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THE ARCTIC CIRCLE AIRPORT – A COMPARATIVE STUDY

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SUMMARY

This report aims to approximate the demand for a non-stop flight route between the future Artic Circle Airport and the airport of Oslo on the basis of a comparison with regard to the routes Molde-Oslo, Kristiansund-Oslo and Harstad/Narvik-Oslo. It claims to be an approximation based on a simple but yet transparent comparative study.

This study analyses the reference routes with respect to underlying population and employment numbers and derives average per capita trip rates for both, the leisure traveler and the business traveler segment. Those trip rates are in a second step applied to the respective population and employment numbers of the catchment area of a future Arctic Circle Airport and corresponding demand figures are approximated.

According to 2014 traffic numbers, considering specific characteristic of the reference routes and reflecting two different scenarios, our analysis gives 'most likely estimates' of 278 100 - 328 500 passengers per year on a direct route to Oslo. This indicates that the medium/long term demand for a future non-stop Oslo-route should be sufficient to attract an airline serving this route at least three times per weekday and one time per day during weekends with Boeing 737/800s or the like.

PREFACE

This report was commissioned by Mo Industripark AS, Nova Sea AS and Polarsirkelen Lufthavnutvikling AS. This work aims to approximate the demand for a non-stop flight route between the future Artic Circle Airport and the Oslo airport on the basis of a comparative analysis with regard to the routes Molde-Oslo, Kristiansund-Oslo and Harstad/Narvik-Oslo. It claims to be an approximation based on a simple but yet transparent comparative study. State-of-the-art methods like the long-distance transport models for Norway (NTM6) are suitable for a more precise forecasting of passenger flows between Norwegian airports. However, international traffic is not included in NTM6. A model for forecasting of international travels from large and medium-sized airports is recently developed by the Institute of Transport Economics (TØI). However, this model has to be adapted for assessing routes from new airports.

The results are supposed to serve as an indicative snapshot of the passenger volume in the case when the airport is well established in the market. How long this adjustment is normally likely to take will vary.

The analysis has a rather narrow geographic scope. Hence, it does not take into account any effects on passenger volumes for the rest of the airports in the area. Any such effects (including updates of the socio-economic analyses) will be left for prospective further studies outside the framework of this analysis.

Svein Bråthen has been the project leader for this analysis and has been responsible for the quality control of the report and discussions about methodology and empirical approach. Falko Müller and Hilde Johanne Svendsen performed the major parts of the analysis, including the sourcing of necessary data, the needed calculations and the writing of this report.

The Client's representative has been Henrik Johansen, Polarsirkelen Lufthavnutvikling AS.

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SAMMENDRAG

Planlegging av ny flyplass i Helgelands-regionen med tilhørende rutetilbud, som for eksempel en direkterute til Oslo, har vært diskutert over lengre tid. Flere rapporter har belyst temaet, og trafikkprognosene i de ulike rapportene varierer betydelig. Mo Industripark AS, Nova SEA AS og Polarsirkelen Lufthavnutvikling AS har derfor ønsket å supplere de eksisterende trafikk-prognosene med en sammenlignende studie. Dette innebærer en sammenligning av en mulig direkterute fra Polarsirkelen Lufthavn (HAUAN) – Oslo Lufthavn med eksisterende ruter mellom Molde – Oslo, Kristiansund – Oslo og Evenes – Oslo. Selv om sammenligningsgrunnlaget er begrenset, så mener vi at studien er egnet til å belyse en mulig utvikling.

Fordelen med å bruke sammenligningsstudie som metode er at kunnskap basert på eksisterende markeder blir brukt til å beregne etterspørselen for en flyrute som ikke eksisterer i dag. Dette bidrar til å analysere markedet for flyreiser på en annen måte enn de metodene som er brukt i de eksisterende rapportene. En av de viktigste faktorene for å lykkes med en sammen-ligningsstudie er å sikre overførbarhet mellom casene. Ikke desto mindre så vil dette arbeidet kun gi en tilnærming basert på en forenklet men dog transparent sammenligning. "State-of-the-art" metoder som NTP-etatenes nyutviklede persontransportmodeller (NTM6) for lange reiser vil være bedre egnet for en mer presis prognosering av trafikkstrømmer mellom norske flyplasser, som også vil fange opp lokale nettverkseffekter av typen overført trafikk fra naboflyplasser. Det er imidlertid slik at dette verktøyet ikke fanger opp internasjonale reiser. Transportøkonomisk institutt (TØI) har nylig utviklet en modell som beregner utenlandstrafikken fra store og mellom-store norske lufthavner. Denne modellen krever imidlertid tilpasninger for å beregne trafikk fra nyetablerte lufthavner. Vår enkle tilnærming fanger i prinsippet opp både innen- og utenlands-trafikk.

Denne rapporten analyserer referanserutene Molde-Oslo, Kristiansund-Oslo og Evenes-Oslo med hensyn til befolkningsmengde og sysselsatte, og beregner gjennomsnittlig antall reiser for både fritids- og arbeidsreiser. I steg to i analysen blir tallet på gjennomsnittlig antall reiser benyttet for beregning av antall reiser basert på bosatte og sysselsatte i influensområdet for Polarsirkelen Lufthavn (HAUAN). Analysen ender opp med en beregnet etterspørsel etter en direkterute mellom Polarsirkelen Lufthavn og Oslo Lufthavn. Resultatene er ment å være et indikativt øyeblikksbilde av trafikkvolumet i det første året etter at flyplassens rutetilbud er "innkjørt" i markedet, basert på 2014 trafikktall. Alle passasjertall oppgitt i rapporten refererer til dette året. Hvor lang tid denne innkjøringen vil ta, er avhengig av kjennetegn ved det lokale markedet, og er ikke nærmere vurdert. Passasjertallene justeres med en årlig vekstfaktor fram til første år der tilbudet har etablert seg i markedet. Egne trafikkprognoser ligger utenfor rammen av oppdraget, men vi har gjort beregninger med en årlig trafikkvekst på 0.9 % fram til 2025.

Med basis i trafikktallene for 2014 og under hensyn til spesielle karakteristika på de valgte referanserutene, vil den mest sannsynlige trafikkmengden være på ca. 329 000 passasjerer på en direkterute til Oslo. Denne etterspørselen vil være på et nivå som gir en kabinfaktor på 84 % for et stort jetfly av typen Boeing 737/800 med fire avganger daglig på virkedager og en avgang daglig andre dager. Vårt laveste anslag på passasjertall gir ca. 238 000 passasjerer, som fortsatt vil være tilstrekkelig til å sikre en kabinfaktor på 75 % med tre avganger daglig på virkedager og en avgang/dag i helgen. Dette forutsetter at en viss andel av Oslo-trafikken fra Sandnessjøen blir overført til den nye ruta mellom HAUAN og Oslo lufthavn.

Dersom vi tar utgangspunkt i et scenario der alle fritids- og arbeidsreiser i Sandnessjøen-området mot Oslo fortsatt vil skje via Sandnessjøen Lufthavn, vil etterspørselen bli redusert. Markedspotensialet for HAUAN i dette scenarioet er i intervallet 202 000 til 350 000 passasjerer. Den mest sannsynlige trafikkmengden i dette restriktive caset er på ca. 278 000 passasjerer. Dette vil fortsatt være nok til at et flyselskap vil kunne se det som attraktivt å opprette en direkterute mellom HAUAN og Oslo med et Boeing 737/800 eller tilsvarende tre ganger daglig på virkedager og en daglig avgang på andre dager. Kabinfaktoren vil i dette tilfellet være på 84 %.

Vi ser det som sannsynlig at en fremtidig lufthavn ved Polarsirkelen i et medium/langtids-perspektiv, vil få en trafikkmengde som er tilstrekkelig til at flyselskap vil kunne opprette en direkterute til Oslo basert på tre daglige avganger på virkedager og en daglig avgang andre dager. En mer detaljert analyse av ruteopplegg og overføringseffekter fra andre lufthavner i regionen er ikke gjort innenfor rammen av dette prosjektet.

SUMMARY

Plans for a new airport in the Helgeland region and related issues, such as the potential for a non-stop link to Oslo, are being debated for several years now. Several reports have dealt with this subject so far and the demand forecasts put forward by these reports however, vary significantly. Mo Industripark AS, Nova Sea AS and Polarsirkelen Lufthavnutvikling AS wish therefore to complement the existing forecasts with the findings of a comparative analysis. In detail, a comparison of a potential non-stop route 'Arctic Circle Airport - Oslo Airport' with the reference routes Molde - Oslo, Kristiansund - Oslo and Harstad/Narvik/Evenes - Oslo has been asked for. Even though the sample size is limited, we believe that this study should be able to shed light on a prospective basis for a direct route to Oslo.

The main advantage of such a comparative approach is that valuable knowledge sourced from actually existing markets is utilized to approximate the demand for a nowadays not-existing service. This then supplements the methods used in the existing reports. One of the key success-criteria of a comparative analysis on the other hand is to ensure the transferability between the cases. Nevertheless, this work claims to be no more than an approximation based on a simple but yet transparent comparative study. State-of-the-art methods like the long-distance transport models for Norway (NTM6) are suitable for a more precise forecasting of passenger flows between Norwegian airports, including local network effects like transfer of passengers from adjacent airports. However, international traffic is not included in NTM6. A model for forecasting of international travels from large and medium-sized airports is recently developed by the Institute of Transport Economics (TØI). However, this model has to be adapted for assessing new airports. In principle, our simplified approach captures both domestic and international traffic.

This study analyses the reference routes with respect to underlying population and employment numbers, first and derives average per capita trip rates for both, the leisure traveler and the business traveler segment. In a second step, those trip rates are then applied to the respective population and employment numbers of the catchment area of a future Arctic Circle Airport (HAUAN). Finally, demand approximations for a non-stop route 'Arctic Circle Airport - Oslo Airport' are deduced. The results are supposed to serve as an indicative snapshot of the passenger volume in the year when the airport is well established in the market, based on 2014 numbers. All passenger numbers throughout the report refer to this year. How long this adjustment will take is dependent on the characteristics of the local markets and is not further assessed here. The passenger numbers should be adjusted with expected annual growth rates up to at least the first year of the airport operation. Such forecasts are not a part of this study, but calculations are made with an annual growth rate of 0.9 % till 2025.

According to 2014 traffic numbers and considering specific characteristic of the reference routes, our analysis gives a 'most likely estimate' of 328 500 passengers on a direct route to Oslo. This demand would be high enough to ensure an aircraft load factor of 84% for a large, like Boeing 737/800 jet aircraft that serves the route with four daily departures per regular weekday and one daily departure per all other days. Our very lowest demand estimate of 238 100 passengers would still be enough to ensure a load factor of 75% with three daily departures per weekday and one departure all other days. Our highest demand estimate of 416 700 passengers assumes high estimates on all underlying factors. Under these scenarios, some traffic from Sandnessjøen is expected to be transferred to HAUAN.

If one assumes that all leisure and business travel originating from the Sandnessjøen area towards Oslo will still use Sandnessjøen airport as departure airfield in the future, the demand approximations are reduced. The market potential for HAUAN in such a scenario is reduced to a range between 202 000 and 350 000 passengers. Our analysis gives a 'most likely estimate' of 278 100 passengers. This would still be enough to attract an airline to serve the HAUAN-OSL link with a Boeing 737/800 or the like three times per weekday plus one times per other day and at the same time ensure a load factor of 84%.

We therefore conclude as follows: There are clear indications of that the medium/long term demand for a future HAUAN-Oslo-route should be sufficient to attract an airline serving this route at least three times per weekday and one time per day during weekends with Boeing 737/800s or the like. A more detailed assessment of departure times, frequencies and transfer effects from other airports are not made within the scope of this work.

1. INTRODUCTION

Plans for a new airport in the Helgeland region and related issues are being debated for several years now. With the report of Luftfartstilsynet (2011), the Arctic Circle Airport (HAUAN) has become an option for a future large scale airport with a minimum runway length of 2 200m in the Helgeland region.

An airport of this size should be capable of handling a wide variety of airplanes, including large, short- and medium-haul jet planes, as typically used by SAS and Norwegian airlines for domestic network operations in Norway. Corresponding planes - e.g. Boeing 737-800 - have a passenger (pax) capacity of up to 186. Such airplanes could potentially be used to serve a non-stop route between HAUAN and Oslo Gardermoen (OSL). The airlines however, will establish such a direct service only if it is economically justifiable.

In this context, an estimation of the future pax-demand for the HAUAN-OSL link becomes crucial. Several reports have dealt with this subject so far (e.g. Hanssen, Mathisen, and Solvoll (2008), Thune-Larsen and Lian (2009), Draagen and Wilsberg (2011), Øvrum and Berg (2015)). The demand forecasts put forward by these reports however, vary significantly.

The principals of this report wish therefore to complement the existing forecasts with the findings of a comparative analysis. In detail, a comparison of HAUAN-OSL with the routes Molde (MOL) - OSL, Kristiansund (KSU) - OSL and Harstad/Narvik/Evenes (EVE) - OSL has been asked for. All three non-stop services have been in place for several years.

