

Summary:

Public transport packages of measures 1996-2000

Economic evaluations

Background to the Norwegian Ministry of Transport and Communications' support for the measures

In 1991, the Ministry of Transport and Communications initiated a pilot project for developing rational and environmentally friendly transport to strengthen public transport. The results of the evaluations of the project show, amongst other things, that a number of measures together complement each other and increase the effect of the measures. This recognition of the potential synergies led to the Ministry of Transport and Communications to change its policy from dealing largely with individual measures to financing packages of measures, from 1996 onwards. As a result, the various schemes for cities and districts are not individual measures, but a combination of different measures appropriate for achieving targets connected with increasing the proportion of public transport, more effective traffic flow and improved public transport.

Packages of measures 1996 – 2000

In the period 1996-97, the Ministry of Transport and Communications allocated a total of NOK 32.2 million for packages of measures for both districts and cities. This was followed up by a new grant of NOK 54 million for the 1998/2000 packages of measures. The packages of measures differ with regard to size, scope, the nature of the measure and combinations of measures which are to be implemented.

The subsidy scheme is organised and administered by the Ministry of Transport and Communications, which invites county councils to apply for funds for long-term projects based in politically adopted plans. A minimum of 50 per cent local finance is required to obtain financial support.

A trial scheme necessitates evaluation. Therefore, a condition for participation in the scheme was that every county council had to carry out extensive

surveys and evaluations. In order to facilitate a common evaluation of the schemes, the surveys and survey methodology was identical between the participating counties. The evaluation is based on the following information, which was collected by each participating county council:

- A before and after Travel Survey with the same respondents (panel data)
- On board user surveys before and after
- Area data
- Passenger statistics

This report contains analyses of packages of measures which have been carried out in the following city areas:

- Rogaland county 1996/97: **Hundvåg scheme**
Comprehensive reorganisation and up-grading of public transport routes in the Hundvåg area of the city of Stavanger were carried out, in order to make it easier for passengers to use. The frequency has been increased from around 10 to 5 minutes in daytime, supplemented by feeder buses. In addition, bus stops have been upgraded, accessibility measures have been implemented and there has been heavy emphasis on information and marketing in this part of the city. The target is an increased proportion of public transport in this area to reduce the anticipated increase in traffic over the city bridge in the years to come. Hundvåg has some 9000 inhabitants.
- Vestfold county 1996: **Continued emphasis on the development of resource- and environmentally-friendly transport in the Tønsberg area**
This scheme comprises, for the most part, improvements to facilities for the combination of bicycles and public transport, inter-changes between train and bus, expanding routes, refurbishing bus stops and attitude-awareness work. Major changes in routes were implemented during the pilot period, but the principles in the new route concept were maintained. The area

- covered by the scheme contains three municipalities. In total there are almost 60,000 inhabitants in the area.
- **Buskerud county 1997: New deal for public transport in the Drammen region**
This package of measures is characterised by the fact that a three-year project has already been carried out and that the scheme is a continuation of phase two. The scheme contains various individual measures spread across four areas: product development, information/marketing, accessibility and bus stops. Four municipalities are involved in the project. In total, the area covered by the measures has in excess of 110,000 inhabitants.
 - **Østfold county 1997: Package of measures for Nedre Glomma**
Nedre Glomma includes the cities of Fredrikstad and Sarpsborg. These two cities have some 40,000 inhabitants, while the region has more than 111,000 inhabitants. The target is to increase the number of journeys by public transport from around 50 per inhabitant per year (1995) to around 70 per inhabitant per year by 2007. The scheme emphasises information, accessibility, the standard of bus stops, fares/ticketing systems and an improved adaptation of available routes according to the market.
 - **Vestfold county 1997: Package of measures for Larvik.** The package consists of a new service model with increased service frequency on two routes; upgrading of bus shelters along these routes; bicycle parking facilities at main interchange points; route information on touch screens in the central bus terminal; marketing; and a feasibility study of a public transport terminal with bicycle parking and public transport information facilities and which links train, bus, ferry and taxi services.
 - **Møre og Romsdal county 1998: Package of measures for Ålesund and Giske.** Bus shelter building and upgrading is the most prominent feature of this package. All bus stops now have shelters. The scheme also consist of infrastructure measures to improve service speeds. On the service scheduling side, clockfaced departures were introduced throughout the day and service frequency was increased on the main route.
 - **Telemark county 1998: "Improved public transport service in the Grenland Region".** Grenland is a conglomeration of several urban areas. The aim of the package was to provide an integrated public transport service between and within these areas, and thereby to increase patronage. The route structure was changed and two new hourly services and two service routes were introduced. Electronic ticketing played an important part of the package, and gave rise to a new fare structure. 60 new bus shelters have been built and information screens have been placed in major terminals. The package also consisted of marketing and information measures.
 - **Oppland county 1999: Package of measures for the towns of Lillehammer and Gjøvik.** The package of measures covers the two towns and their surrounding areas. A high standard express service between the two towns is the main feature of the package. The service runs every hour on upgraded infrastructure (stops, shelters, terminals), and the bus drivers are specially trained.
 - **Troms county 1999: Bus 2000 in Tromsø.** "Buss 2000" is a continuation of a major restructuring of services and fares which took place in 1997/8. Important measures are new bus terminals, and the refurbishment of selected bus stops by means of ad-sponsored bus shelters. Real time information is introduced on two main routes.
 - **Sør-Trøndelag county 2000: "Trial scheme for attractive public transport corridors" (PRAKK) in Trondheim city.** (PRAKK) is a comprehensive package of measures. Important measures are increased service frequencies with the introduction of between 1200 and 1300 *new* bus departures per week. One new bus route and two new service routes were introduced. 25 new low floor buses were acquired. Travel information monitors were placed at the central station; new route maps and timetables were printed; a passenger guarantee/compensation scheme was introduced; and marketing activities initiated.
 - **Vest-Agder county 2000: Package of measures for Kristiansand.** The aim of this package of measures was to develop less transport generating land use planning principles, and to introduce a metro standard bus service which meets people's travel needs. The "Bus Metro" with high standard buses, stops, frequent, fast and accessible services was launched.

