

Summary:

The economic and environmental impact of air transport

Norway is particularly dependent on air transport due to long distances both domestically and to the European continent, and because of a topography making it expensive to build roads and railways. The report analyses two fundamental aspects of air transport: its economic and social benefits on the one hand, and the environmental impact on the other.

Benefits to society

In 2005, the aviation sector in Norway employed 20 000 people directly. The sector also generates indirect and induced employment of 15 000 workplaces. In addition, the catalytic effects from air transport, impacting on the location of activities, tourism, trade, productivity and investments, are estimated to generate an increase in employment of 80 %, amounting in this case to additionally 28 000 people employed. In total, air transport in Norway employs 60-65 000 people, and considering the growth in air traffic, it is expected that employment will increase. Some technical functions have however been outsourced over the last years, and a further rationalisation of air companies may be expected, which would imply slower growth rates for employment than for air traffic.

Type of impact	Description	Analysis and documentation
1 Direct	Operation of airlines and airports (technical support and handling, catering, fuel, security, cleaning), commercial activities (shopping, restaurants, car rental, parking), land transport and air cargo)	Survey or rules of thumb (such as employees pr million passengers)
2 Indirect	Sub supplies (goods and services) to direct activities (covered in the region)	Survey or estimates
3 Induced	Spending by employees in activity 1 and 2	Estimates
4 Catalytic	a- Location impacts (firms and labour) b- Tourism and trade (demand side) c- Productivity and investments (supply side)	Case-studies or econometric studies

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The aviation market

In 2007, air travels amounted to 11 million domestically and 13 million internationally, representing an increase since 2005 in the number of travels of 14 % and 25 % respectively. The increase in air travels is related to a strong cyclical growth in both consumer and business demand, demonstrating that the growth in the aviation market is strongly related to the growth in income. It is also spurred by rivalry between competing airlines. Competition increases capacity and reduces prices, resulting in more traffic.

The largest competitor to air traffic is travels by car. When the extent of air transport is reduced, for instance due to increased prices and reduced capacity, the market share of car transport for long-distance travels increases. For travels longer than 400 km, approximately 50 % of travellers go by air.

In 2005, airplane tourists visiting Norway spent close to 10 million overnight stays in the country, spending a total of 13 billion NOK during their stay. The number of Norwegian tourists going abroad is also increasing, and their consumption abroad is 50 % above the consumption by foreign tourists in Norway.

Norway has an extensive airport coverage. Two thirds of the population can access an airport within one hour travel by car. In Northern and Western Norway, where alternatives to air transport are fewer, airport coverage is even higher. From almost every part of the country it is thus possible to travel to a five-hour meeting in Oslo and return home within the same day.

Survey data indicates that there is a positive correlation between short distance to airport and population growth. The frequency of air-borne travel increases as distance to airport decreases. Domestic air travel frequency is highest in Northern Norway and lowest in the southeast parts of the country, while the opposite is true for international travels.

Air freight facilitates the export of higher-value products such as fresh rather than frozen seafood. The higher prices obtained by commercialising a more valuable product, compensates by far for the cost of air freight, thus benefiting both the producer and society as a whole.

It is estimated that if 10 % of domestic air travels were transferred to the slower mode of car transport, it would amount to a yearly loss of two billion NOK for the travellers, due to the extra amount of time spent. If climate-induced pricing instruments were introduced, resulting in a 10 % reduction in traffic volumes in all segments of the aviation market, the drop in activity would represent a loss of 600 million NOK. A 10 % reduction in air traffic gives a reduction in CO₂-emissions of 0.35 million tons. Given the contemporary estimated quota prices of approximately 25 euro pr ton CO₂, the value of the reduced emissions amounts to 70 million NOK.

Climatic effects of air transport

The climatic effect of air transport is mainly related to the combustion of fuels that generate CO₂-emissions to the atmosphere. There is an ongoing debate concerning the effect of emissions to higher strata of air, particularly relating to

H₂O (steam) and NO_x. The argument is that the effect of emissions is aggravated when released to higher stratus.

Steam from airplanes condenses into contrails, which in turn may form cirrus clouds. Both contrails and cirrus clouds contribute to global warming. Emissions of nitrogen oxides (NO_x) in higher stratus contribute to the formation of ozone. These emissions have a relatively low retention time in the atmosphere, as opposed to the longevity of CO₂ in the atmosphere of several hundreds years.

Thus, the additional effects of emissions at high altitudes depend on the time horizon applied. If a 100-year perspective is applied, in line with the Kyoto Protocol, additional high altitude effects relative to the CO₂ effect is estimated to be 0,2 without cirrus effects and 0,8 with cirrus effects. The effects of contrails and cirrus clouds are, however, uncertain, among other things because the effects depend on local meteorological conditions. Applying a high altitude effect multiplier with higher numerical value than above, can be interpreted either as a deliberate choice of shorter time horizon, or to give weight to the precautionary principle due to scientific uncertainty about these additional effects.

In estimating the contribution of aviation emissions to individual countries, several methods may be used: 1) the principles as used in the Kyoto Protocol, where only domestic flights are considered, 2) domestic sale of aviation fuels for both domestic and international flights, and 3) the contribution of aviation emissions to a country's climatic footprint. Following the first two principles, the contribution of aviation emissions to total Norwegian emissions in 2005 is estimated to be:

- 1.7 % if only domestic flights are considered
- 3.4 % of bunker fuel sold in Norway

When it comes to the climatic footprint of Norwegians, there is great uncertainty about the denominator which is the total emission of Norwegians (export deducted and import included). In 2007, the CO₂-emissions from air travels made by Norwegians totalled 3.4 million tons, of which 0.83 million ton was generated from domestic travels, 0.12 million tons from travels to the Nordic countries, 1 million ton from travels to the rest of Europe, and 1.44 million tons from travels to other parts of the world. Towards 2020 it is expected that the increase in emissions primarily will come from a growth in air travel to countries outside Europe.

Concluding remarks

Technology improvements have a certain potential to reduce emissions from air transport. Substituting air transport with land transport has a limited potential as only 6-8 % Norwegian air travel, measured in passenger kilometres, take place on routes and distances where there are realistic alternatives.

Due to Norway's particular dependency on air travel, specific economic measures addressed directly to the air transport sector is not recommended. General economic measures, like emission trading, would be a more cost effective way of reducing global CO₂-emissions, even if they do not necessarily reduce air transport.