

RECONSIDERING THE REGIONAL AIRPORT NETWORK IN NORWAY

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ABSTRACT

A network of regional airports with short runways was established in Norway from the end of the 1960's to provide communications between rural towns and the main airports in the larger cities. Today, the transport services provided at these regional airports are less competitive due to considerable upgrade of road infrastructure. This article demonstrates a way to meet these challenges by reducing the number of regional airports. An example is given from Northern Norway where plans exist to replace three small regional airports with one medium sized airport. The joint airport is expected to remove the need for state subsidised flights (PSO-routes), reduce security upgrade costs and give lower fares and direct flights to more destinations. A reduction in the number of airports would require some sort of infrastructure improvements as compensation to municipalities for giving up their local airport. The procedure can be used in other Norwegian regions as well as in other countries with a similar airport network.

Keywords: Regional airports, social efficiency, regional development.

INTRODUCTION

Difficult topography, combined with long transport distances and rural settlements, makes Norway a challenging country in which to provide efficient public transport - both on the ground and in the air. A way of meeting these challenges and improving the national transport infrastructure was the establishment of a regional airport network with short runways (800 metres) at the end of the 1960's and in the beginning of the 1970's. Today there are 20 commercial airports in Norway with short runways (Williams et al., 2007). The main argument for constructing these airports was to establish efficient transport communications between rural towns and the main airports in the county centres (Bråthen,

2003; Solvoll and Amundsveen, 2004). In 2009 there was scheduled passenger transport from 29 regional airports and the government used about NOK 574 million to subsidise PSO-operations to and from these airports (St. prp. 42, 2008-2009) with an expected increase to NOK 629 million in 2010 (The Norwegian Ministry of Transport and Communication, 2009). Norway is, according to the European Commission (2009), a dominating 'PSO-country' in Europe holding nearly 20 % of all restricted PSO-routes¹.

Today Norway is amongst the countries in Europe with the highest air transport dependence (Williams et al., 2007). For example, while Norway in 2003 had a domestic trip rate per capita on 2.27, most European countries had less than one third of this value. The exception is Iceland with a corresponding value of 1.13. Moreover, Williams et al. (2007) shows that Norway has the highest number of commercial airports with short runways (< 1 000 m) in Europe.

At the time of construction it was decided to arrange the regional airports for operation by Short Take-Off and Landing (STOL) planes (Hanssen, 2007). The restriction to STOL-planes created problems for the transport authorities with the end of production of most such planes in the late 1980's. Combined with the requirements of the transport authority that planes must have a capacity of 30 passengers and a pressurised cabin, the STOL-plane imposes severe limitations on the number of air transport companies that can participate in the competitive tendering that takes place every third year². It is, thus, reasonable to expect that the weak competition for the tendered contracts is well known for the transport companies and that they will adapt to this market situation by requiring higher subsidies³.

Since the 1960's, the Norwegian government has invested substantial resources in upgrading road infrastructure, by constructing bridges, underwater tunnels, and in establishing an effective network of fast craft routes along the coast. These investments have reduced travel time between rural towns by car and also improved the public transport system. As a result the average travel time from the municipality centres to the nearest commercial airport is about 50 minutes and in the nine coastal counties 2/3 of the population lives within half an hour's travel time to their nearest airport (Lian et al., 2005). The infrastructure investments have also contributed to some of the regional airports in a report from 2001 (Avinor, 2001) being found unprofitable from a welfare perspective.

The reduced travel time between airports and requirements for substantial investments in the airports in order to meet international security measures (The Norwegian Ministry of Transport and Communication, 2006) have revitalised the issue of reconsidering the structure of the regional airport network in Norway (see e.g. Hanssen and Mathisen, 2008; Lian, 2009). A question of current interest is therefore whether Norway has too many airports with runways shorter than 1 000 m.

¹ See e.g. Williams and Pagliari (2004) for information about the development of PSO routes in Europe.

² Norway is obliged follow the EU-regulation when procuring air transport services - using tendered contracts. The standard duration of the tendered contracts has recently been prolonged to four years (EU, 2008).