Objectives

The aim of the majority of the packages of public transport measures is to provide more effective public transport for passengers and companies, as well as getting more people to use public transport.

In this report we look specifically at the economic performance of the packages of measures. The main objective of this report is therefore to perform an

economic evaluation of the 1996-2000 urban public transport packages of measures. That is, to look at costs and benefits of the schemes and to draw conclusions on their economic performance.

Two additional objectives are 1) to estimate the diversion factor, which measures the degree of transfer between public and private motorised transport; and 2) to identify and to correct for the negative effects of increased fares. Increased fares are not part of the packages of measures and have particularly adverse effects on the economic performance of the schemes.

Patronage and diversion between public and private transport

Table S.1 shows passenger numbers before and after the implementation of the packages of measures, and the estimated patronage post implementation if fares were not increased. On average, patronage increased by about 9 percents.

Economic evaluation of the packages of measures

We have carried out a cost-benefit analysis, which estimates the economic benefit produced by the schemes, in terms of user benefits, producer benefits and external effects. The benefits are set in relation to the costs involved.

The evaluation is based on two main data sources. Firstly, *registrations of area data* (zonal data) describe the characteristics of the different transport alternatives from home (zones within the area) to the centre of the municipality, in the before- and-after situations.

Secondly, annual *passenger counts* before and after the measures were implemented.

User benefit

The benefits to passengers consist of improvements in walking time, waiting time, travel time, information, ride quality, facilities at terminals, stations and stops and so on. We have calculated an interval for the user benefit, reflecting the fact that the value of a package is less than the sum of individual values of improvements. This is called package effects.

Table S.2 shows changes in user benefit, calculated for each urban area and for different kinds of improvements. In total the schemes have provided passenger benefits of between NOK 21m and 30m.

Improved service frequency is the one factor which has contributed most to improved passenger services. In total, frequency gains improve user benefits by NOK 11.1 million. On the other hand, the introduction of extra interchanges in Hundvåg and Tromsø have contributed to a welfare loss to passengers of NOK5.4m in total. The single most beneficial measure is the punctuality improvements in Kristiansand, which gave rise to annual passenger benefits of NOK6.3m.

At the bottom line of the table we have calculated change in user benefit per passenger. This can be seen as a measure of the degree of passenger orientation. Areas with large benefits per passenger have been successful in meeting passengers' preferences (and in particular for high levels of punctuality and frequency). Kristiansand and Grenland have been most successful in this respect, and provide improvements worth more than NOK 3 per passenger.

Table S.1: Passenger numbers (1000)

Area	Before	After	After, corrected for fare increase	Relative change, %
Tønsberg	2 027	2 048	2 198	8,4
Hundvåg	1 154	1 356	1 389	20,2
Drammensregionen	6 617	6 734	7 080	7,0
Ålesund*	2 844	2 925	2 925	2,8
Grenland	1 284	1 465	1 597	24,4
Gjøvik – Cty bus	688	677	730	6,2
Gjøvik – Express bus	149	185	193	29,9
Trondheim	7 576	8 346	8 657	14,3
Tromsø*	6 418	6 638	6 638	3,4
Kristiansand	2 732	2 918	2 990	9,4
All areas	31 489	33 292	34 396	9,2

* No change in ares

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Table S.2: Change in annual user benefit. All figures, except the bottom line, are in NOK 1000s (1998 values)

