fares/costs has increased faster that fuel cost.

- More buses
- Learn from Evaluation

- **Projects**
- MalmöExpressen
  Karlstadsbuss

MEX: objektives 2012

- Increase passenger capacity
- Shorter travel times along the route
- More public transit trips along the route
- Reduce traffic emissions along the route

Pre-launch situation in 2013

- Bus line 5 is Malmö's busiest
  - Route east of Central Station is along Amiralsgatan, one of the largest and most frequented roads in Malmö
  - During rush hour 18m long busses are scheduled every 3-4 minutes (ledbus with practical capacity of 65 passengers)
  - Some crowding during rush hours, possibly due to bunching.
  - More busses not perceived an option due to existing bunching issues.

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MalmöExpressen

- Ett smart sätt att resa

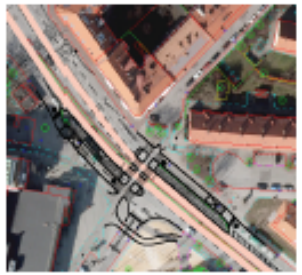
Västra hamnen
Ubåtshallen
Dockan
Stapelbädds-parken
Orkanen
Centralen
Anna Lindhs plats
Djäknegatan
Studentgatan
Konserthuset
Folkets park
Nobeltorget
Annelund
Rosengård station
Rosengård
Rosengård Centrum
Ramels väg
V. Skrävlinge
Buketten
Stenkällan

Bytespunkt till tåg/regionbuss

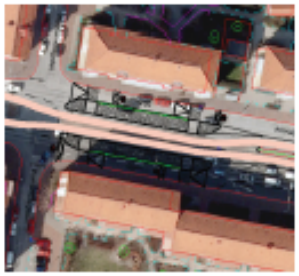
HÅLLPLATS NOBELTORGET

Tre nya hållplatser som ligger mitt i gatan:

- Folkets Park
- Nobeltorget
- Annelund



HÅLLPLATS FOLKETS PARK



HÅLLPLATS ANNELUND

Stora bussar med mindre miljöpåverkan

MalmöExpressen är ett nytt och miljösmart busskoncept. De 24 meter långa bussarna är så kallade gashybrider som använder en kombination av biogas och uppladdningsbara batterier som laddas vid inbromsning, vilket ger mindre miljöpåverkan. Bussarnas stora kapacitet gör att fler kan åka med och trängseln minskar. I rusningstrafik är det extra tätt mellan bussarna vilket gör tidtabellen mindre viktig eftersom det alltid kommer en ny buss.

En smidig reseupplevelse

MalmöExpressen erbjuder en smart och smidig resa genom staden. Bussarna har eget busskörfält längs långa sträckor på Amiralsgatan samt signalprioritering i vissa korsningar. På- och avstigning sker genom alla dörrar precis som på ett tåg, vilket kortar tiden vid hållplatserna. Det finns dessutom biljettmaskiner vid varje dörr där du själv registrerar eller köper din resa med ditt Jojo-kort.

En livsnerv genom staden

MalmöExpressen kör från Stenkällan till Västra Hamnen och knyter därmed samman stora delar av staden. Bostäder, skolor, arbetsplatser och handelsområden länkas ihop på ett naturligt sätt och underlättar vardagen för Malmös invånare. Med MalmöExpressen tar vi ytterligare ett steg mot att göra Malmö till en mer hållbar stad.

MalmöExpressen är ett samarbete mellan Malmö stad, Skånetrafiken och Nobina. Projektet delfinansieras av Delegationen för Hållbara Städer samt Europeiska regionala utvecklingsfonden.