The aim of the projected study is to elaborate on the potential market demand for the possible non-stop route HAUAN-OSL. Even though the sample size is limited, we believe that this study should be able to shed light on a prospective basis for a direct route to Oslo.

2. METHOD

2.1 COMPARATIVE ANALYSIS

This report tackles the research problem with the methodology of comparative analysis, which has rarely been applied to the HAUAN case so far. The market entry considerations of companies are very often influenced by inter-market comparisons. Companies tend to forecast a product's demand for one (non-existing) geographical market by projecting the situation of another (existing) geographical market. In the case of HAUAN, this means that the potential airlines will at least partly base their decision of whether to establish a direct OSL-link or not on the situation in the existing markets. This report follows this practice.

The research method of a comparative analysis deals with the analysis of two (or more) cases, which are similar in some but different in other respects. Those differences are the essential points that become the focus of the elaboration. The goal of a comparative study is to understand why the cases differ and also to reveal the underlying structure which causes the variations.

The basic idea behind the research approach is as the following: Let us assume that the four respective geographical markets (MOL, KSU, EVE and HAUAN) for a non-stop route to Oslo do not differ at all. More precisely, we presume that all factors that determine the air travel demand (in short: demand drivers) in these four markets are exactly the same in existence and magnitude. Then, the factual air travel demand (measured in terminal pax) of all four markets (and for the respective non-stop routes to OSL) would indeed be the same.

If one alternatively assumes that the four markets differ only by the fact that HAUAN/Mo i Rana does not have a non-stop service to OSL (ceteris paribus) right now, then one could explain the difference in terminal-pax among MOL, KSU, EVE and Mo i Rana solely by that fact. It means that once a non-stop route between HAUAN and OSL is established, the demand level for HAUAN-OSL should converge towards the demand levels at MOL, KSU and EVE.

However, a scenario with almost identical magnitudes of demand drivers for different airports is unrealistic. If, in a more likely case, the markets differ with respect to their underlying demand drivers, it is natural to expect deviating terminal pax-numbers which cannot be explained exclusively by the non-existence of HAUAN-OSL. Such dissimilarities in demand drivers, which are not always precisely measurable and hardly adjustable for interaction effects, can provide a useful guidance for an approximation of potential demand-numbers for HAUAN-OSL.

The above-presented approach corresponds with the so-called 'spatial transfer'[1] of knowledge from an estimation context (e.g. MOL-OSL) to the application context of HAUAN-OSL. The two key aspects of this analysis are: quantifying the impact of major demand drivers on the demands for MOL-OSL, KSU-OSL and EVE-OSL in a suitable way; and then to transfer those results to the setting of HAUAN.

The chance to approximate the demand for a non-existing route is one advantage of such a comparative approach and may hold true even in the absence of some crucial metrics for the HAUAN-OSL market (e.g. market prices). The main challenge of this approach, however, is related to the transferability of the estimation context into the application context. Ensuring this transferability is not without problems. 'Transferability' here points towards the question whether the general situation of HAUAN-OSL is 'equal enough' to the settings of the reference-routes to legitimize the application of a comparative research approach[2].

The transferability in this analysis will be ensured in two ways: first, we apply per capita-based metrics, which, by their very nature, will account for a certain degree of deviation between the routes; and second, we will explicitly address the critical differences among the routes and help to interpret the respective results.

Anyway, an unavoidable degree of uncertainty remains associated with the chosen analysis approach, and the reader of this report has to be aware of the resulting implications. This is, for example, related to the fact that within a comparative analysis not all decisive demand drivers can be addressed and that interaction effects among different demand drivers can be accounted for only partially. One may, for example, analyze the per capita trip rate of MOL based on the population size in the respective catchment area. The application of the resulting trip rate to the HAUAN context, however, always implicitly assumes that all other demand drivers are held

[1] For a brief introduction to 'spatial transferability' and further references, the reader may consult Karasmaa (2003).

[2] An enlightening discussion of that issue in the context of international benefit transfer can be found in Ready and Navrud (2006).

constant. This is a weakness of this analysis approach, which can be migrated but cannot be completely avoided.

This work claims to be no more than an approximation based on a simple but yet transparent comparative study. State-of-the-art methods like the long-distance transport models for Norway (NTM6) are suitable for a more precise forecasting of passenger flows between Norwegian airports, including local network effects like transfer of passengers from adjacent airports. However, international traffic is not included in NTM6. A model for forecasting of international travels from large and medium-sized airports is recently developed by the Institute of Transport Economics (TØI). However, this model has to be adapted for assessing new airports. In principle, our simplified approach captures both domestic and international traffic.

Finally, the reader has to accept that transferring metrics from the estimation context to the application context automatically induces a common 'time dimension'. The results are supposed to serve as an indicative snapshot of the passenger volume in the year when the airport is well established in the market, based on 2014 numbers. All passenger numbers throughout the report refer to this year. How long this adjustment will take is dependent on the characteristics of the local markets and is not further assessed here. The passenger numbers should be adjusted with expected annual growth rates up to at least the first year of the airport operation. Such forecasts are not a part of this study, but calculations are made with an annual growth rate of 0.9 % till 2025.

2.2 PASSENGER AIR TRAVEL DEMAND DRIVERS AND ANALYSIS APPROACH

There exists a vast literature dealing with the impact of different factors on air passenger travel demand[3]. A widely recognized systematization of different demand drivers is used by Jorge-Calderón (1997). With respect to the ability of an airline to influence and control decisive demand drivers, there are the so-called 'geo-economical' and the so-called 'service-related' determinants of demand. A comprehensive picture of the most-used drivers of both groups can be found in Sivrokaya and Tunc (2013). For the purpose of this report it is suitable to know that population size, the disposable income of that population, and the economic activity level of certain geographical areas are the most important geo-economic demand drivers. Also, the most-used service-related demand drivers are airfare, departure frequency, and aircraft technology.

Service-related demand drivers pose some challenges in a comparative analysis design. This is partly related to the endogenous nature of these factors, which implies that an explicit cause-effect relationship is hardly quantifiable. It is a well-known fact that an increase in departure frequency or the replacement of turboprop airplanes by modern jet planes stimulates air travel demand. However, airlines will increase departure frequencies and introduce larger planes if the increased demand generates enough profits. Here the 'chicken-egg' issue becomes rather obvious.

Within the framework of a comparative analysis, one can therefore analyze such service-related drivers only to a very limited degree and the amount of transferable knowledge gained is rather limited. Nicolaisen and Standal (2013), for instance, isolated a distance component of airfares of

[3] For an introductory summary of the field, the reader may be referred to Doganis (2010) or Holloway (2008).

approximately 0.12 NOK per kilometer for the economy travel segment in the Norwegian domestic market. For the OSL-MOL link (March 2013) the authors found average low-flex airfares ranging from 559 - 884 NOK (one-way) dependent on the airline and the date of booking.[4] Based on such results, it is theoretically possible to approximate an airfare for HAUAN-OSL. In terms of demand estimations, however, nothing can be gained from such a procedure. This can be attributed to two reasons: first, a 'measurable' non-stop market for HAUAN-OSL does not exist at the moment and hence the gained price information can hardly be transferred into reliable demand estimates; and second, the price effects of e.g. MOL-OSL are already implied in the actual demand figures for MOL-OSL.

Instead of trying to handle 'squashy' service-related demand drivers and calculate their effects for HAUAN-OSL, we prefer to include those drivers in our analysis by choosing the reference routes in an appropriate way. In terms of airfares, we include both, routes with lower flight distances (hence lower airfares) and a route with higher flight distance then HAUAN-OSL. To account for the demand driver departure frequency, we have chosen routes with different numbers of daily departures. It, therefore, becomes a matter of argumentation in the interpretation part of this analysis to adjust for the service-related effects.

The core of this analysis consequently deals with the most important geo-economic demand drivers. Among others, Holloway (2008) highlights the need to differentiate demands for different underlying travel motivations. A separate approach for privacy/leisure-related air travel ('leisure') and work/business-related air travel ('work') is called for, which, in turn, determines the specific demand drivers that have to be treated.

Finally, all demand drivers have to be assessed with respect to the specific 'catchment area' (CA) of an airport. The catchment area of an airport can be understood as the geographical area from which an airport generates the overwhelming part of its outbound travellers and the area in which the major part of all inbound passengers of the airport continue to travel. The definition of reasonable CAs is crucial for this analysis and several assumptions have to be made in this regard.

2.3 ASSUMPTIONS

Catchment Area (CA)

We define the CA of an airport for this report in the following way. The starting point is always the minimum driving distance for a potential passenger between the administrative centre of their home municipality and an airport with access to OSL-services. This includes both non-stop flights and flights with stopovers. All municipalities are designated to the CA of that particular airport for which this driving time is minimized. The resulting CA will be denoted by 'CA_{xmindt}', where '*CA*' represents the '*catchment area*' of airport '*x*' under the assumption of the minimized driving time '*mindt*'. The actual driving time estimation is sourced from Internet-based route planners.

Such a strict driving time-oriented derivation of CAs does not seem accurate enough and is most likely to distort some relevant metrics. Therefore, we introduce the additional CA-definition 'CA_{xadj}', which originates from the first CA-term but has been '*adj*usted' for case-specific

[4] The respective numbers for OSL – KSU are 986 – 1041 NOK and for OSL-EVE 829 – 1219 NOK.

characteristic such as equal driving times needed to reach two neighbouring airports or well-known leakage effects. The case-specific characteristics will be discussed in the next chapter.

HAUAN-OSL and Southbound Traffic
We assume that a future non-stop service HAUAN-OSL serves the entire demand for all air travel to/from destinations that are located south of the Trondheim Airport (TRD). In other words, we do not expect to see any additional non-stop air transport service from/to HAUAN, besides the already existing ones and HAUAN-OSL.

Aircraft Capacity and Resulting 100% Load Factor
According to a statement of the principal of this report, it is desirable to operate HAUAN-OSL with a modern jet plane, and to offer at least three daily departures on weekdays and one daily departure on all other days. Following the assumption of Øvrum and Berg (2015), with 230 regular 'weekdays' and 135 'other days', Table 1 visualizes the resulting annual capacity for different scenarios. Column One includes reasonable departure frequency combinations from 'one departure per weekday and one departure on other days' (1/1) to 'five departures per weekday and one departure per other day' (5/1). How many daily departures are offered by an airline is to the major part determined by the existing demand. Other considerations such as 'where' and 'when' to park an airplane over night also impact departure times and frequencies, especially for low-demand periods like weekends. Such aspects, however, have to be seen in the larger context of an airline's overall network of operations and cannot be dealt with in this report. We therefore indicate in the last row of Table 1 by how many annual passengers the capacity would increase with one more departure per 'other day'. The principal's 'desired service scenario' (3/1) leads to an annual capacity of 306 900 available seats (arrived/departed).

Table 1: Annual Capacity in Seats – with respect to aircraft type and departure frequency

A/C-type Schedule	B737/800 (186)	A320 (168)	B737/700 (141)
1/1	135 780	122 640	102 930
2/1	221 340	199 920	167 790
3/1	***306 900***	277 200	232 650
4/1	392 460	354 480	297 510
5/1	478 020	421 760	362 370
-/1	50 220	45 360	38 070

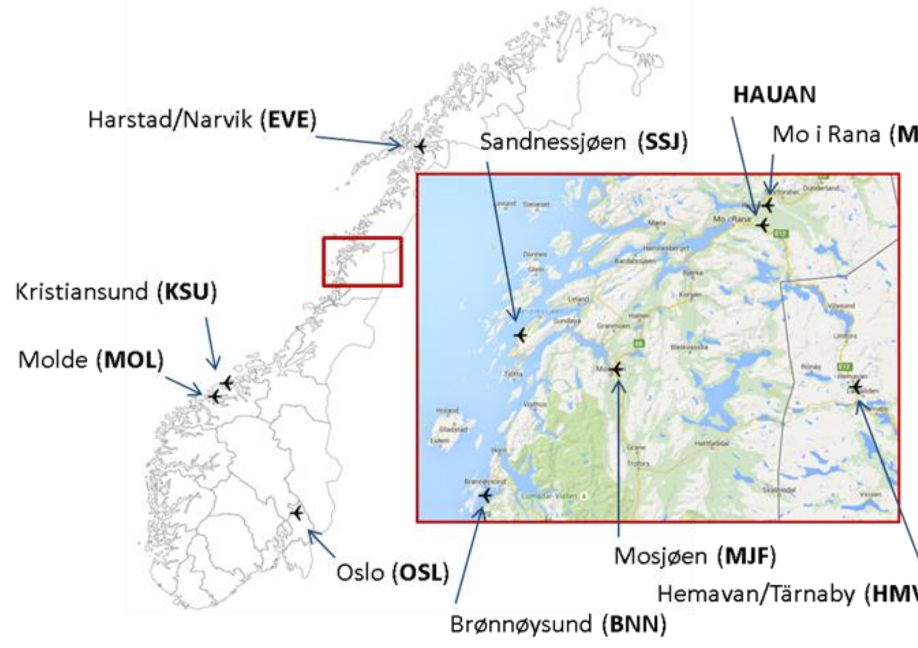
Source: Own Calculations

3 AFFECTED AIRPORTS

3.1 GEOGRAPHICAL DISTRIBUTION

The geographical distribution of all relevant airports of this analysis is shown in Figure 1. The reference airports are all situated at the west coast of Norway, and the resulting air travel distances vary between 350 and 962 km on way. Among others, Helgheim (2002) finds, in an analysis of air travel demand for the routes MOL-OSL and KSU-OSL, that substitutional modes of transport (e.g., bus, car, rail) have only a limited impact on air travel demand for such distances. We, therefore, assume that such cross-effects do not have to be considered in our analysis. One could of course claim that a certain share of e.g. Helgeland leisure travellers would prefer to travel by car, bus or rail to TRD and would start their air journey from there. This would consequently interfere with the above assumption. However, this is only partly true, because the references routes MOL-OSL and KSU-OSL contain such an intermodal competition aspect; hence related effects are represented by the comparative character of this study. The red rectangle highlights the Helgeland region and provides a closer look at the existing airport infrastructure. In addition, the location of the intended airport HAUAN is visualized.