³ It is well recognised in game theory literature that fewer bidders means reduced competition and reduced welfare for society (e.g. Klemperer, 1999).

However, before restructuring of the airport network can take place, there has up to now been political consensus that the local councils and the county administration involved have to agree on the structural change. Underlying agreement has also existed with regard to the condition that the municipalities concerned will receive some sort of infrastructure improvements as compensation for giving up their local airport. Consequently, this is definitely a sensitive political topic, and in their programmes the political parties are generally vague with respect to the future network of regional airports.

The present coalition government consisting of the three parties, the Labour Party (Arbeiderpartiet), the Centre Party (Senterpartiet) and the Socialist Left Party (Sosialistisk Venstreparti) stated in their political platform that the regional airport network will remain intact unless local initiatives desire restructuring. The Progress Party (Fremskrittspartiet) states, in contrast, that they will change the ownership organisation of the air transport industry and allow private airports and increased competition (The Progress Party, 2009). The Conservative Party (Høyre) states that airports are important and agree with The Progress Party in promoting competition between airports and organisation of airports in limited companies (The Conservative Party, 2009). Moreover, the vice-chairman and transport spokesman of the Progress Party has indicated that 25 airports should be closed down over the next 20 years (Hegvik and Johnsen, 2008). This should then be followed-up by major upgrading of the road infrastructure in the respective regions.

The aim of this paper is to present the main challenges facing the Norwegian regional airport network and discuss traffic, market and financial consequences, if the scheduled air services are concentrated around fewer and larger airports. A case is used to demonstrate the consequences and it is emphasised under which circumstances a generalisation of the results is feasible.

The article is structured as follows: Chapter Two provides central characteristics of the present regional airport network and regional air route system in Norway and main challenges related to this structure. Then the means of meeting these challenges by reducing the number of airports is discussed. Next, in Chapter Three we exemplify the principal discussions using a current transport case from Northern Norway where plans exist to replace three small regional airports with one medium sized airport. Finally, the main conclusions and implications from our work are presented in Chapter Four.

THE REGIONAL AIRPORT NETWORK IN NORWAY

The state, through the wholly owned subsidiary company Avinor, owns and operates 46 airports in Norway. The airports are located throughout the country and categorised as large (6 including OSL), medium (11) and regional (29) according to Figure 1. The regional airports were taken over from the municipalities by the state in 1997 and 1998.

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Figure 1: Airports owned by Avinor (Source: www.avinor.no).

Challenges for the Regional Airports in Norway

Only minor changes have taken place in the regional airport network since construction in the 1960's and 1970's. However, considerable changes have taken place in other sections of society during the last 40 years. Today the regional airports and the regional air services face the following major challenges:

1. Passengers face a high level of fares and in some cases poor flight connections to the capital, Oslo.
2. The authorities need to cover both considerable operation deficits at the airports and award financial compensation for the route operations using public service obligation (PSO).
3. Travel surveys show growing leakage of passengers to the large and medium-sized airports.

The challenges listed above will be elaborated on separately in the following sections.

Fare Level and Route Services

Maximum fares for the regulated regional flights have been adjusted mainly according to the Norwegian Consumer Price Index (CPI) (Solvoll and Amundsveen, 2004). Deregulation of the commercial part of Norwegian air transport market in 1994 resulted in a market situation characterised by competition regarding capacity (Salvanes et al., 2003). However, the entry into the commercial air transport market of the low fare company “Norwegian air shuttle” in 2002 provided increased domestic competition and considerable fare reductions. Hence, fares have developed in opposite directions for regulated and commercial flights. Experience from Japan show similar results with deregulation giving lower fares on high traffic routes and making low traffic routes less competitive – both with respect to fares and service (Ida and Tamura, 2005).

Only a limited number of the regional airports have direct connections to Oslo (the capital city of Norway). The lack of direct connections often makes it impossible for business travellers from rural areas to attend meetings in Oslo without planning an overnight stop. Passengers using the regional air transport services also complain about the disadvantages they face due to relatively low reliability which inflict an extra day of travel with corresponding board and lodging expenses. Business travellers often need to stay overnight in Oslo when attending meetings in the city. It has been demonstrated by Hanssen et al. (2008) that the above problems increases the passengers’ generalised travel costs substantially.