What changed with launch June 2014

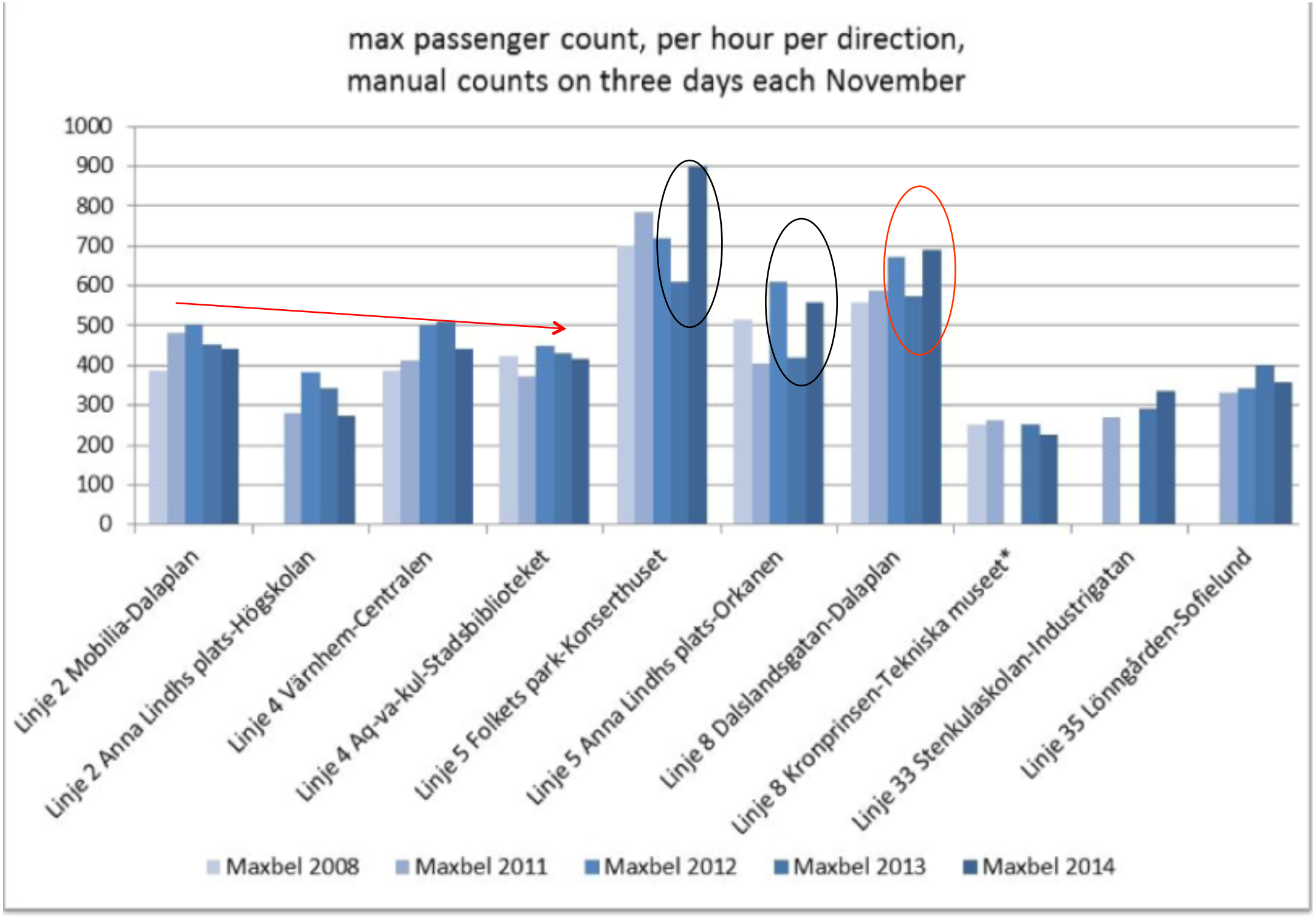
- New route west of Central Station
  - Towards growing Västra Hamnen
- Fewer but larger busses
  - every 5 minutes during rush hours
  - 24 m long, practical capacity 90
  - -> same theoretical capacity as previously but possibly less bunching
  - entry and ticket validation at all doors
  - premium look and feel: special colouring, tram-like design, infotainment
  - gas/electric fuel system to reduce emissions
- Infrastructure changes:
  - Separate clearly marked bus lanes on 10 out of 16 km
    - less space for cars, trucks and bikes
  - Three major bus stops on the route were re-built (longer and middle of road)
  - Traffic signal priority system installed