Figure 1: Geographical Distribution of Relevant Airports



Flight distance in km	
	OSL
MOL	350
KSU	368
EVE	962
HAUAN	695

Source: maps - SSB and maps.google.com; flight distance - travelmath.com

3.2 MOLDE AIRPORT, ÅRØ (MOL)

3.2.1 CATCHMENT AREA

Table 2 shows the municipalities that constitute the CA of MOL. The originally derived $CA_{MOLmindt}$ is adjusted by excluding the municipalities of Dovre and Lesja, because both municipalities are located within a reasonable driving distance to OSL and air travel via MOL can be understood as a detour. The municipalities of Gjemnes and Vestnes are most likely to be influenced by leakage effects relating to the nearby airports of KSU and Ålesund (AES). For Gjemnes we approximate a 50% work-related leakage and, for Vestnes, a 50% leakage for both traveler segments. Our resulting population size of CA_{MOLadj} is consequently 68 149 people (employment: 34 867).

Table 2: CA MOL

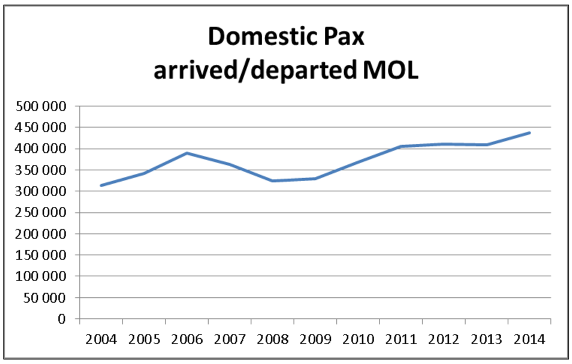
Municipality	$CA_{MOLmindt}$	CA_{MOLadj}
Molde	X	X
Rauma	X	X
Nesset	X	X
Midsund	X	X
Aukra	X	X
Fræna	X	X
Eide	X	X
Sunndal	X	X
Dovre	X	
Lesja	X	
Gjemnes	X	X*
Vestnes	X	X**

Source: Own work; * 100% leisure, 50% work-related (rest CA KSU),
**** 50% leisure- and work-related (rest CA AES)**

3.2.2 DOMESTIC TRAFFIC VOLUME AND OFFERED SERVICES

In 2014, approximately 463 000 domestic passengers (pax) departed or arrived at the Molde Airport. Figure 2 shows the development with respect to time. During the period between 2004 and 2014 the pax-numbers increase by 39%.

Figure 2: Traffic development MOL - domestic



Source: Avinor (2015)

MOL nowadays offers direct services to the three largest Norwegian towns. In addition, flights to the airports of KSU and Stord are offered (see Table 3). However, only the routes to OSL, Bergen (BGO) and TRD account for a considerable amount of traffic.

Table 3: Weekly Departures MOL, Sept. /Oct. 2015 – Available Destinations

	MOL
OSL (SK, DY)	42
Bergen (WF)	19
Trondheim (WF)	9
KSU (WF)	4
Stord (WF)	3

Source: Avinor's websites

3.2.3 TRAFFIC VOLUME AND OFFERED SERVICES – OSLO-ROUTE

The MOL-OSL-link is currently operated by the two airlines Norwegian Air Shuttle (DY) and Scandinavian Airlines (SK). In total, 42 weekly departures are scheduled. The typical weekday departure (DEP) plan for autumn 2015 is shown in Table 4. One can see that the airlines schedule their departures with respect to each other, and both airlines park one plane at MOL during night.

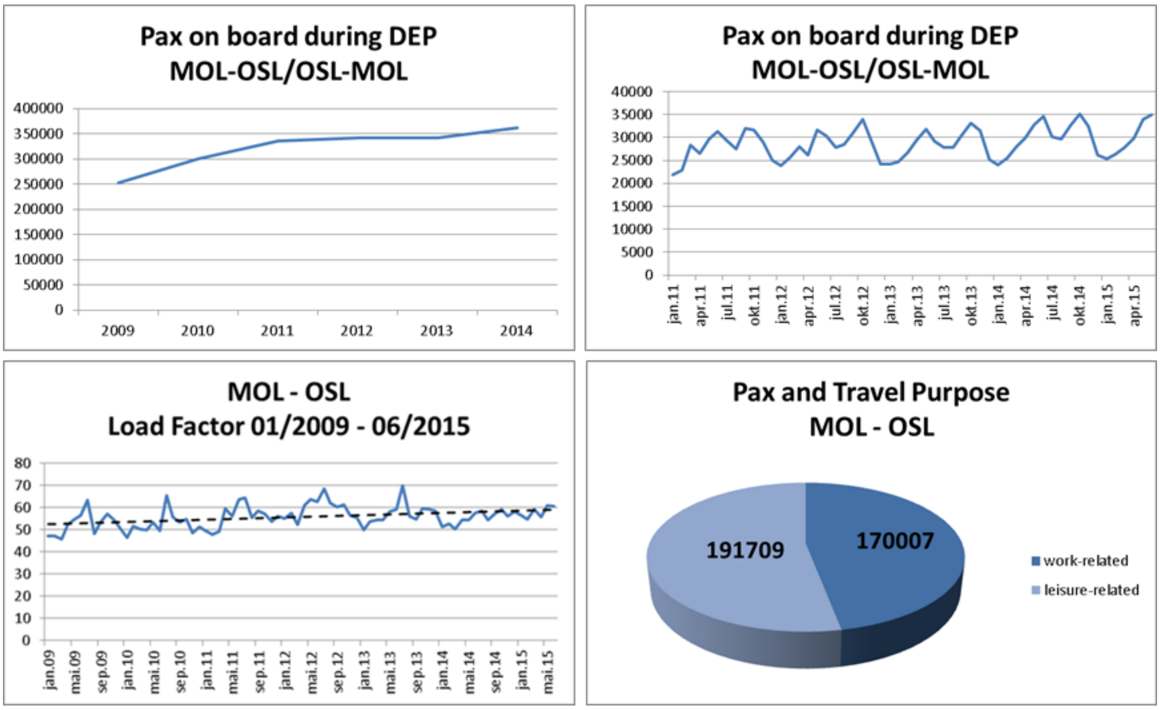
Table 4: Daily arrivals (ARR) and DEP - Oslo-link

ARR MOL	Airline	DEP MOL
20:40	SK	06:50
22:50	DY	06:45
09:00	SK	09:25**
09:20	DY	09:45
13:10*	SK	13:45
16:45	SK	17:10
17:00	DY	17:30

Source: Avinor's websites; * Tuesday - Friday
**** Monday - Thursday**

Figure 3 visualizes some key metrics for the route MOL-OSL. The major aspects are as the following: approximately 362 000 pax travelled on this route in 2014, which is equivalent to 83% of the total domestic traffic of MOL. During the period between 2009 and 2014 the pax demand for MOL-OSL increased by 43%. This strong growth can partly be explained with extraordinary demand effects related to the construction of the close by Nyhamna gas processing plant. A closer look at the monthly traffic statistics reveals a seasonal demand pattern. The demand during the peak period in spring and autumn is approximately 40% higher than the demand during the lean period in summer and winter.

Figure 3: MOL-OSL - statistics



Source: Avinor's websites, SSB (2015b) and own calculations

If the available seat capacity for this route is compared with the realized demand figures, an average Load Factor (LF) of 58% is found. This seems quite low in comparison with the usually assumed values for routes in the domestic network. Anyway, one can see a rising trend line. Based on Denstadli, Thune-Larsen, and Dybedal (2014), a separation of demand in travel purpose segments is possible. Figure 3 shows that leisure-related travel (53%) is slightly more important for MOL-OSL than work-related travel (47%). The resulting segmented traffic volumes are as follows:

$PaxL_{MOL-OSL}$: 191 709 ('L' denotes 'leisure'),
$PaxB_{MOL-OSL}$: 170 007 ('B' denotes 'work/business').

3.2.4 MOL-OSL – DEMAND ADJUSTMENTS

Earlier, we assumed that HAUAN-OSL would satisfy the demand for all air travel to/from destinations south of TRD (see Section 2.3). Therefore, it is necessary to adjust the demand numbers for $PaxL_{MOL-OSL}$ and $PaxB_{MOL-OSL}$in the same manner. It means that the existing pax-volumes for MOL-BGO have to be implemented. One can presume that a high share of today's MOL-BGO travelers would travel via OSL if MOL-BGO were not operated. The exact magnitude of this share is unknown and cannot be calculated. We estimate for further calculations that 100% of today's work-related and 80% of today's leisure travel would use the OSL-link in such a scenario. Based on the individual statistics of the segments for MOL-BGO (Denstadli, Thune-Larsen, and Dybedal 2014), we adjust the demand numbers for OSL-MOL and use the following numbers for the further calculations:

$PaxL_{MOL-South}$: 216 024
$PaxB_{MOL-South}$: 205 686.

3.3 KRISTIANSUND AIRPORT, KVERNBERGET (KSU)

3.3.1 CATCHMENT AREA

Table 5 shows the municipalities that constitute the CA of KSU. $CA_{KSUmindt}$ is adjusted by reducing the relevant share of the Surnadal municipality to 50% for the leisure segment (because of TRD leakage) and also adding 50% of the work-related leakage for Gjemnes. The latter is related to almost equal driving distances between the administrative centre of Gjemnes to MOL and KSU. We do not assume such a leakage effect for the leisure segment, since MOL offers better services than KSU in terms of airfares and frequencies. In fact, it does not seem far-fetched to expect an overall leisure leakage out of the defined KSU CA towards MOL. Our resulting population size of CA_{KSUadj} is consequently 43 947 people (employment: 22 031).

Table 5: CA KSU

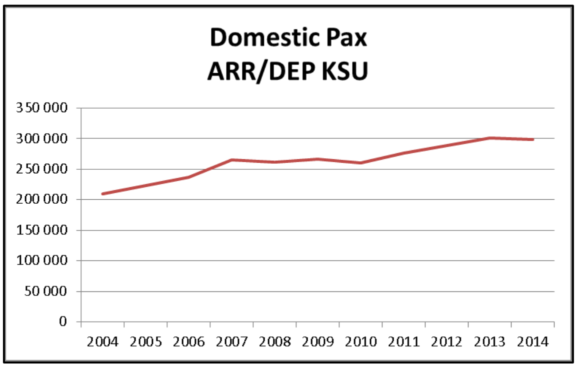
Municipality	$CA_{KSUmindt}$	CA_{KSUadj}
Kristiansund	X	X
Averøy	X	X
Tingvoll	X	X
Aure	X	X
Halsa	X	X
Smøla	X	X
Surnadal	X	X*
Gjemnes		X**

Source: Own work, * 50% leisure-, 100% work-related (rest TRD),
**** 0% leisure-, 50% work-related (rest MOL)**

3.3.2 DOMESTIC TRAFFIC VOLUME AND OFFERED SERVICES

In 2014, approximately 298 000 domestic pax departed or arrived at KSU airport. Figure 4 below shows the development with respect to time. During the period between 2004 and 2014 the pax-numbers increased by 42%.

Figure 4: Traffic development KSU - domestic



Source: Avinor (2015)

KSU offers direct services to the three largest Norwegian towns. In addition, flights to the airports of Stavanger (SVG), MOL and Stord are offered (see Table 6). However, only the routes to OSL, BGO, SVG and TRD account for a considerable amount of traffic.

Table 6: Weekly Departures KSU, Sept. /Oct. 2015 – Available Destinations

	KSU
OSL (SK)	24
Bergen (WF)	25
Trondheim (WF)	9
MOL (WF)	2
Stord (WF)	3
Stavanger (WF)	5

Source: Avinor's websites

3.3.3 TRAFFIC VOLUME AND OFFERED SERVICES – OSLO-ROUTE

The KSU-OSL-route is currently being operated only by SK. In total, 24 weekly departures are scheduled. The typical weekday DEP/ARR plan for autumn 2015 is shown in Table 7.