Airport Deficits and Subsidised PSO-Operations

In 2006 the Civil Aviation Authority (CAA) formulated directions for the outline of Norwegian airports in order to prevent and reduce the extent of accidents in the aviation industry. The regulations, often referred to as BSL E 3-2, were adopted by The Norwegian Ministry of Transport and Communication (2006) and state requirements for the runway, safety zones, marking and the use of lights for all airports serving aircrafts with a start weight above 5 700 kg or cabins approved for 10 or more passengers. These criteria include the planes operating at regional airports of Norway meaning that these airports must also meet the new requirements, which in most cases implies considerable investment costs. The CAA estimates that the average investment cost for the regional airports amounts to NOK 30 million⁴ in order to meet the new requirements.

There has been a considerable increase in the operating costs for airports in Norway since 2000⁵, which could be partly related to the increase in safety and security measures following the September 11th terror attacks in 2001. High fixed costs generate economies of scale with regard to the number of passengers. For example, the average operating expenses per passenger for the three regional airports at Mo i Rana (MQN)⁶, Mosjøen (MJF) and

⁴ 1 € ≈ 8.15 NOK (January 2009).

⁵ Each regional airport had, according to the accounts for the regional airport division at Avinor, an average annual deficit amounting to about NOK 23 million in 2007.

⁶ IATA airport codes in brackets.

Sandnessjøen (SSJ) were NOK 402 in 2007. These airports are more closely discussed in 'the Northern Helgeland case' in chapter 4. A comparable amount for five medium-sized airports is NOK 168 (Hanssen et al., 2008).

To secure appropriate public transport service in the rural areas of Norway, the Ministry of Transport and Communications buy flight connections between regional airports and to/from the regional airports and their nearest airport with flight connections to/from Oslo Airport, Gardermoen (OSL). The subsidies necessary here have also grown during the last years, due to quite costly flight operations (short flights with many landings and take offs) and a lack of competition in the triennial competitive tendering.

Leakage of Passengers to Larger Airports

In an intra-national "hub and spoke" flight network in which direct flights to the capital are not available, the demand for transport to the local hub can leak to car transport for the trip to the central hubs (Phillips et al., 2005). This is also discussed by Lian (2009) with reference to the Norwegian air travel survey 2009 (Denstadli, 2009).

Because of high fare level and relatively low frequency, it is reasonable that passengers' travel patterns have gradually shifted to other transport modes than routes from the regional airports. The shift in demand is strengthened by reduced travel time, higher comfort and lower travel costs for intra-region trips, especially for the private car, but also for public sea transport.

Fewer Airports as a Solution

The substantial increase in standard for land- and sea-based transport infrastructure indicates that the airport structure is more than ready for revision. Restructuring parts of the regional network into fewer and larger airports could bring considerable benefits for both passengers and authorities. However, the improvement of commercial conditions will also allow more airline companies to compete for the passengers with the consequence of falling profits.

The increased number of persons within the impact area of a joint airport will provide increased demand that, together with the availability of long runways, will give the operators opportunities to establish both qualitative and quantitative better air services. It will, for example, be more attractive to establish direct connections to the main airports in Norway. Direct flights reduce the need for transit and transfer for trips between regional airports and the main cities. This will generate new traffic due to a reduction in passengers' generalised travel costs.

With fewer sites to operate, Avinor can benefit from economies of scale following the increased number of passengers at the remaining airports. Besides, Avinor will be able to reduce its total investment to fulfil the requirements in BSL E 3-2. Higher traffic will, generally, also increase Avinors' revenues in the network. Higher revenues and lower costs will improve the company's economic performance and leave room for investments. The increased capacity utilization at a consolidated regional airport network enables the operation of an increased number of commercial routes and reduces the need for subsidised PSO routes.