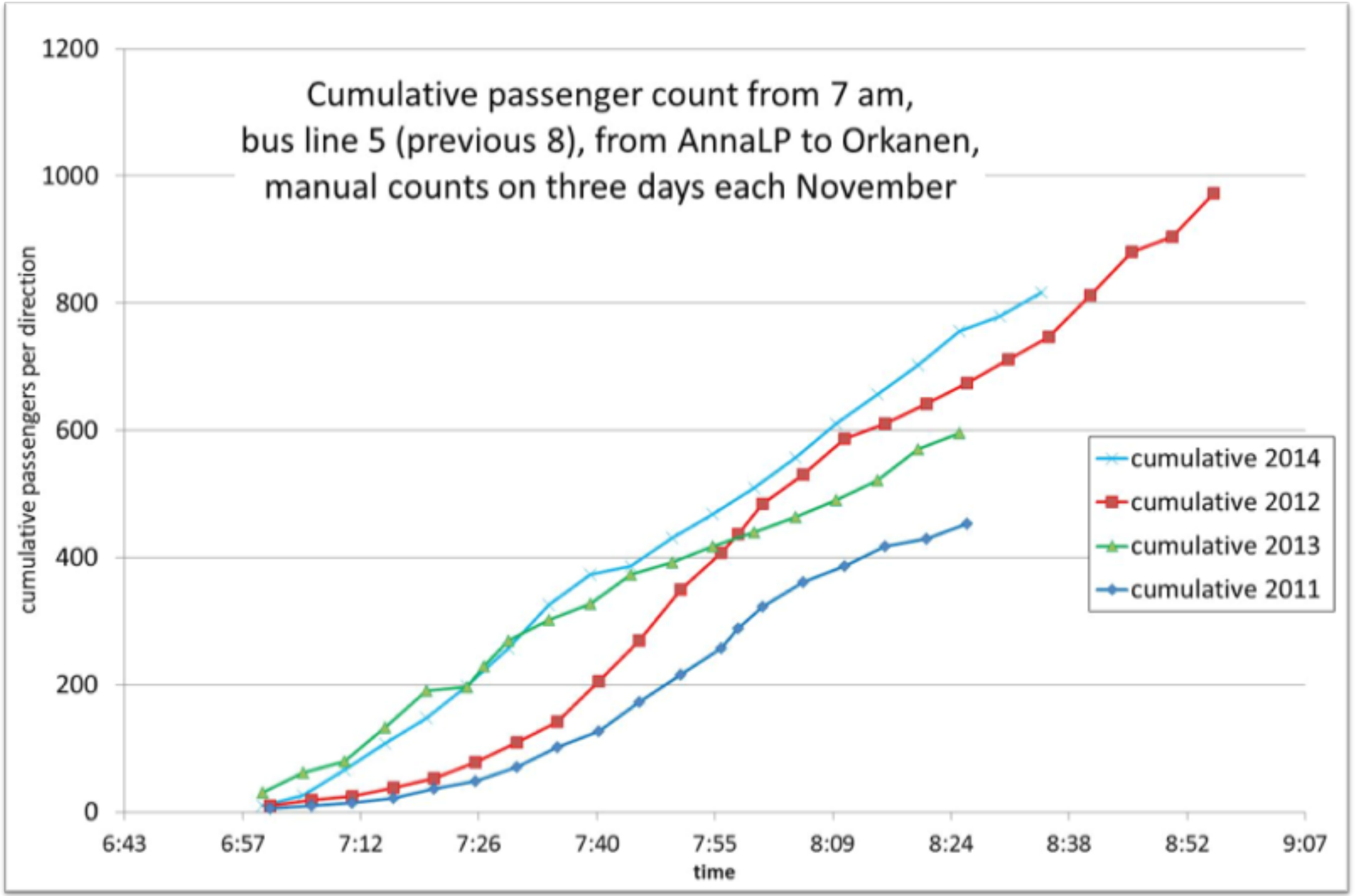
Costs

	MSEK
purchase 15 busses (8 MSEK each)	120
roadwork and traffic signals (initially 35 MSEK)	66
change in staff, fuel and maintenance costs	?