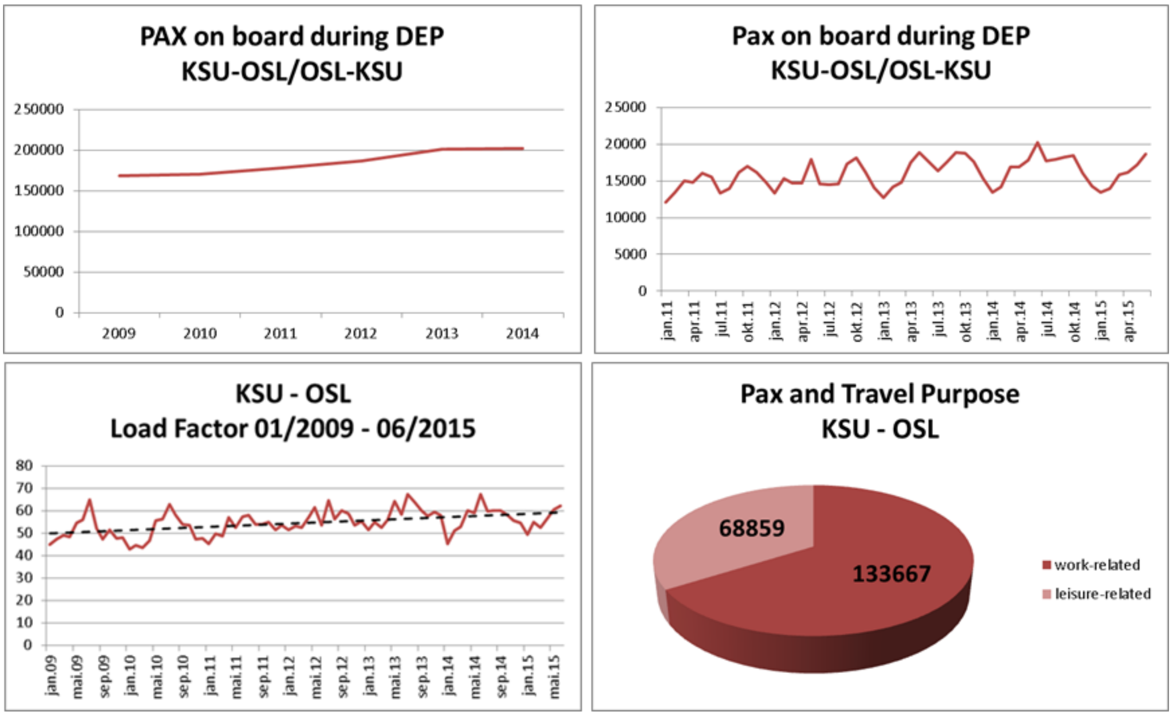
Table 7: Daily ARR/DEP - Oslo-link

ARR KSU	Airline	DEP KSU
22:40	SK	06:35
08:55	SK	09:20
14:00	SK	14:25
18:30	SK	18:55

Source: Avinor's websites

Figure 5 visualizes some key metrics for the KSU-OSL link. The major aspects are described in the following. Approximately 203 000 pax travelled on this route in 2014. This is equivalent to 68% of the total domestic traffic of KSU. During the period between 2009 and 2014 the pax demand for KSU-OSL increased by 20%. The monthly traffic statistics indicate the same 'two-top' seasonal demand pattern, as seen for MOL. The monthly traffic volumes vary by 30%, seen from the lows. The calculated LF of 58% is equal to the one stated for MOL. A closer look at the respective graph, however, indicates a rising tendency for the most recent period of time. Based on Denstadli, Thune-Larsen, and Dybedal (2014), a separation of demand in the travel purpose segments is again possible. Figure 5 reveals that the overwhelming part of the demand (66%) for KSU-OSL is work-related. The authors also report that 37% of the total traffic can be directly linked to oil-related activities. This share is clearly above the respective oil-related values for MOL (11%) and EVE (9%).

Figure 5: KSU-OSL - statistics



Source: Avinor's websites, SSB (2015b) and own calculations

The resulting segmented traffic volumes are as follows:

$PaxL_{KSU-OSL}$: 68 859
$PaxB_{KSU-OSL}$: 133 667.

3.3.4 KSU-OSL – DEMAND ADJUSTMENT

The demand figures for KSU-OSL are significantly influenced by the oil-related activities in the KSU-area. Those activities are unfortunately not represented by any economic metric concerning the KSU CA. This is related to the fact that a high share of air travellers uses KSU as a 'connecting airfield' for offshore operations. These travellers are not officially registered as inhabitants or employees in the KSU CA. This, however, would artificially inflate the per capita air trip rates, as compared with MOL or EVE. Consequently, the effect of work-related travel would be over-estimated when transferred to the setting of HAUAN.

We therefore adjust the number of work-related travellers in such a way that the share of oil-related air travel is reduced approximately to the level of MOL and EVE (10%). This step is intended to increase the transferability of KSU numbers and comes along with a decrease in KSU work-related air travel from 133 677 to 79 258 pax in 2014. In addition, we adjust the demand numbers for the effects of the two routes KSU-BGO and KSU-SVG. We apply respective segmentation shares as sourced from Denstadli, Thune-Larsen, and Dybedal (2014) in the same way as we did earlier for MOL-BGO. For further calculations we consequently use the subsequent numbers that account for both, the oil related and BGO/SVG-related effects:

$PaxL_{KSU-South}$: 81 726
$PaxB_{KSU-South}$: 91 241.

3.4 HARSTAD/NARVIK AIRPORT, EVENES (EVE)

3.4.1 CATCHMENT AREA

Table 8 shows the municipalities that constitute the CA of EVE. $CA_{EVEmindt}$ is adjusted by including the municipality of Lavanger, with 50% for the leisure segment. In addition, a large amount of municipalities located in the Lofoten region is included. Denstadli, Thune-Larsen, and Dybedal (2014) show that a major share of the travelling originating from one of those municipalities is in reality performed via EVE (29% of all leisure and 16% of all work-related traffic). Ignoring this fact would again inflate the respective per capita trip rates and over-estimate the demand for HAUAN-OSL. We account for this 'Lofoten effect' and correct the EVE CA with regard to specific 'market shares' for individual municipalities, which are also provided by Denstadli, Thune-Larsen, and Dybedal (2014). These ‘market shares’ range between 5% and 85% and are used as ‘weights’ for both, population and employment size. We prefer this approach as compared to a crude inclusion of Lofoten’s entire population/employment, because the latter would inflate the relevant population size to more than 100,000 people, which is in contrast to empirical evidence. Our resulting population size of CA_{EVEadj} is consequently 86 372 people (employment: 41 649).

Table 8: CA EVE

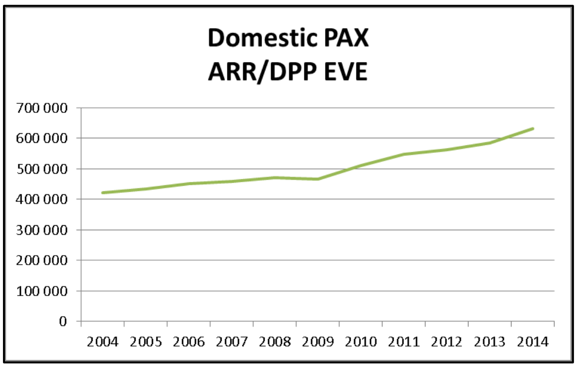
Municipality	$CA_{EVEminkt}$	CA_{EVEadj}
Narvik	X	X
Tysfjord	X	X
Løding	X	X
Tjeldsund	X	X
Evenes	X	X
Ballangen	X	X
Harstad	X	X
Kvæfjord	X	X
Skåland	X	X
Gratangen	X	X
Lavangen		X*
Andøy (5%)**		X
Sortland (82%)**		X
Bø (85%)**		X
Øksnes (85%)**		X
Hadsel (70%)**		X
Vågan (40%)**		X
Vestågøy (17%)**		X
Flakstad (5%)**		X
Moskenes (5%)**		X

Source: Own work; * 50% leisure related (rest Bardufoss);
**** estimated based on Denstadli, Thune-Larsen, and Dybedal (2014)**

3.4.2 DOMESTIC TRAFFIC VOLUME AND OFFERED SERVICES

In 2014, approximately 632 000 domestic pax departed or arrived at Evenes airport. Figure 6 shows the development with respect to time. During the period between 2004 and 2014 the pax-numbers increased by 50%.

Figure 6: Traffic development EVE - domestic



Source: Avinor (2015)

EVE nowadays offers direct services to five Norwegian cities (see Table 9). The most important routes are the once to OSL, Bodø, Tromsø, and TRD. OSL is the only non-stop domestic destination south of TRD.

Table 9: Weekly Departures EVE, Sept. /Oct. 2015 – Available Destinations

	EVE
OSL (SK, DY)	43
Bodø (WF)	11
Trondheim (DY)	4
Tromsø (WF)	12
Andøya (WF)	5

Source: Avinor's websites

3.4.3 TRAFFIC VOLUME AND OFFERED SERVICES – OSLO-ROUTE

The EVE-OSL-link is currently operated by both DY and SK. In total, 42 weekly departures are scheduled. The typical weekday DEP/ARR plan for autumn 2015 is shown in Table 10. One can see that the airlines schedule their departures again with respect to each other and that both airlines have one aircraft for overnight stay in EVE.

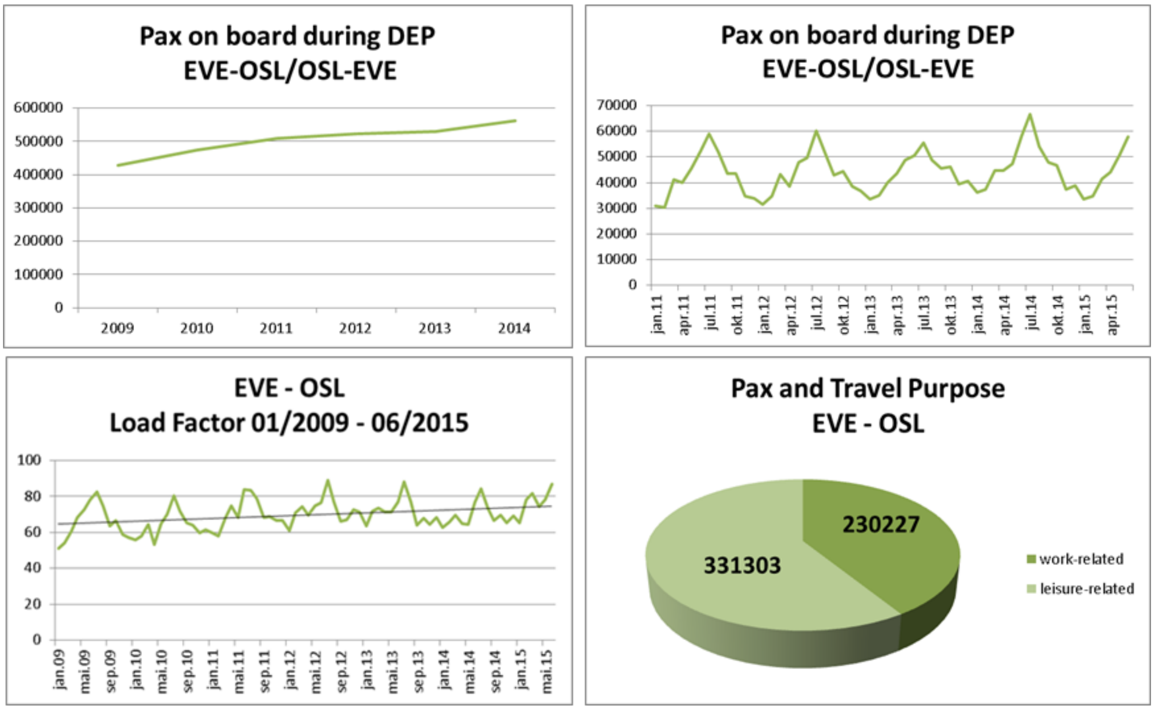
Table 10: Daily ARR/DEP - Oslo-link

ARR EVE	Airline	DEP EVE
22:00	SK	06:45
22:30	DY	06:35
10:15	SK	10:40
10:35	DY	11:05
15:00	DY	15:45
17:30	SK	17:55
19:35	DY	20:05

Source: Avinor's websites

Figure 7 shows some key metrics for the route EVE-OSL. The major aspects are described in the following. Approximately 562 000 pax travelled on this route in 2014. This is equivalent to 89% of the total domestic traffic of EVE. During the period between 2009 and 2014 the pax demand for EVE-OSL increased by 31%. A closer look at the monthly traffic statistics reveals a significant 'one top' seasonal pattern. In fact, the peak time traffic volume is approximately 100% above the low-demand periods. In addition, it is eye-catching that the peak regularly occurs during the summer months. This is a clear indication of a high amount of inbound tourism air travellers. The exact share of this traveller group is hard to calculate. Madsen, Vinogradov, and Velvin (2015) find that 54% of all tourists in the Lofoten area use air travel as their main mode of transportation to reach and leave the Lofoten region. This aspect has to be kept in mind for the interpretation phase of our analysis.

Figure 7: EVE-OSL - statistics



Source: Avinor's websites, SSB (2015b) and own calculations

The calculated average LF of 71% is clearly higher than the ones found for KSU and MOL. Indeed, if one calculates the EVE LF only on the basis of the 2015 data, it increases to more than 80%. Figure 7 additionally indicates that contrary to KSU, the major part of the demand (59%) for EVE-OSL is leisure-related. The resulting segmented traffic volumes are as follows:

$PaxL_{EVE-OSL}$: 331 303
$PaxB_{EVE-OSL}$: 230 227.