It is important to be aware that restructuring of the network may weaken the passenger basis for the current hub and spoke system and present passengers with longer average transport distance to reach their local airport. The closure of regional airports could impose reduced transport standard for some passengers due to increased travel costs to the airport, at least in the short run. This may especially be the case for passengers with high time costs settled close to an airport that are closed. However, these passengers may also achieve improved transport standard if closure of the local airport is accompanied by improvements in road infrastructure to the new airport. Moreover, if a joint airport provides longer runway the average regularity of the existing flights by STOL planes will, *ceteris paribus*, increase and, hence, improve the transport standard. In cases where flights provided by STOL planes are substituted by jet planes, the regularity could be reduced if the runway is not long enough to avoid imposing take-off and landing restrictions on the larger planes.

Reduced operating costs and costs for PSO-operations can, for instance, be spent on further improvements in the road infrastructure in the region that loses its airport. What can be seen as an optimal airport structure from a social point of view is a very difficult 'arithmetical problem'. In addition to market considerations topography and weather conditions impose considerable restrictions regarding where it is practically possible to construct an airport.

THE NORTHERN HELGELAND CASE

The consequences of changes in the airport structure can be exemplified by the Helgeland region in the Northern part of Norway. The changes in the airport network in this region has previously been studied by Hanssen and Mathisen (2008). It is a politically stated goal to find a suitable localisation for a joint airport for the northern Helgeland region (Innst. S. nr. 269, 2001-2002). The region is currently served by three airports each with less than 100 000 passengers per year (Avinor, 2010). The airports are Mo i Rana (MQN) and Sandnessjøen (SSJ), opened in 1968, and Mosjøen (MJF), opened in 1987.

Airport Structure and Air Route Services

The flights from MQN, SSJ and MJF are operated by PSO-routes provided by the same operator as when they opened more than 40 years ago. The subsidy requirements for the

route operations in the period 1st April 2009 to 31st March 2012 are about NOK 300 million (€ 37 million). The services are characterised by high fares, many stop-overs and small planes (39 seats).

The PSO-routes are often exposed to difficult wind and cloud conditions resulting in quite low reliability which inflicts uncertainty and waiting costs for travellers. The weaknesses related to uncertainty of the current flight programme probably explains why the population of this region only makes 2.5 trips to/from the local airport on average in 2007 (Avinor, 2010). In contrast, the average number of trips in 2007 for seven medium sized airports was 7.3 to/from passengers per capita⁷. Air travel surveys show that almost 50 percent of the passengers between Oslo and the Helgeland region chose to travel from the nearby main airports rather than the local regional airport (Institute of Transport Economics, 2008).

Infrastructure Improvements

The road infrastructure was very poor on Helgeland during the first two decades after the Second World War. Several infrastructure improvements were initiated but progress was slow due to tight budgets. During the 1960's several ferry crossings were established in the region and road construction connecting the coastal and inner parts of Helgeland was initiated (Svanberg, 1990). In the decades after the construction of the regional airports in 1968, there have been considerable improvements in the road infrastructure. Connections to the main roads were improved and many towns originally hard to reach by private car were interconnected by bridges and tunnels. As an illustration of the development in the middle and northern parts of Helgeland we can compare the road infrastructure in 2009 through looking at the description in historical documents⁸ (Norwegian Automobile Federation, 1967), see Figure 2.

In 1967, there was only one road between the four towns (blue lines). This road went from Sandnessjøen to Mosjøen using one ferry and then to Mo i Rana by road. The road was narrow and gravel covering was gradually replaced by asphalt from 1970 to 1990. Modernisation of the road due to increased traffic was required at the same time as improvements of the existing roads took place (Svanberg, 1990).

⁷ The seven airports are Haugesund, Ålesund, Molde, Kristiansund, Harstad/Narvik, Bardufoss and Alta.

⁸ Detailed sources covering road infrastructure standards at different points in history are the periodical road description books published by the Norwegian Automobile Federation (NAF).