Outcomes

- Overall travel time unchanged
  - Driving speed increases by 3km/h from separate lanes
  - Smaller than expected signal priority effects (why?)
  - Longer stop times (why?)
  - Reliability, waiting times and bunching changes unknown
- 3-days manual counts interpreted as strong 27% increase in passengers
  - But high variance in manual count data across years and across bus stops
  - Source of potential increases unknown (e.g. route choice vs. mode choice)
  - Smart Card Data exist but not available and analyzed (yet).
  - Car traffic on Amiralsgatan “appears reduced”, but no analysis available
- Some issues at introduction
  - too few stroller/wheelchair spaces
  - higher motor noise levels disturbing residents
  - fare evasion -> more ticket controls
- Emission and air quality effects not known


max passenger count, per hour per direction,
manual counts on three days each November
1000
900
800
700
600
500
400
300
200
100
0
Linje 2 Mobilia-Dalaplan
Linje 2 Anna Lindhs plats-Högskolan
Linje 4 Värnhem-Centralen
Linje 4 Aq-va-kul-Stadsbiblioteket
Linje 5 Folkets park-Konserthuset
Linje 5 Anna Lindhs plats-Orkanen
Linje 8 Dalslandsgatan-Dalaplan
Linje 8 Kronprinsen-Tekniska museet*
Linje 33 Stenkulaskolan-Industrigatan
Linje 35 Lönngården-Sofielund
Maxbel 2008
Maxbel 2011
Maxbel 2012
Maxbel 2013
Maxbel 2014


Cumulative passenger count from 7 am,
bus line 5 (previous 8), from AnnaLP to Orkanen,
manual counts on three days each November
cumulative passengers per direction
1200
1000
800
600
400
200
0
6:43
6:57
7:12
7:26
7:40
7:55
8:09
8:24
8:38
8:52
9:07
time
cumulative 2014
cumulative 2012
cumulative 2013
cumulative 2011

Project effect objektives met?

- Increase passenger capacity: not really
- Shorter travel times along the route: no, due to longer stop times
- More public transit trips along the route: don't know.
- Reduce traffic emissions along the route: unknown

Costs and benefits

- Reduction in accessibility by car: due to separate bus lanes. Cannot be quantified.
- Investment cost 120 MSEK

- Shorter travel times along the route: no
- More public transit trips along the route due to better comfort/reliability or visibility: possibly
- Reduce traffic emissions along the route: unknown, analysis in progress

Alternative (more efficent) meassures:

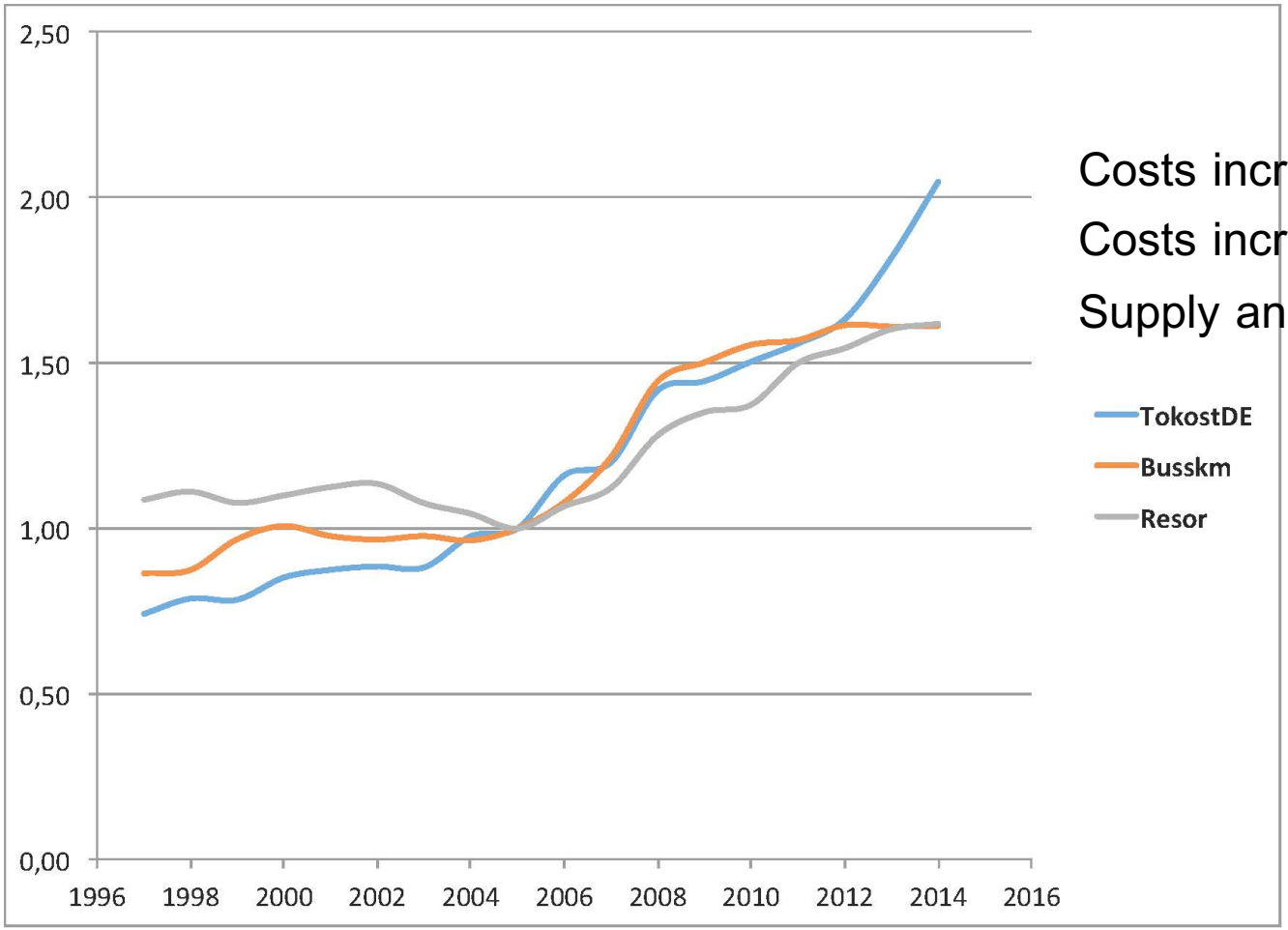
- Headway based spacing (Cats and West in Stockholm)
- Price differentiation: reduction in off peak
- Was the road space used efficiently with separate bus lanes? What is the effect on cars, trucks, bikes? More priorities to buses?
- Was the gas/electric requirement effective, or could emission objectives be met with cheaper methods

Karlstad

- 87 000 inhabitants.
- 2007 better color coding of streets, mostly communication improvements, new network, new bus stops
- Soft service focus
  - 2005 quality incentives introduced to Nobina, e.g. cleanliness, friendliness, planned was a gradual process from 2005 to 2012 but tough targets already achieved within a year. Rather than just incentives per traveler (quantitative).
  - Bus TV
- Visibility and marketing
  - Passenger perception (status , modernity)