A further adjustment for additional southbound routes or other factors is not necessary. We will, therefore, use the subsequent demand numbers for further calculations

$PaxL_{EVE-South}$: 331 303
$PaxB_{EVE-South}$: 230 227.

3.5 ARCTIC CIRCLE AIRPORT (HAUAN)

3.5.1 CATCHMENT AREA

For the definition of a reasonable HAUAN-CA, a few prerequisites should be acknowledged:[5]

1. We assume that a future airport, HAUAN, will attract all demands with the departure point MJF and destinations south of TRD (vice versa). It means that today's MJF CA (see Øvrum and Berg (2015)) will be absorbed by CA HAUAN, with the exception of the flight to/from TRD and destinations north of TRD. As stated in the introduction, a full network analysis is beyond the scope of this study.
2. The airport BNN offers non-stop flights to OSL, already. To what extent the future airport, HAUAN, would impact the traffic volume of this route is hard to gauge. The distance between today's CA BNN and HAUAN is rather long. Also, travelling by car directly to TRD to start air travel from there seems to be a suitable option for trips originating/ending in CA BNN. In order to avoid an unnecessary element of uncertainty for our analysis and to increase the robustness of our results, we exclude today's CA BNN (see Øvrum and Berg (2015)) from the analysis and assume that no CA BNN-pax would use HAUAN in the future.
3. The airport of HAUAN is to be located approximately 35 kilometres north-west of the Norwegian-Swedish borderline. It would be a natural decision to include the close by Swedish territory into the CA HAUAN. For several reasons, we do not consider the Swedish territory as part of CA HAUAN. The airport of Hemavan/Tarnaby (HMV), which is situated about 60 kilometres south the borderline, offers daily departures to the hub airport of Stockholm. In 2013, ca. 11 000 pax (ARR/DEP) used HMV as the starting or end point of air travel. The extent of a potential leakage in favour of HAUAN seems rather limited. This is because of the low-demand numbers of HMV—the fact that especially business-related travel is often strongly committed to the nation's hub-airports and also because of the overall low population size of only 2,000 inhabitants between the borderline and HMV. The argument that HAUAN would potentially provide growth stimuli for the tourism industry in the boundary region and that it would lead to higher air travel demand in HAUAN seems plausible, but it cannot be considered in a comparative analysis design. Consequently, the design of CA HAUAN is restricted to the Norwegian territory.

Table 11 shows the municipalities that constitute the CA of HAUAN. $CA_{HAUANmindt}$ is adjusted by including several municipalities, which are in the proximity of the airports MJF and SSJ. The earlier formulated regime applies for MJF. In case of SSJ, it is possible to travel with a non-stop flight from SSJ to OSL, as of today, two times a week. We assume that this service would mainly attract business travellers once HAUAN gets operational. Consequently, we approximate a 50% work-related leakage to HAUAN. At the same time, we assume that all leisure-related traffic would use HAUAN. This situation is denoted by $CA_{HAUANadj}$. Øvrum and Berg (2015) indicate the theoretical chance that the non-stop service SSJ-OSL would be intensified in the future. In such a scenario, it is likely that HAUAN will have fewer pax. In order to respect such a scenario, we introduce an additional CA-design, namely $CA_{HAUAN-SSJ}$, which excludes the municipalities in

[5] For a better understanding of the spatial situation, the reader is referred back to Figure 1.

spatial proximity to SSJ. The resulting population size of $CA_{HAUANadj}$ is consequently 65 079 people (employment: 28 268). The numbers for $CA_{HAUAN-SSJ}$ are 52 344 and 25 246. Based on factors such as lower airfares and higher service frequency by HAUAN, we assume $CA_{HAUANadj}$ to be the more likely case. Nevertheless, we perform all further calculations for both CA-designs. This is, because the results of this analysis are especially sensitive to the underlying CA-designs. One can therefore assess $CA_{HAUANadj}$ as an 'upper bound'-design and $CA_{HAUAN-SSJ}$ as a 'lower bound' design.

Table 11: CA HAUAN

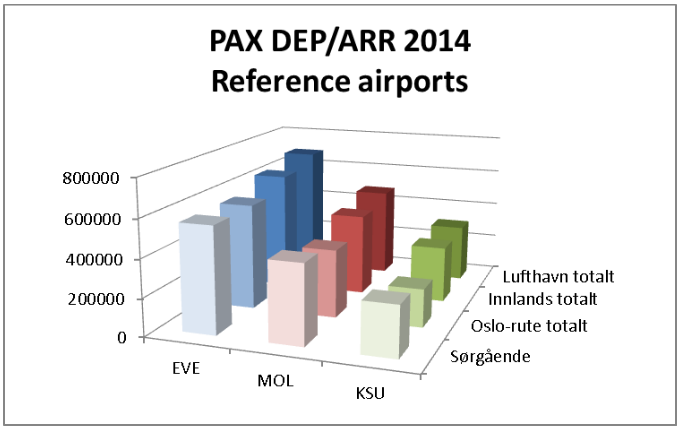
Municipality	$CA_{HAUANmindt}$	$CA_{HAUANadj}$	$CA_{HAUAN-SSJ}$
Nesna	X	X	X
Hemnes	X	X	X
Rana	X	X	X
Lurøy	X	X	X
Træna	X	X	X
Rødøy	X	X	X
Herøy		X*	
Alstahaug		X*	
Leirfjord		X*	
Dønna		X*	
Vefsn		X	X
Grane		X	X
Hattfjelldal		X	X

Source: Own work; *100% leisure-, 50% work-related (rest SSJ)

3.6 INTERIM CONCLUSIONS

In this chapter, we mainly presented some key metrics of the reference airports MOL, KSU and EVE. First, in terms of population and employment figures, we indicated that CA MOL and CA EVE are larger than CA HAUAN and that CA KSU is smaller than CA HAUAN. We furthermore showed how two different designs of CA HAUAN impact the figures for HAUAN (see Table 12).

Figure 8: Traffic Volumes – Reference Airports 2014



Source: Own work, based on SSB (2015b)

Second, we turned toward the traffic situation at the reference airports. Figure 8 summarizes the traffic volume scales. EVE has by far the highest traffic volume, both in terms of total domestic traffic and passenger demand for the OSL-link. KSU is the smallest of the three airports. For MOL and KSU, the share of the OSL traveller is seen with respect to the total domestic demand volume being lower than for EVE.

Moreover, we pointed out that KSU-OSL is operated by only one airline, and that the better service frequency and lower airfares in MOL might lead to a leakage from KSU to MOL. In addition, we made the reader familiar with the special role of oil-related activities for the demand in KSU and posed the issue of strong seasonal tourism pattern with regard to EVE. We showed for all three cases that the demand has grown significantly since 2009. One reason for that can be assumed to be a stable business cycle. Furthermore, we elaborated on the two underlying travel motivations at the reference airports. Table 12 summarizes the major findings by showing some key figures.

Table 12: 2014'-Statistics - summary

2014' metrics	MOL	KSU	EVE	HAUAN
Population	68 149	43 947	86 372	65 079* 52 344**
Employment	34 867	22 031	41 649	28 268* 25 246**
Oslo-route:				
Passenger	362 000	203 000	562 000	
Change since 2009	+ 43%	+ 20%	+31%	
Average LF	58%	58%	71%	
Leisure Share	53%	34%	59%	
Work/Business Share	47%	66%	41%	
Corrected Demands:				
$PaxL_{X-South}$	216 024	81 726	331 303	
$PaxB_{X-South}$	205 686	91 241	230 227	

Source: Summary of numbers in line with earlier provided references; * $CA_{HAUANadj}$; ** $CA_{HAUAN-SSJ}$

Finally, we presented the actual load factors for the three non-stop routes to OSL. We also recognized a substantial deviation among the routes. It allowed us to design a LF-corridor for HAUAN, which can be used to adjust the already calculated theoretical 100% LF (see Table 1) to more reasonable values. From our point of view, it should be in the interest of Helgeland's population to potentially attract both DY and SK airlines. This, however, forbids planning with too low LF-values. DY, for instance, would not be willing to operate the route with LFs as low as the current run of KSU-OSL by SK. We, therefore, assume as lower bound for the HAUAN LF-corridor the average LF of MOL-OSL in 2015, plus one standard deviation (LF-corridor lower bound = 61%). As upper bound, we choose the 2015 values of EVE-MOL and add again one standard deviation (LF-corridor upper bound = 84%). Since other reports often refer to LFs of 75%, we include those figures as well to give the reader an additional line of reference.

Table 13 provides an overview of the resulting demands needed to attract an airline for HAUAN-OSL under different scenarios.

Table 13: Required Demand HAUAN-OSL - Scenarios

	A/C-type	**B737/800 (186)**	**A320 (168)**	**B737/700 (141)**
Schedule	**LF**			
1/1	61%	82 826	74 810	62 787
	75%	101 835	91 980	77 198
	84%	114 055	103 018	86 461
2/1	61%	135 017	121 951	102 352
	75%	166 005	149 940	125 843
	84%	185 926	167 933	140 944
3/1	61%	***187 209***	169 092	141 917
	75%	***230 175***	207 900	174 488
	84%	***257 796***	232 848	195 426
4/1	61%	239 401	216 233	181 481
	75%	294 345	265 860	223 133
	84%	329 666	297 763	249 908
5/1	61%	291 592	257 274	221 046
	75%	358 515	316 320	271 778
	84%	401 537	354 278	304 391

Source: Own calculations

4 DEMAND ESTIMATION HAUAN-OSL

4.1 LEISURE SEGMENT

4.1.1 DEMAND DRIVER POPULATION

Table 14 gives the population sizes for the previously defined catchment areas in the adjusted versions. One can see that CA EVE has the largest population size. One has to keep in mind, however, that this is a result of the implementation of several Lofoten municipalities. CA KSU shows the smallest population size, and CA MOL and CA HAUAN are almost equal in numbers. For HAUAN CA, the alternative specification without the population of today's CA SSJ is also provided, and one can see that it leads to a reduction in population of about 13 000 people.

Table 14: Population in CAs - 2014

Airport	MOL	KSU	EVE	HAUAN
CA_{xadj}	68 149	43 947	86 372	65 079
$CA_{HAUAN-SSJ}$				52 344

Source: Own calculations based on SSB (2015g)

Table 15 below shows the trip rate coefficients of the reference routes and the resulting leisure segment demand approximations for HAUAN-OSL. We used the above-mentioned population sizes and calculated the '2014 leisure-related per capita trip rates' based on the segmented leisure traffic volumes, as presented in the earlier sections of this report.

Table 15: Trip Rate Coefficients and Resulting Demand Approximations HAUAN – Leisure Segment

	CA-designs		Demand Leisure Segment	
Reference route	CA_{xmindt}	CA_{xadj}	QL_{HAUAN}	$QL_{HAUAN-SSJ}$
$PaxL_{MOL-OSL}$	2,51	2,81	182 872	147 086
$PaxL_{MOL-South}$	2,83	3,17	206 300	165 930
$PaxL_{KSU-OSL}$	1,48	1,57	102 174	82 180
$PaxL_{KSU-South}$	1,76	1,86	121 046	97 359
$PaxL_{EVE-OSL}$	5,54	3,84	249 903	201 000
$PaxL_{EVE-South}$	5,54	3,84	249 903	201 000
$PaxL_{MOLKSU-OSL}$	2,12	2,32	150 983	121 438
$PaxL_{MOLKSU-South}$	2,42	***2,65***	***172 459***	***138 711***

Source: Own calculations

Column One refers to the underlying demand scenario (reference routes). Column Two gives the resulting trip rates for the 'unadjusted' CA designs and is intended to visualize the effects of our adjustment actions. Column Three provides the leisure per capita trip rates for the adjusted catchment areas. Columns Four and five offer the resulting leisure segment demands in pax for the two different HAUAN CA designs and are based on the 'adjusted' CA-designs.

Having a closer look at Columns Two and Three reveals that the trip rate coefficients are higher for the '*south*' specifications than for the 'OSL' specification. This is caused by the implementation of the demand of additional routes, such as MOL-BGO. Furthermore, it becomes obvious that our 'adjusted' CA trip rate coefficients differ significantly from the values in Column Two. This is related to the change in the population size due to leakage effects. Based on our argument so far, we consider the tripe rate resulting from the combination of '*south*'-demand and '*adj*' CA-design as most reliable. Focusing on these values only, it can be clarified that the trip rates vary between 1.86 (KSU) and 3.84 (EVE). The latter rate has to be seen in the context of the previously discussed 'tourism issue'. The spread between the KSU and MOL coefficients can be interpreted as a direct consequence of the hitherto not considered additional leakage effects from CA KSU to MOL. We have already suggested this phenomenon in an earlier stage of this report and think that this effect is caused by the lower airfares in MOL and the higher service frequency. In order to mitigate this disturbing issue, we introduce the additional scenario '*MOLKSU-South*', artificially treating KSU and MOL in combination as one airport with one common CA. The resulting trip rate coefficients and demand approximation for HAUAN can be seen in the two last rows of Table 15.