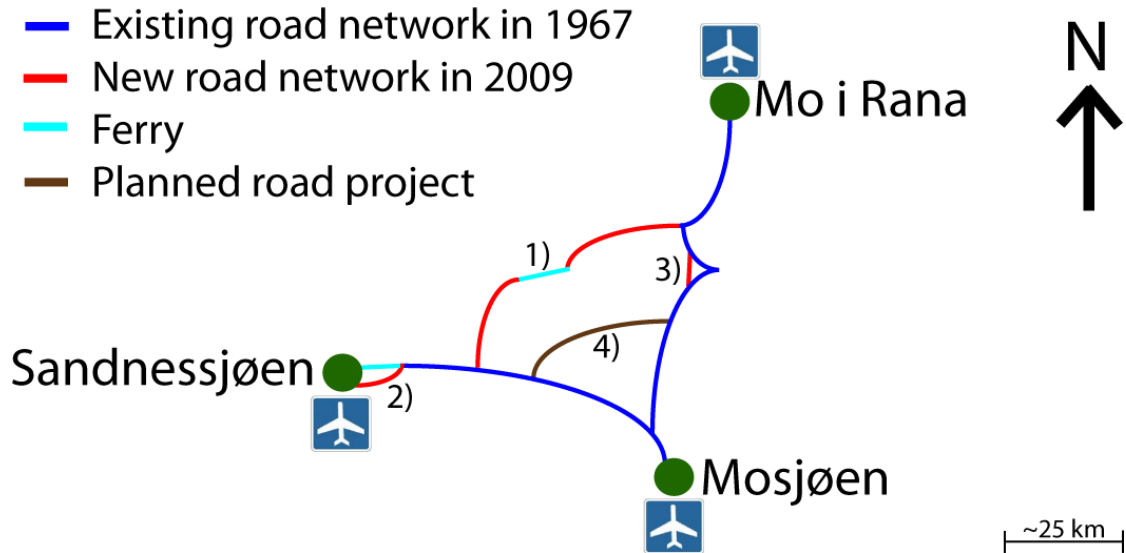


Figure 2: Illustration of changes in the road network in the Helgeland region from 1967 to 2009.

Four projects are indicated in Figure 2 that, in addition to the general road infrastructure improvements, have contributed to better road accessibility between the three towns. The first major improvement was the establishment of the ferry crossing from Liavika to Hemnesberget reducing the road distance for travellers from Sandnessjøen to Mo i Rana (marked as 1). The next project was the construction of the bridge in 1991 eliminating the need for ferry transport for travellers from Sandnessjøen to the mainland (marked as 2). The third project was the construction of the tunnel through the Korgen mountain area in 2005 removing a major bottleneck for road transport between Mosjøen and Mo i Rana and shortening the distance by 4 km (marked as 3). Finally, the fourth major improvement is the planned construction of a tunnel which, when completed in 2013, will make the ferry crossing from Liavika to Hemnesberget redundant and shorten the time usage by road from Sandnessjøen to Mo i Rana and Mosjøen by 33 minutes and 12 minutes, respectively (The Norwegian Public Roads Administration, 2006a).

It is clear from Figure 2 that the road network between the three towns in question has been considerably improved in the four decades since the regional airports were established. From 1967 to 2009, higher standard on both roads and vehicles combined with improved ferry frequency has increased the average vehicle speed and reduced the average waiting time at ferry quays. Estimates of the changes in travel time are presented in Table 1.

Table 1: Travel time for private cars between three cities in the northern Helgeland region in 1967 and 2009.

	<i>Time consumption</i>		
	1967 ^a	2009 ^b	Change
Sandnessjøen - Mosjøen	111 min.	71 min.	-40 min.
Sandnessjøen - Mo i Rana	211 min.	135 min.	-76 min.
Mosjøen - Mo i Rana	127 min.	87 min.	-40 min.

^a Assumes average speed of 45 km/h and 20 minutes waiting time at quay.

^b Assumes average speed of 60 km/h and 15 minutes waiting time at quay..

The overview in Table 1 shows that the road improvements within the northern Helgeland region have considerably reduced the travel time by car between the towns. The relative

reduction varies from 31 % on the stretch between Mosjøen and Mo i Rana to 36 % for the two other stretches. Our estimates show that the three towns of Mo i Rana, Mosjøen and Sandnessjøen in 2013 will all be accessible by car within the space of 2 hours. Today the travel distances are 70 km between Sandnessjøen and Mosjøen, 100 km between Sandnessjøen and Mo i Rana and 85 km between Mosjøen and Mo i Rana.