	Tønsberg	Hundvåg	Drammen	Ålesund	Grenland	Oppland	Trondheim	Tromsø	Kristiansand	Sum
Travel time	13	226	-7	0	1 151	0	1 761	0	930	4 075
Frequency	11	1 726	3 113	342	3 422	340	1 059	289	839	11 143
Walking time	208	0	-73	0	0	0	0	0	0	134
Interchange	0	-586	0	0	0	0	0	-4 823	0	-5 410
Bus shelters	148	440	0	799	345	0	0	946	0	2 677
Terminals	210	0	0	0	0	0	0	1 943	0	2 154
Bus shelter maintenance	0	0	376	0	0	0	0	0	730	1 106
Information at stops	0	0	684	1 047	0	57	0	0	0	1 788
Real time information	0	0	0	0	0	0	231	2 090	648	2 970
Low-floor buses	0	750	0	0	0	0	1 915	0	0	2 665
Punctuality	0	0	0	0	0	0	0	0	6 272	6 272
New route structure, rescheduling	0	0	119	0	0	0	0	0	0	119
Sum, user benefit	590	2 556	4 212	2 188	4 918	398	4 967	446	9 420	29 694
Lower estimate (0.7*user benefit)	413	1 789	2 948	1 532	3 442	278	3 477	312	6 594	20 785
User benefit, NOK per passenger	0,27	1,84	0,60	0,75	3,08	0,43	0,57	0,07	3,15	0,86

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Producer benefit

Gains to the operators are called producer benefit. This is calculated as the increase in ticket revenue which is due to increased patronage. The costs of the schemes are deducted separately. Table S.3 shows changes in producer benefit.

External effects

In calculating the marginal external effects, we have looked at effects on the environment and on accidents and congestion costs. These have been influenced by changes in bus kilometres and by modal shifts to/from private cars. Our calculations show that the effects of the great increase in bus patronage in Hundvåg, Tønsberg, Ålesund and Kristiansand were not offset by the effects of reduced car use. This is shown in Table S.4. In total, the environmental effects of the schemes, measured in exhaust discharge and noise, were negative, -NOK1.1 million. This means that the packages of measures have not succeeded in producing more environmentally friendly transport.

This is due to the fact that major increases in bus kilometres are not sufficiently outweighed by positive effects of reduced car usage.

In order to conclude whether the measures have been beneficial for society, we have calculated benefit-cost ratios. The numerator is the sum of benefits shown above. The denominator is the annual operating costs plus annual capital costs of investments. A benefit-cost ratio above unity indicates that benefits have exceeded the costs.

We see from table S.5 that benefits exceed costs in Drammen, Grenland, Trondheim, Tromsø and Kristiansand. The benefit/cost ratio is between 1.05 and 2.83 in these areas. In the remaining areas, the gains of the measures have not outweighed the costs. In economic terms, and given the assumptions for the analysis, these schemes have been wasteful. In total, however, benefits have exceeded costs in both the earlier 1996/97 and the later 1999/2000 packages of measures. As such, the packages of measures have, in total, been a good investment of public funds.

Table S.3: Change in annual producer benefit. All figures in NOK 1000s (1998 values)

	Tønsberg	Hundvåg	Drammen	Ålesund	Grenland	Oppland	Trondheim	Tromsø	Kristiansand	Sum
User benefit	2 229	3 727	7 318	1 329	6 211	1 813	21 975	4 615	4 839	54 056

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Table S.4: External effects summarised. All figures in NOK 1000s

	Tønsberg	Hundvåg	Drammen	Ålesund	Grenland	Oppland	Trondheim	Tromsø	Kristiansand	Sum
External cost of increased bus-km	-1 086	-1 584	-630	-848	156	-334	-3 009	0	-1 280	-8 615
External benefit of reduced car-km	227	565	874	249	371	747	3 399	344	708	7 484
Sum, external benefits	-859	-1 019	245	-600	527	413	390	344	-572	-1 131

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Table 5.10: Calculations of benefits and cost of the packages of measures. NOK 1000s (1998 values)

	Tønsberg	Hundvåg	Drammen	Ålesund	Grenland	Oppland	Trondheim	Tromsø	Kristiansand	Sum	1996/97 packages	1999/2000 packages
Numerator (sum annual benefit)	1 960	5 264	11 774	2 917	11 656	2 624	27 333	5 404	13 687	82 619	18 998	63 621
Numerator, lower estimate	1 783	4 497	10 511	2 261	10 180	2 505	25 843	5 270	10 861	73 711	16 791	56 920
Denominator (annualised cost)	5 432	6 233	4 128	3 128	5 320	10 810	23 242	1 971	10 093	70 357	15 793	54 564
B/C ratio	0,36	0,84	2,85	0,93	2,19	0,24	1,18	2,74	1,36	1,17	1,20	1,17
B/C ratio, lower estimate	0,33	0,72	2,55	0,72	1,91	0,23	1,11	2,67	1,08	1,05	1,06	1,04