4.1.2 TRIP RATE CORRECTION – DEMAND DRIVER INCOME

The above-derived trip rate coefficients can only be used without further adjustment if other major demand drivers do not differ significantly. This issue addresses especially the impact of disposable income of the CAs' populations. The reason is simple: we have so far argued that the demand for air travel is directly related to the size of population in a CA. One could additionally argue that higher incomes enable people to travel more by air and hence the trip rates would be inflated irrespective of the population size of a CA. The above-calculated trip rates would then lose their explanatory power.

Table 16 shows the average per capita after tax income in the four CAs (year 2013). For practical reasons, we calculated here the values for the 'unadjusted' CAs based on median household incomes, household sizes, and weighted for population sizes in the individual municipalities.
What becomes obvious is that average per capita incomes do not differ significantly among the CAs. We, therefore, believe that the effects of the demand driver 'income' do not considerably affect our population-based trip rates.

Table 16: Per Capita CAs – mean 2013

Catchment Area	Per capita income in NOK
$CA_{MOLmindt}$	207 404
$CA_{KSUmindt}$	204 429
$CA_{EVEmindt}$	205 224
$CA_{HAUANmindt}$	201 768

Source: Own calculations, based on (SSB (2015f), SSB 2015e)

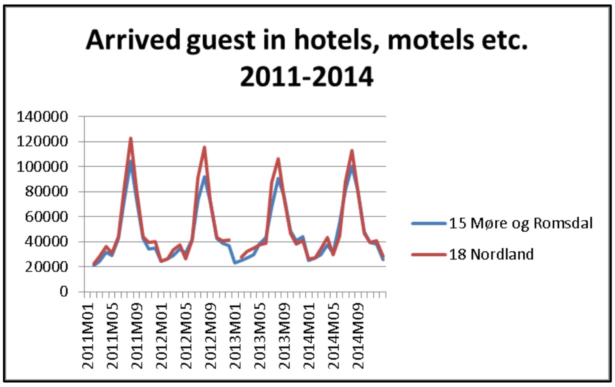
4.1.3 TRIP RATE CORRECTION – DEMAND DRIVER INBOUND TOURISM

We have already indicated that the EVE-leisure demand rates seem to be inflated by inbound tourism. If that would be the case, the resulting demand estimates for HAUAN would only be valid if CA HAUAN could attract the same amount of tourists in the future as CA EVE does today. In a short-term and medium-term perspective this seems questionable. So, the applicability of the EVE-leisure trip rate depends, to a certain degree, on the question of whether the trip rate is indeed inflated by tourists or not.

Unfortunately, relevant statistics that allow an exact estimation of the EVE-tourism phenomenon are not on hand. We, therefore, approach this issue indirectly.

Figure 9 shows the amount of arrived guests, registered on arrival at a hotel or similar establishments, in accordance with Møre & Romsdal (M&R) as well as Nordland county, during the period from 2011 to 2014, independent of transportation modes. The travel patterns in terms of seasonality seem to be equal with the peaks in the summer months. The overall demand for accommodation is, however, always higher in Nordland than in M&R. Expressed in arrived guests relative to the population of the county, Nordland's rate is 27% higher than M&R's rate for July. In this context, we think it is natural to assume that the proportion of tourists travelling by air is higher for Nordland than for M&R. This is mainly related to the sheer distance between Norway and Europe's main population centres.

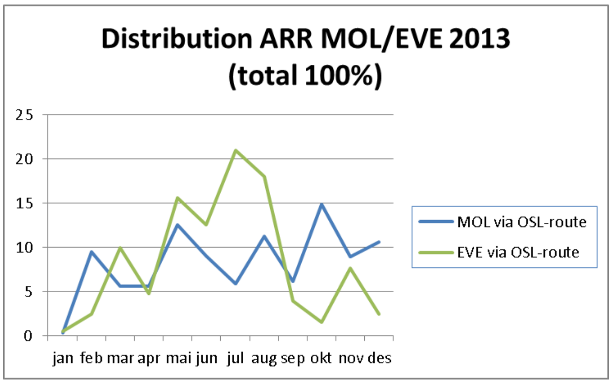
Figure 9: Tourism Statistics - county



Source: SSB (2015a)

Figure 10 shows the distribution of arriving 'holiday' travellers at MOL and EVE in 2013, as sourced from Avinor (2013). The graphs represent a total of 100% for each of the two airports. One can see that the graph for MOL indicates a more stable pattern than the one for EVE. Indeed, the EVE graph seems to confirm that by tendency, the majority of holiday air travellers in EVE arrive during the summer months.

Figure 10: Distribution of Arrivals at MOL and EVE in % with Travel Motive *Holiday* - 2013



Source: Own calculations, based on Avinor (2013)

From the above discussion we conclude that the EVE-leisure trip rate is most likely to be inflated by inbound tourism. We consequently consider this trip rate as 'problematic' in terms of transferability to the HAUAN case. We also believe that the leisure trip rate coefficient of '2.65' ($PaxL_{MOLKSU-South}$) is the most probable value and should be used as the '*preferred*' leisure trip rate for further calculations

4.2 WORK/BUSINESS SEGMENT

4.2.1 DEMAND DRIVER ECONOMIC ACTIVITY LEVEL

Addressing the work-related traveller segment, we have to have a look at the overall economic activity level in the relevant regions. Since suitable statistics such as export or productivity numbers on municipality level do not exist, we have to utilize employment figure instead[6].

Respective disaggregated figures are available for the municipality level, and they allow the calculation of a per capita (meaning per employed person) work-related trip rate for the CAs. Such rates can then be applied in the same way as we used the leisure per capita trip rates to estimate a leisure demand for HAUAN-OSL.

Table 17 gives the employment numbers for the previously defined catchment areas in the adjusted versions. One can see that CA EVE has the largest figures. However, one has to keep in mind that it is a result of the implementation of several Lofoten municipalities. CA KSU shows the smallest employment numbers, and CA MOL and CA HAUAN are close to each other. For HAUAN, the alternative specification - without the employees of today's CA SSJ - is also provided and one can see that this leads to a reduction of about 3 000 positions.

Table 17: Employment in CAs - 2014

	MOL	KSU	EVE	HAUAN
CA_{xadj}	34 867	22 031	41 649	28 268
$CA_{HAUAN-SSJ}$				25 246

Source: SSB (2015c); note: employment by place of work

[6] Nevertheless, in order to gain a 'broader' picture, the interested reader may be referred to some relevant county-based statistics in Annex 1.

Table 18 below shows the trip rate coefficients of the reference routes and the resulting work-related demand approximations for HAUAN-OSL. We used the above-mentioned employment figure and calculated the '2014'-work-related per capita trip rates' based on the segmented traffic volumes, as presented in the earlier sections of this report.

Table 18: Trip Rate Coefficients and Resulting Demand Approximations HAUAN – Work-related Segment

Reference route	CA_{xadj}	Demand Work/Business Segment QB_{HAUAN}	$QB_{HAUAN-SSJ}$
$PaxB_{MOL-OSL}$	4,87	137 665	122 948
$PaxB_{MOL-South}$	5,90	166 781	148 951
$PaxB_{KSU-OSL}$	6,08	171 869	153 496
$PaxB_{KSU-South}$	4,14	117 030	104 518
$PaxB_{EVE-OSL}$	5,52	156 039	139 358
$PaxB_{EVE-South}$	***5,52***	***156 039***	***139 358***
$PaxB_{MOLKSU-OSL}$	5,33	150 668	134 561
$PaxB_{MOLKSU-South}$	5,21	147 276	131 531

Source: Own calculations

Column One refers to the underlying demand scenario (reference routes). Column Two gives the resulting per capita trip rates for the adjusted catchment areas. Columns Three and Four offer the resulting work-related demands (in pax) for the two different HAUAN CA designs.

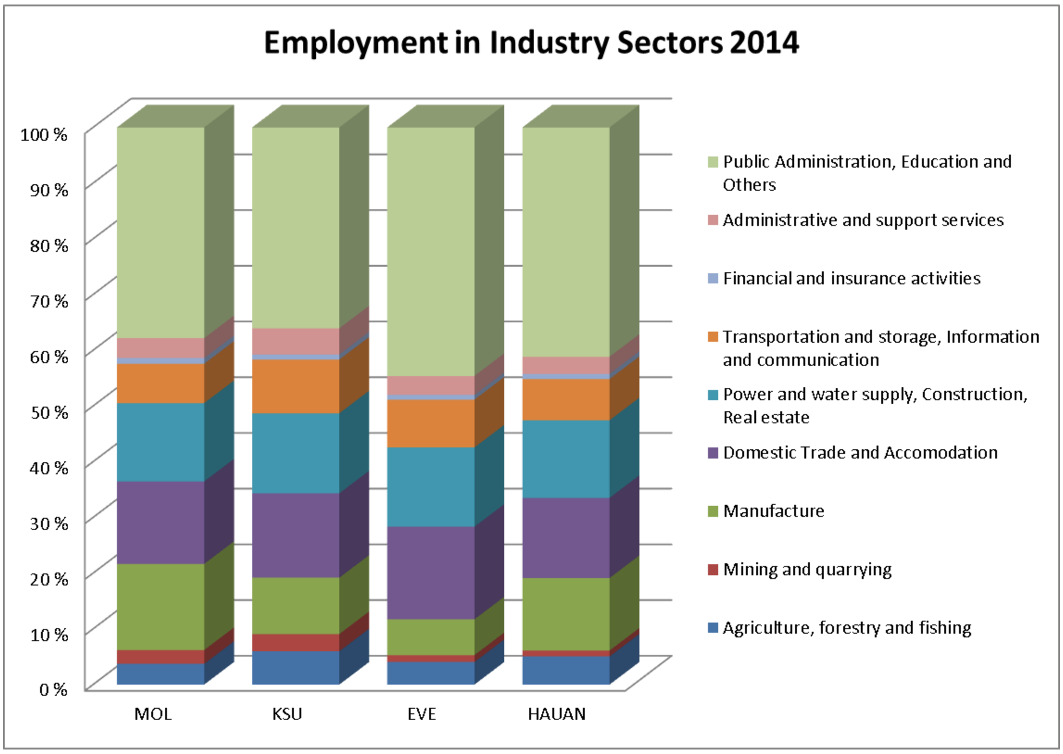
A closer look at Column Two reveals that the trip rate coefficients for the '*south*'-specifications of MOL and KSU differ from those of the respective 'OSL' specifications. For MOL the coefficient increases, which is related to the implementation of the BGO route. For KSU the coefficient decreases, which is the direct result of the 'oil-correction procedure'. In order to reduce the uncertainty related to the leakage between MOL and KSU, we again introduce an aggregated 'MOLKSU'-CA. The resulting coefficients are only slightly off the values for EVE. Owing to the chance of some induced uncertainty with regard to the correction for 'oil' and 'additional southbound routes', we prefer continuing our calculations with the EVE-based coefficient of '5.52'. The resulting work-related demand approximations for OSL-HAUAN are 156 039 pax and 139 358 pax, respectively.

4.2.2 TRIP RATE CORRECTION – DEMAND DRIVER INDUSTRY STRUCTURE

The above-derived trip rate coefficients can only be used without further adjustment if the overall industry structure in the CAs is comparable. The reason is simple: we have so far argued that the demand for business air travel is directly related to the number of employees in a CA. One could also argue that business trip rates vary with respect to the underlying industry structure. This is to say that some industries require more communication with their business partners (here in the form of air travel) than others. The resultant travel effects, however, cannot be caught up by a simple employment based per capita trip rate. It is therefore to check for differences in industry structures among the CAs, next.

Figure 11 depicts the industry structure (in employment) in the CAs. One can see that public services are very important for all CAs. The most significant deviation among the CAs is the below-average 'manufacturing sector' in EVE, and slightly above-average size of 'mining and quarrying' in MOL and KSU. Besides that, the industry structures of the four CAs look rather homogeneous.

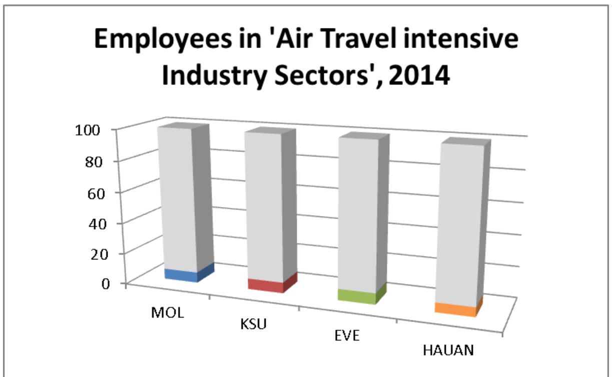
Figure 11: Employment in Industry Sectors



Source: SSB (2015c)

If one wants to focus on the industry sectors, which are said to have come along with high travel demands, one can have a closer look at Figure 12. Here we set the amount of employment in specific 'air travel intensive industry sectors' in relation to the total employment of each CA. Our classification of an industry sector as 'air travel intensive' is loosely based on Bråthen et al. (2005). One can see that the share of air travel intensive employment in the CAs is relatively low. What is, however, more important in the context of this analysis is that the individual shares are almost equal ranging from 6,1% (HAUAN) to 7,2% (EVE).