Consequences of Establishment of a Joint Airport for the Region of Northern Helgeland

The customer base for a joint airport for the northern area of Helgeland will range from 60 000 – 70 000 persons. A joint airport will pave the way for more direct connections and lower average prices and most probably eliminate the need for PSO-routes to the nearby main airports. Avinor will save substantial amount on its investment budget in relation to present requirements at the three current airports. In total, the welfare benefits for replacing the three airports in the northern part of the region by one joint airport amounts to about 4.5 billion NOK (Thune-Larsen and Lian, 2009)⁹. The main effects of a joint airport at Helgeland are presented in Table 2 and accounted for in the following sections, together with assessments of the profitability from a welfare perspective.

Table 2: The economic benefits of a joint airport for Northern Helgeland.

<i>Category</i>	<i>Million NOK^a</i>	<i>Comments</i>
User benefits	2 900	Divided by 1 600 NOK for work trips and 1 300 NOK for leisure trips.
PSO routes	1 500	Reduced subsidies due to the need for fewer PSO routes.
Accidents, noise and pollution	-50	Primarily due to reduced accidents (road), noise (air) and pollution (air).
Airline companies	-100	Reduced profits in the airline industry.
Avinor (airport owner)	250	Reduced operating costs.
Total economic benefit	4 500	Sum net present value of benefits.

^a Discounted values are estimated in accordance with the Norwegian recommendations for Cost Benefit Analyses (CBA) for air transport investments (Bråthen et al., 2006), using an interest rate of 4.5% over 25 years.

Increased User Benefits

Both the business community and the population of the region will enjoy considerable reductions in generalised travel costs for their trips to/from Oslo if a joint airport is constructed. Calculations show that, for both business and leisure travellers, reduced fares and shorter flight time more than compensates for the increased costs for driving to the airport (Hanssen et al., 2008). Consequently the net savings for the users amount to NOK 2 900 million divided into NOK 1 600 million for work trips and NOK 1 300 million for leisure trips.

⁹ The figure represents net present value of utility and do not include costs related to construction of the airport.

No Need for PSO-Operations

The joint airport provides a larger impact area (larger customer base), runways that can serve larger planes and a simpler route structure (fewer airports to serve). These factors are, in sum, expected to make way for commercial operations and, thus, remove the need for subsidies by the use of PSO at the joint airport. The discontinuation of PSO-operations saves the authorities from rendering subsidies amounting to about NOK 100 million per year, corresponding to a discounted value of NOK 1 500 million. This amount is, however, only a redistribution of wealth from a welfare perspective. The welfare economic effect is the economic impact of less need for taxation which in Norway is set to 20 percent of total taxable income (The Norwegian Ministry of Finance, 2005).

Changes in Accidents, Noise and Pollution

The replacement of 3 small airports by a medium-sized airport will to some degree influence road accidents due to changes in driving patterns in the area together with local noise and air pollution from the flight operations. The probability and consequences of flight accidents change because of new flight patterns and the use of larger planes. Pecuniary valuation of accidents, noise and pollution is suggested by Bråthen et al. (2006). The net effects are estimated at a discounted value of about NOK -50 million. Consequently a joint airport will reduce the costs related to accidents and pollution.

Influence on Airline Companies

The number of routes in the region will be reduced as a result of the closure of two airports. This leads in total to fewer flights with higher capacity utilization. This will decrease both the operating costs and the taxes linked directly to the number of departures. However, since competition increases and PSO subsidies are discontinued, the airline companies are expected to experience a slight reduction in profitability with a discounted value amounting to NOK 100 million.

Impact on Operating Costs for Airport Owner

The three regional airports at the middle and northern part of Helgeland had in 2008 operating expenses amounting to NOK 75 million. If the operations at the three airports are discontinued and replaced by a new joint airport, it is estimated that operating costs, with an annual number of passengers up to 500 000, will amount to about NOK 62 million. Hence, the annual reduction in operating costs is approximately NOK 13 million with a discounted value of NOK 200 million. The increased traffic following the establishment of the joint airport results in increased net income with a discounted value amounting to about 50 million NOK.