Costs and Travellers

Total real cost



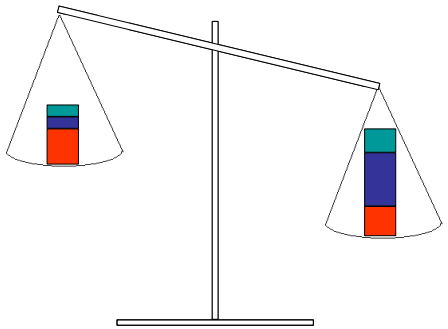
Costs increase faster than no. trips

Costs increase 104% 2005-2014

Supply and no trips match pretty well

Optimizing Welfare in a bus systems: NACKA

- Optimize objective function all BENEFITS and COSTS
- Benefits of higher frequency (larger buses?).
  - Less crowing
  - Less waiting time
  - Externalities
    - Less car use (congestion and pollution)
    - Positive economies of density: more users allow increased frequency implying decreased waiting costs. (Mohring, 1972).
    - Large fixed costs of rail infrastructure (marginal cost lower than average cost).
    - Equity effects: low-income groups use more PT. Applicable in Sweden?



- Costs higher frequencies
  - Wages (drivers and other workers)
  - Fuel and maintenance
  - Capital cost (in peak)

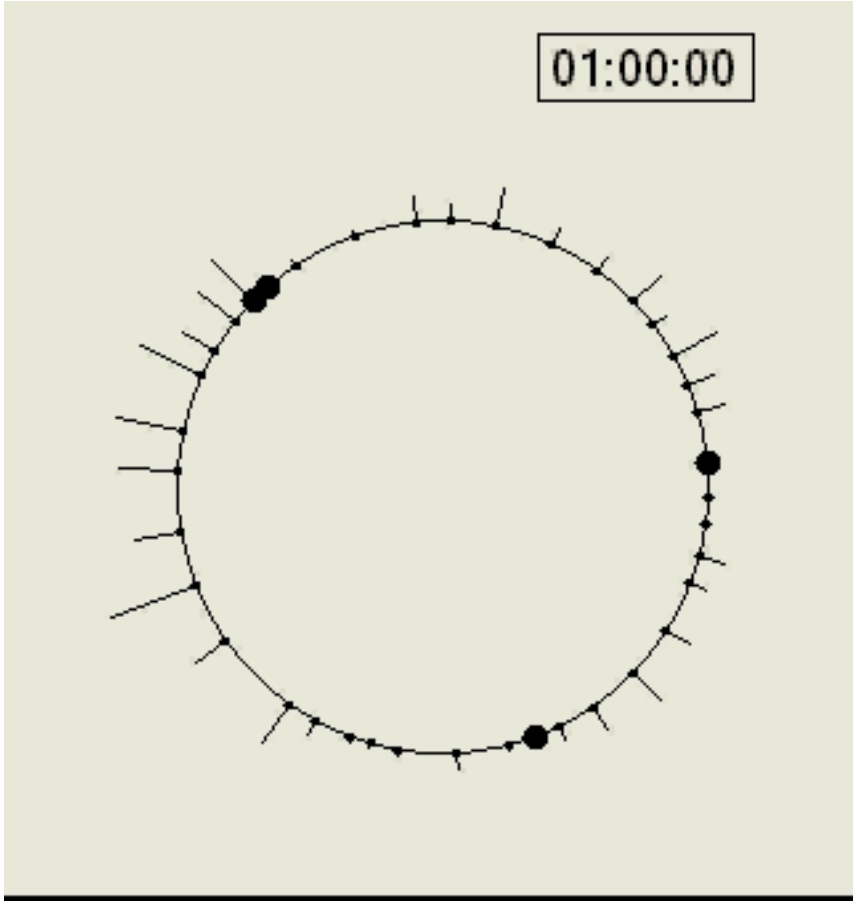
Welfare effects of BRT-inspired systems

- Separate buss lanes and priority
- Comfort
- Visibility (marketing)
- Better steering systems preventing bus bunching
- Entering in all doors
- Reducing number of bus stops

- + Reduces congestion in vehicles
- + Recuses travel time/unreliability
- - Reduces accessibility by car
- - Increased costs

Pålitlig

- Kolonnkörning oundvikligt
- Förhindras med bättre styrsystem
- Tänk en ”töjbar fjäder” mellan varje buss
- Varje chaufför kör individuellt – krävs ingen komplicerad trafikledning



Pålitligt för incidenter (t ex trasig buss)