Figure 12: Employment in Air Travel intensive Industry Sectors



Source: Own calculations based on SSB (2015c)

Based on these findings, we do not think that differences in industry structures among the CAs significantly impact the business-related air travel demand in the four CAs. We consequently assume that the earlier derived trip rates should provide good approximations for the work-related air travel demand for HAUAN-OSL.

4.3 COMBINED DEMAND

Table 19 integrates the travel segment results and sums them up to total demand numbers. Column Four shows the resulting total HAUAN-OSL demand approximations under the $CA_{HAUANadj}$ assumption and column Seven gives the results for the $CA_{HAUAN-SSJ}$ scenario.

Table 19: Demand Approximations CA HAUAN

	$CA_{HAUANadj}$			$CA_{HAUAN-SSJ}$		
Reference route	QL_{HAUAN}	QB_{HAUAN}	Q_{HAUAN}	$QL_{HAUAN-SSJ}$	$QB_{HAUAN-SSJ}$	$Q_{HAUAN-SSJ}$
$MOL-South$	206 300	166 781	373 081	165 930	148 951	314 881
$KSU-South$	121 046	117 030	238 076	97 359	104 518	201 877
$EVE-South$	249 903	***156 039***	405 942	201 000	***139 358***	340 358
$MOLKSU-South$	***172 459***	147 276	319 735	***138 711***	131 531	270 242

Source: Own calculations

One can see that the approximated total demand for HAUAN-OSL varies with respect to the underlying reference routes. Not surprisingly, the lowest estimates with 238 000/202 000 pax yield from the KSU-route, which is likely to suffer from leakage. The highest estimates (406 000/340 000 pax) result from the EVE-case. Especially the leisure component, fostered by inbound tourism, seems to contribute to this. The numbers for MOL might slightly be inflated by demand generated inside of CA KSU. The approximated demand for $Q_{HAUAN-SSJ}$ is roughly speaking 25% below the estimated demand for Q_{HAUAN} what reflects the reduction in catchment area size.

In line with the earlier defined 'preferred trip rate coefficients', we assume that the combination of '*MOLKSU*'-based leisure demand and '*EVE*'-based business demand approximations are the most reasonable ones (table 19 in bold). The resulting 'preferred' total demands are than 328 498 pax for Q_{HAUAN} and 278 069 pax for $Q_{HAUAN-SSJ}$.

5 DISCUSSION

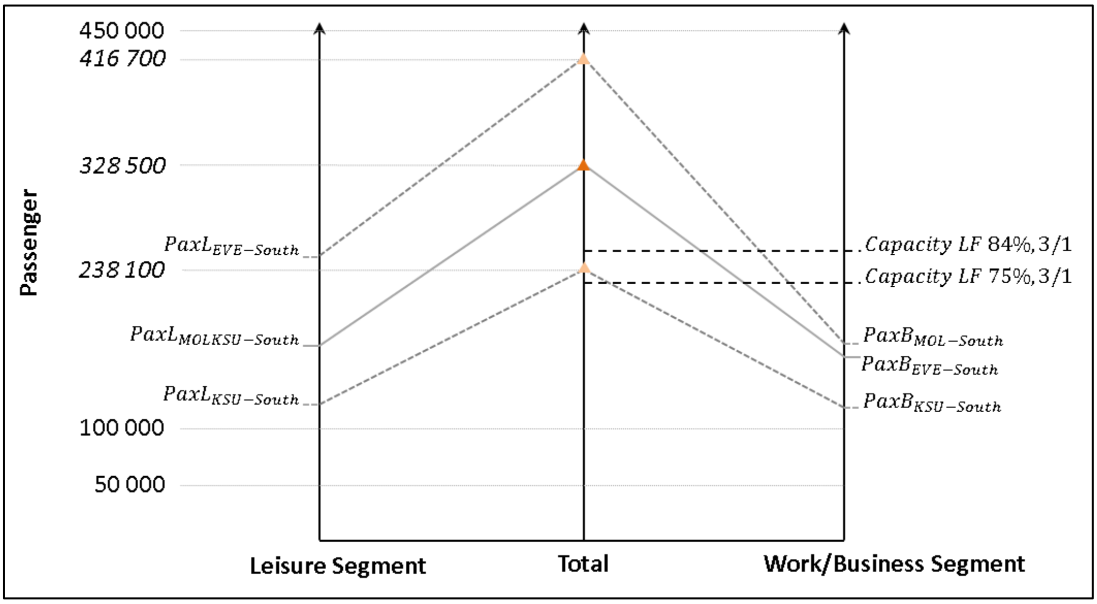
5.1 PRESENTATION OF RESULTS

The approximated demand figures for HAUAN-OSL are shown in Figure 13 once again. Here, we graphically illustrate the spread of estimates in the form of a corridor. The outer vertical axes show the segmented demands and the inner axis gives the total demand for $CA_{HAUANadj}$. In terms of a minimum and maximum bound, we depict those particular segmented demand combinations that result in the absolutely lowest and highest total demand estimates. The lower bound is constituted by estimates gained from the 'KSU-reference' and the upper bound results from combing the 'EVE-leisure estimates' with the 'MOL-business estimates'. Accordingly, the resulting total demand corridor ranges from 238 100 pax to 416 700 pax. All other possible combinations of leisure- or work-related estimates add up to a total demand that lies within the bounds of the corridor.

This corridor can be interpreted as a range of all possible demand approximations for HAUAN-OSL derived from our analysis. In other words, our analysis (under the current set of assumptions) gives no reasons to believe that a non-stop service of HAUAN-OSL would have a total demand of less than 238 100 or more than 416 700 pax per year[7]. Within this rather wide range of estimates, our 'preferred' total demand estimate of 328 500 pax is, roughly speaking, in the center of the corridor.

In order to compare the estimates with the minimum required level of demand (see Section 3.6), Figure 13 entails the LF-limits of 84% and 75% for the 'desired' service scenario (186 seats airplane with 3/1 schedule). One can see that the 75% LF-limit lies outside the demand corridor and that the 84% LF-limit is marginally above the lower bound of the corridor. It, however, remains approximately 70 700 pax below our 'preferred' demand estimate.

Figure 13: Demand Approximation Q_{HAUAN} 2014 – graphical illustration



Source: Own work

[7] For further interpretation of these numbers, the reader is referred to the next section.

Table 20 compares the 'preferred' estimate of 328 500 pax/year with the required demands for different service scenarios (sourced from Table 13). The comparison indicates that the 'preferred estimate' meets the required demand levels up to the scenario of a 186-seat airplane with a service schedule of 4/1 and an LF of 75%. In fact, the estimate corresponds with an 83,7% LF, which means that the higher 4/1 LF scenario of 84% is also reached virtually.

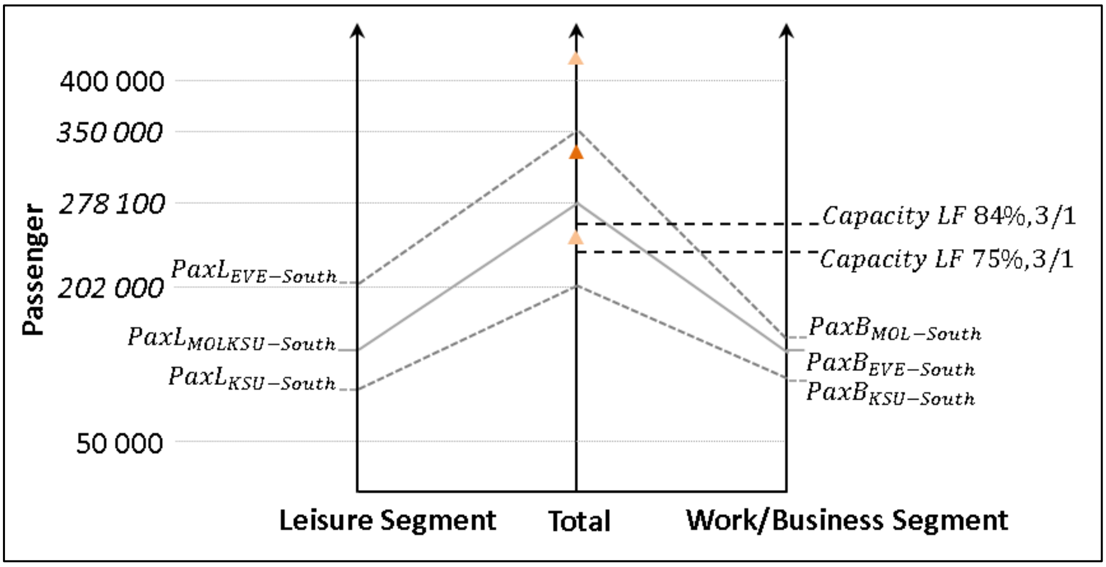
Table 20: 'Preferred' Estimate Q_{HAUAN} and Required Demand - Contrast

Schedule	AC-type / LF	B737/800 (186)	A320 (168)	B737/700 (141)
1/1	61%	82 826	74 810	62 787
	75%	101 835	91 980	77 198
	84%	114 055	103 018	86 461
2/1	61%	135 017	121 951	102 352
	75%	166 005	149 940	125 843
	84%	185 926	167 933	140 944
3/1	61%	187 209	169 092	141 917
	75%	230 175	207 900	174 488
	84%	257 796	232 848	195 426
4/1	61%	239 401	216 233	181 481
	75%	294 345	265 860	223 133
	84%	329 666	297 763	249 908
5/1	61%	291 592	257 274	221 046
	75%	358 515	316 320	271 778
	84%	401 537	354 278	304 391

Source: Own calculations

For the more restrictive catchment area definition of $CA_{HAUAN-SSJ}$ the approximated demand figures for HAUAN-OSL are illustrated in Figure 14. The illustration follows the same logic as Figure 13. The lower and the upper bounds, as well as the 'preferred' estimate are constituted by the same reference routes as the ones earlier used. Accordingly, the resulting total demand corridor ranges from 202 000 pax to 350 000 pax and the 'preferred' estimate gives 278 100 pax. In order to compare the results of this restrictive CA-design ($CA_{HAUAN-SSJ}$) with the setting including 'CA SSJ', Figure 14 entails three triangles on the middle vertical axis. Those triangles denote the respective total demand corridor for the $CA_{HAUANadj}$ – case. Two things are eye catching. First, the upper bound of $CA_{HAUAN-SSJ}$ is significantly reduced and comes close to the 'preferred' estimates of $CA_{HAUANadj}$. Second, the lower bound is now clearly below the demand level that is needed to ensure an LF of 84% with a 3/1 schedule. This shows how sensitive the demand approximations are with respect to the design of HAUAN's catchment area and to additional non-stop links connecting the Helgeland-region with OSL.

Figure 14: Demand Approximation $Q_{HAUAN-SSJ}$ 2014 – graphical illustration



Source: Own work

Table 21 compares the 'preferred' estimate of 278 000 pax/year with the required demands for different service scenarios (sourced from Table 13). The reduced population and employment size of this CA-design naturally downsizes the capacity that can be filled. One can, however, see that all the LF-scenarios for a 186-seater with a 3/1 schedule are within range. Hence, even within this rather restrictive framework, the 'preferred' estimates correspond with the required demand for the 'desired service scenario'. The lowest $CA_{HAUAN-SSJ}$ 'estimate' of 202 000 pax/year, however, is only sufficient to justify an 'unhandy' 2/1 schedule for a 186-seater or alternatively, the deployment of smaller jet-planes in a 3/1 scenario.

Table 21: 'Preferred' Estimate $Q_{HAUAN-SSJ}$ and Required Demand - Contrast

	AC-type	B737/800 (186)	A320 (168)	B737/700 (141)
Schedule	LF			
1/1	61%	82 826	74 810	62 787
	75%	101 835	91 980	77 198
	84%	114 055	103 018	86 461
2/1	61%	135 017	121 951	102 352
	75%	166 005	149 940	125 843
	84%	185 926	167 933	140 944
3/1	61%	187 209	169 092	141 917
	75%	230 175	207 900	174 488
	84%	257 796	232 848	195 426
4/1	61%	239 401	216 233	181 481
	75%	294 345	265 860	223 133
	84%	329 666	297 763	249 908
5/1	61%	291 592	257 274	221 046
	75%	358 515	316 320	271 778
	84%	401 537	354 278	304 391

Source: Own Calculations

5.2 INTERPRETATION AND LIMITATIONS

The results presented above have to be interpreted in the light of the limitations of the methodology of a comparative analysis (see Section 2.1). This concerns, for example, the study design's inability to quantitatively account for the differences in service-related demand drivers.

Thus in terms of airfares, we showed that KSU-MOL is operated by only one airline. Under an airline competition perspective, this should come along with relatively higher airfares as compared to the two routes with competition[8]. If HAUAN-OSL is to be operated by only one airline (which seems likely according to the approximated demand figures) one would expect to see an airfare premium as well. This then should have a dampening effect on demand, as compared to the approximations based on the two other OSL-routes. Anyway, since the KSU-based estimates constitute the lower bound of the calculated 'demand corridor', such a 'negative' airfare-effect is already included in the demand corridor. The same argumentation holds true for the demand-generating effects of the demand driver departure frequency.