In sum, this is expected to provide the airport owner Avinor with a net gain of 250 million NOK.

Investment Costs and Profitability from a Welfare Perspective

The changes in utility for the involved parts presented in Table 2 enable the calculation of the economic effect of the airport project from a welfare perspective. The total economic benefit of 4.5 billion NOK by replacing three regional airports with one medium-sized airport indicates the limiting value for construction determining whether the project is profitable or not from a welfare perspective. There is one possible location for a medium sized airport close to Mo i Rana where both the topography and weather conditions provide better than 98% regularity. The estimated construction costs for this airport amounts to NOK 1 500 million. Hence, the profitability from a welfare perspective is about NOK 3 000 million and derives a CBA-fraction of 3.

Regional Effects

It is well documented that improved infrastructure in general (e.g. Krugman, 1995) and for airports in particular (Bråthen, 2003; York Aviation, 2004) brings significant positive regional effects. The extended effects of air transport are normally divided in direct, indirect, induced and catalytic effects (e.g. Cooper and Smith, 2005). Direct and indirect effects are related to the daily operation of the airport and the use of suppliers. Induced and catalytic effects are less tangible and brought about by the localisation of new businesses in the region due to the mere presence of an airport in the region. Even though the direct and indirect effects may be considerable the induced and catalytic effects stand out as most important with regard to the long-run development of the region in which the airport is located.

The main reason for restructuring the airport network in the Helgeland region centres round the positive effects related to trade and competitive conditions for the businesses. A new joint airport will offer considerable positive catalytic effects for the business community in general - and particularly the tourism and manufacturing industry. Direct flight connections to/from Oslo lower the barriers related to distance for establishing and maintaining contact with suppliers, customers and authorities. The international trend of higher travel frequency related to vacations with shorter duration (e.g. Denstadli et al., 2008) makes direct connections a critical success criterion for the tourism industry. It is reasonable to expect that these catalytic effects will be of substantial size if a direct connection to Oslo is established. The positive catalytic effects will stand out even more prominently if the road infrastructure is improved, giving better accessibility within the region.

Alternative Use of Aviation Subsidies

To ease local acceptance for joint airports it is often necessary to offer municipalities losing their local airports some form of compensation. A feasible measure of compensation is to use cost savings in airport operations and PSO routes to make extraordinary investments and maintenance in the road infrastructure in order to reduce the passengers' distance costs.

Such a way of financing infrastructure projects has been suggested in other parts of Norway. For example, the municipality of Narvik has agreed to discontinue the operation of their local regional airport if they are compensated by a substantial contribution to the construction of a bridge that will reduce the distance to the nearest alternative airport. If a similar approach is taken at Helgeland, the amounts saved by Avinor and The Ministry of Transport and Communications could be invested in improved road infrastructure between the three towns in the middle and northern parts of the region.

The discounted value of reduced operating costs and the lapse of subsidies to PSO-operations are estimated at NOK 1 750 million. All or some of this amount could alternatively be spent on necessary investments in the road infrastructure in the Helgeland region. There is, for example, a need to upgrade the European motorway (E6) between Mo i Rana and Mosjøen. The cost of upgrading this road is estimated at NOK 500 million (The Norwegian Public Roads Administration, 2006b). As an additional positive consequence, rough estimates by the Directorate of Roads indicate that a realisation of this road project over a 25 year period will reduce users' transport costs by NOK 26 million and accident costs by NOK 13 million.

However, possible restructuring of the regional airport network is a political decision that must be determined at the highest national level (Stortinget). The future of the regional airport network both in Helgeland and the rest of Norway will therefore depend on the transport policy decided by the sitting government.