A far more essential limitation to the findings of our comparative methodology is set by the induced ‘common time dimension’ of the estimation- and application context. For the major part, the calculations in this report utilize year-2014 data. Strictly speaking, the resulting demand scenarios, be it Q_{HAUAN} or $Q_{HAUAN-SSJ}$, have to be interpreted as demand approximations for an already *existing* HAUAN-airport - with a 'history' comparable to those of the three reference airports. In other words, it is unrealistic to presume that once the HAUAN airport is built and the Oslo-link is established, HAUAN-OSL will indeed attract 328 500 passengers per year. Such an understanding suppresses the fact that the underlying reference demands (MOL-OSL, etc.) are the results of long-term growth phases themselves. It seems rather adequate to understand the calculated OSL-HAUAN-demand figures as long-term prospects, in terms of representing the situation when the market has adjusted to the new airport and its Oslo route.

An airline facing the choice between establishing a direct link to OSL and rejecting such an option can consider long-term volume prospects only to a minor degree. Ideally, the demand should be high enough to ensure an acceptable LF as soon as the route is established. Such a 'by the date' estimate cannot be gained by a comparative analysis.

Nevertheless, we interpret the results of our analysis in such a way that for a fictitious opening day of HAUAN in the year 2025, the demand would indeed be high enough to attract an airline to serve a direct link to OSL.

5.3 ROBUSTNESS OF DEMAND ESTIMATES

The conclusion above is based on the finding that our 'preferred' scenario (Q_{HAUAN}) results in 70 700 more annual pax than needed to achieve an 84% LF in a 186-3/1 scenario. This constitutes a sufficient 22% 'buffer' to safeguard against the 'time dimension issue'. The 'buffer', however, reflects the situation according to 2014'-numbers. If one assumes a conservative annual demand growth rate of 0,9%[9] and holds aircraft capacity and required LF constant, the respective pax number increases to 359 300 pax, which implies a safety margin of 28%. Figure 15 illustrates this

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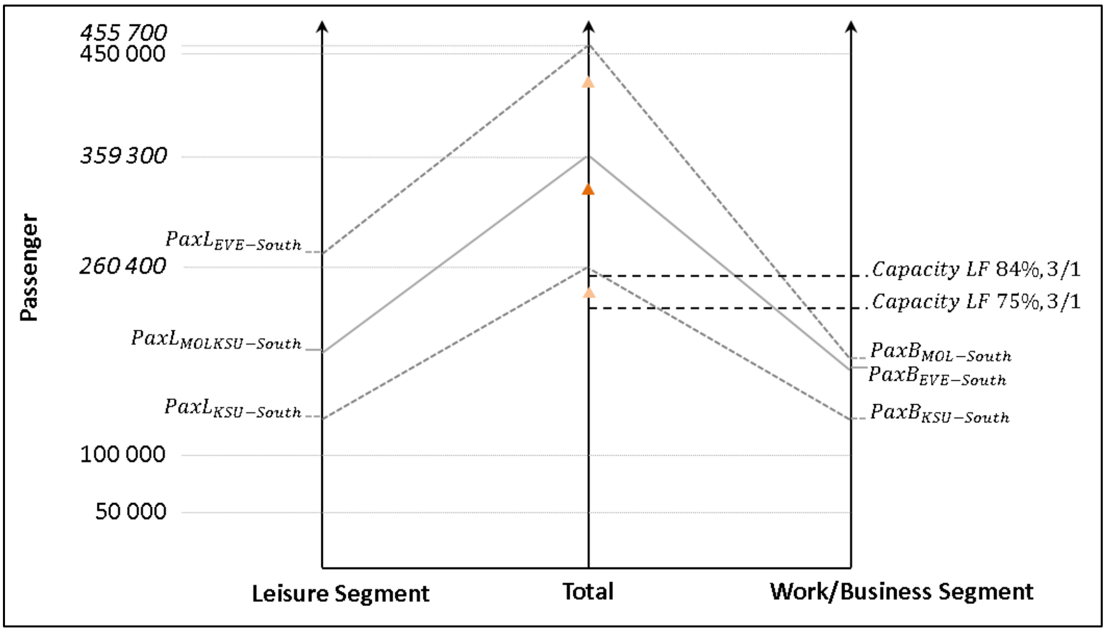
[8] For empirical evidence concerning KSU and MOL, see Denstadli, Thune-Larsen, and Dybedal (2014).

[9] As used by Øvrum and Berg (2015). The reader may notice that the authors forecasted this moderate growth for parts of the Helgeland region and that we apply this rate to the 'calculated' HAUAN estimates. Past or future growth rates of the reference routes are not considered here.

situation for the case of $CA_{HAUANadj}$ (the three triangles give again reference to the 2014'-numbers). One can see that an assumed moderate annual growth rate of 0,9% until 2025 increases the demand approximations significantly. In fact, even the lowest demand estimates are now above the 84% LF-limit (3/1).

Figure 15: Demand Approximation Q_{HAUAN} 2025 (0,9% annual growth rate)– graphical illustration



Source: Own work

Our confidence in the above formulated conclusion is furthermore fostered by several aspects.

First, the calculations for the far more restrictive CA-design $CA_{HAUAN-SSJ}$ result in an approximation of 278 000 annual pax for HAUAN-OSL (according to 2014' numbers). This would still imply a safety margin of 7% in regard to a 186-3/1 scenario with an LF of 84%. By assuming a demand growth rate of 0,9% until 2025, the buffer would increase to 15%.

Second, we re-calculated our 'preferred' scenario ($PaxL_{MOLKSU-South}$; $PaxB_{EVE-South}$) under even more restrictive terms. We increased the underlying population and employment numbers for the reference routes by 10% each (deflated the resulting reference trip rates) and simultaneously decreased the population and employment numbers of CA_{HAUAN} by 10%. The resulting demand estimate is 269 023 pax, which again reduces the safety margins significantly. Thus the estimated demand remains above the values necessary for the 186-3/1 scenario with an LF of 84%.

Finally, we decided to check our 'preferred trip rate coefficients' themselves, in a setting outside the framework of this analysis. We chose to test our coefficients for the route Bardufoss (BDU) -OSL. The respective catchment area was designed in a manner comparable to the reference CAs and can be found in Annex 2. The resulting population size for the year 2014 is 42 328 people and the number of employees is 19 670. Based on these numbers and our 'preferred' coefficients, we approximate a theoretical 2014'-demand of 220 747 pax. SSB (2015b) reports an almost equal amount of 219 613 pax for the route BDU-OSL in their 2014'-statistics. This does not necessarily prove that our coefficients are correct, but increases our confidence in our results.

5.4 COMPARISON WITH EARLIER STUDIES

Several reports have dealt with demand approximations for a HAUAN-OSL link so far (e.g. Hanssen, Mathisen, and Solvoll (2008), Thune-Larsen and Lian (2009), Draagen and Wilsberg (2011), Bråthen et al. (2012), Øvrum and Berg (2015)). The reports' demand forecasts span widely from 100 000 pax (Øvrum and Berg 2015) to 215 000 passengers (Bråthen et al. 2012) and can be explained with the different assumptions made by the individual authors. These assumptions pertain to, for instance, assumed growth rates, price elasticities and opening dates of HAUAN as well as non-uniform definitions of HAUAN CA.

Our 'preferred' estimates are outside this range. This does not necessarily imply that our estimates are 'wrong'. We understand this rather as a logical consequence of the fundamentally different analysis approaches used. None of the earlier reports has extensively implemented and analysed data from 'external scenarios' and has applied those to the HAUAN-case. Only Hanssen, Mathisen, and Solvoll (2008) include a short comparative element in their analysis. Based on 2007-data, the authors compared population-centric trip-rates of eight medium-sized-airports. With a CA-design quite similar to our CA_{HAUAN}-definition, the authors suggested that HAUAN could have approximately 400 000 terminal passengers in total. This seems in line with our findings.

Apart from this singularity, the earlier reports generated their findings with a 'within scenario approach'. This means that the actual demand figures of the existing Helgeland airports supplemented by leakage demand estimates[10] form the basis of the calculations. Those demand numbers are carried on into the future. Based on the changes in generalized costs, it is determined how much additional traffic volumes have to be expected as the direct consequence of the change in setting. This proceeding presumes that the existing 'Oslo-travel-market' is in fact 'equal enough' to the future 'non-stop OSL-HAUAN market' to justify such a forward projection. Another challenge of such an approach is to determine the correct 'basement demand'. On the other hand, the potential shortcomings of our analysis approach related to the transferability between different cases or the 'common time dimension issue' can be circumvented by the reports.

Our analytical approach is by contrast based on the observation of human behavior in other, 'external' scenarios and assumes the transferability of metrics between the scenarios. Why this yields significantly higher demand estimates cannot be finally answered here and remains as a subject for further research.

[10] Here we refer to leakage numbers, e.g. pax that start their air travel in TRD but reach TRD by car, sourced from travel surveys.

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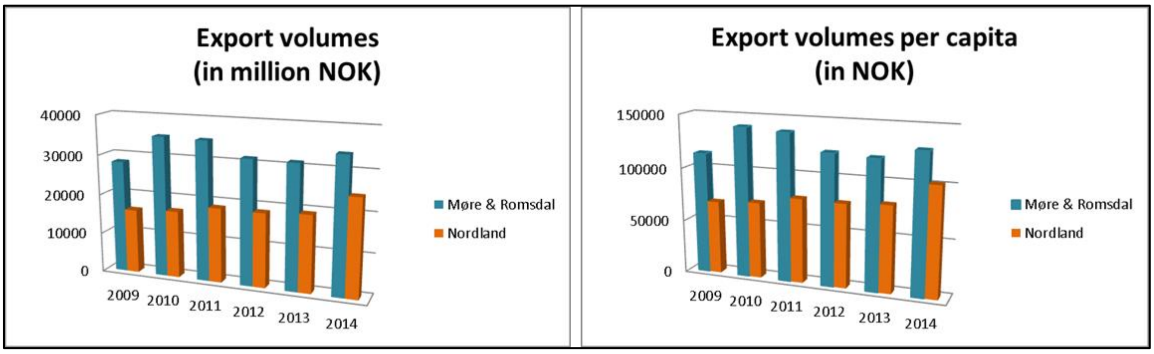
APPENDIX

Annex 1

Figure A1 compares the export volumes of the counties in total and in per capita terms. One can see that at the county level Møre & Romsdal has had higher export volumes than Nordland county. This holds true in terms of total volumes and in terms of per capita volumes. However, the split between the two counties seem to have decreased in recent past. In 2014, Nordland reaches 72% of M&R export volumes, as compared with 57% in 2009. Even thus only very roughly, this finding could give a first indication that the overall work-related air travel demand originating from Nordland is lower than the one originating from M&R.

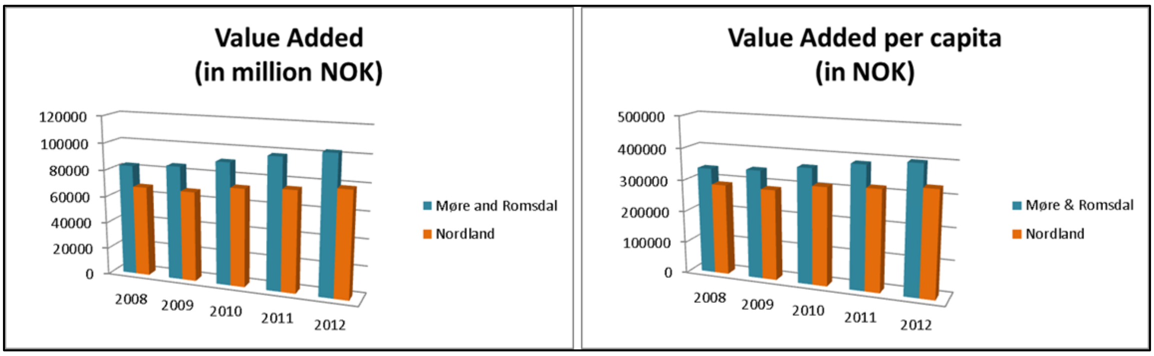
Figure A1: Exports volumes – county level



Source: SSB (2015d), note: mainland exports only, in current prices

This reasoning is confirmed if one compares the overall output levels of the counties, as shown in Figure A2. Here we show the values added in the two counties, both in total and in per capita terms. Again, M&R has higher values (Nordland reaches in 2012 78% of M&R's outputs), which could be an indicator of more work-related air travel demand.

Figure A2: Values Added - county level



Source: SSB (2015h); note: mainland only, in current prices

Anyway, the 'export volumes' and 'value added' of both metrics can only provide a first rough indication of the total level of work-related travel demand. A reasonable approximation of HAUAN-OSL demand numbers is not possible. This is because the numbers reflect the situation at a higher aggregation level and cannot be assumed to reflect the situation in the specific CAs of interest.

Annex 2

Table A1: CA BDU

CA_{BDUadj}
Ibestad
Bardu
Salangen
Målselv
Sørreisa
Dyrøy
Tranøy
Torsken
Berg
Lenvik
Balsfjord
Lavanger (50% rest EVE)
Lyngen (50% rest TOS)
Storfjord (50% rest TOS)

Source: Own work

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