CONCLUSIONS AND IMPLICATIONS

The Norwegian network of regional airports was established at the end of the 1960's and during the 1970's and has remained virtually unchanged since construction. Over the same four decades, the travel time by car between the cities holding regional airports has been considerably reduced due to infrastructure investments in roads, bridges, tunnels and ferry connections. An example is the case of the Helgeland region in Northern Norway that has been studied in this article. Here the travel time between regional airports has been reduced by between 40 and 76 minutes from 1967 to 2009. Today 68% (96%) of the population in Norway can reach an airport within one hour (two hours).

During recent years the operating costs for the regional airports have increased substantially, mainly due to the introduction of agreed upon specifications for safety and security at the airports (regulation BSL E 3-2). Simultaneously many of the regional airports need

substantial investments being made in runways, safety zones, terminal buildings etc. in order to fulfil the requirements set out in the regulation. The subsidy requirements for the PSO routes serving these airports have also shown a rapidly increasing curve, due mainly to three reasons. First, there is a leakage of passengers to larger airports due to lower ticket prices and better flight connections. Second, there comes the increased cost of flight operations caused by increased factor prices (fuel, pilots and flight attendants). Finally, there is an absence of real competition for the competitive tendered PSO contracts. Not surprisingly, recent investigations also show that some of the regional airports are unprofitable according to the principles of economic welfare.

Recent development shows that the regional airport structure in Norway is more than ripe for reconsideration. A closure of the most unprofitable airports from a welfare perspective combined with investments in some of the existing ones or construction of new airports could have a positive impact on many of the challenges discussed in this article. We would especially like to emphasise that:

- A reduction in the number of airports gives each remaining airport a larger impact area ensuring for better flight connections; especially direct flights to/from OSL.
- Better flight connections stimulate demand and have a self-strengthening effect on travel frequency by reducing passengers' generalised travel costs.
- Fewer airports give the airport-owner Avinor reduced operating costs, thereby enabling necessary investments at the remaining airports.
- Through more efficient route operations and increased competition among airlines, more connections can be served on a commercial basis. This reduces the need for PSO-routes and also means a reduction of subsidy requirements.
- Better flight connections in general, and lower ticket prices in particular, offer positive regional effects for local industry and commerce in general and especially for tourism.

However, it is important to keep in mind that too strong a reduction of the number of airports could weaken parts of the present hub and spoke system, and thereby lead to a reduction in flight services in some of the existing hubs. A reduction in the number of airports would also bring up the issue of compensating measures in the form of investments in parts of the road system - so that the passengers' travel costs to and from the airports are reduced. It is also important to consider how a change in the regional airport structure, the route network and the travel pattern will influence the environment. It should be ensured that the structural changes do not conflict with Norway's environmental obligations. However, this is certainly a quite complicated arithmetic exercise.

Based on conclusions from the Norwegian aviation case some of the knowledge gleaned can be transferred to other regions in Norway and other aviation dependent countries. We would especially emphasise the following:

- The authorities should consider investments in road transport infrastructure and aviation infrastructure in relation to one another attempting to find economic future-oriented distribution of trips between the various transport modes.
- Cost benefit analysis can provide useful information as to whether a given change in airport structure is economically profitable or not.
- It is important to visualise the distributional effects of different measures and also consider relevant compensating measures to groups or regions experiencing the disadvantages of changes in the airport structure.

Following these general guidelines, the transport authorities obtain objective and professional documentation concerning costs and benefits as a result of a particular measure. This will ensure that the risk for making decisions that are economic unprofitable is reduced. Simultaneously, good documentation of distributional effects and possible remedy measures to compensate those who might suffer detrimental effects means that local political discussions naturally following in the wake of larger infrastructure changes will hopefully become more objective and better structured.

As a general rule a change in airport structure is more likely to be economic profitable when:

- Many small airports are located quite near each other and travel alternatives between the airports are good.
- Travel surveys shows a substantial and increasing leakage of passengers from regional to larger airports.
- The travel activity to a large extent is concentrated towards one central hub.
- Investments in the road network can lead to a considerable decrease in travel time to a joint airport.

Since land based transport infrastructure steadily is improved in most countries and travellers generally demand better quality of transport services, it is valid for all countries with an airport network like Norway to evaluate whether a reduced number of airports can increase the social economic profitability of the total network.

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