INTRAPLAN
Consult GmbH

Air Traffic Forecast
Aéroport International de Genève

Final Report
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0. MANAGEMENT SUMMARY

In the context of the Aviation-Infrastructure-Planning-Process (**PSIA-Plan sectoriel de l'infrastructure aéronautique**) an **air traffic forecast** (passengers, cargo, aircraft movements/ATMs) **for Geneva Airport (GVA)** comparable with that for the other Swiss airports had to be prepared. The air traffic forecast for GVA is based on a wide and detailed set of empirical **data**, among others:

- statistics of air traffic of the Office Federal de la Statistiques OFS (time series)
- passenger surveys GVA 2013
- origin-destination matrices of the Swiss and other relevant air traffic 2012/2013
- flight record data of GVA (complete for 2012/2013), with arrival/departure times, aircraft type, number of passengers per flight, etc.
- OAG 2013 world timetables, converted into a network model including the land-base access to and egress from the airports and competition air - rail
- socio-economic data
- data on airline economics

The **forecast** model applied in the study is considering **exogenous factors** such as the socio-economic development as well as **endogenous factors** related to the air transport system.

There are mainly **two forecast steps**:

Step I: the forecast of the regional air traffic potentials (demand model)

Step II: the assignment of the potentials to airports, airlines and single routes and destinations (airport/route choice model).

Main variables for the **forecast step I** are

- the regional GDP/per capita income
- the population and age structure per region
- the employment and employment structure
- air fares/user costs
- supply with air traffic and with other modes to calculate modal-split and access/egress

Detailed statistical analyses show that the **by far most important driver** for the market development also for GVA is the **GDP development** and in rank two it is the **development of air-fares**, stimulating demand as can be seen in GVA due to the expansion of Low-Cost-airlines.

Main variables for the **forecast step II** are

- the travel time, thereof access and egress
- travel costs (airline/alliance related, lower for Low-Cost-airlines)
- transfers (transfers between competing alliances and airlines are 'punished' in the model by high penalties)
- the service frequency (‘availability’)
- service levels per airline

The most important criteria for the airport/airline choice are the overall **travel time** incl. access/egress (most important for business travellers) and the **airfares** (most important for private passengers).

In the network model **all relevant airports** including all Swiss and relevant foreign airports are considered as well as **the competition between air traffic and High Speed Rail** (HSR) on short haul point to point traffic.

For the main forecast drivers the following **assumptions** have been made:

- a **population growth** of 9,4 % in Switzerland until 2030, among others in the canton Genève (+ 12,6 %), the canton Vaud (+ 17,1 %), and in the department Haute Savoie of 17,4 %.
- **economic growth** assumed to be 2,2 % per year in the average in Switzerland and 1,9 % in France with a slightly over average growth in the region close to GVA
- considering the need of consolidation resp. profitability of the airline industry and increasing fuel prices, but progress in fuel efficiency, a **constant airfare** level on to 2030 **for the conventional airlines** and an **increase for low-cost-airline**s of 0,5 % p.a. have been assumed
- concerning the **policy framework**, no major changes have been assumed until 2030
- all relevant **rail infrastructure** projects under construction or with fixed planning dates have been taken into consideration .
- for the airport of **Geneva** the tendencies with regard to traffic supply (Low-Cost-hub, winter tourist traffic, intercontinental services among others by Middle East Carriers) have been analysed and extrapolated. As a working hypothesis **no capacity restraints** are considered in GVA.

The **results of the forecast** are summarized in Table 0-1.

Passenger numbers in Geneva would grow from 14,45 million in 2013 to 18,3 million in 2020 and reaching 25 million in 2030. Average yearly growth would be at 3,3 % per year which is less than the demand growth in the past (4,6 % p.a. between 1995 and 2013, 5,9 % p.a. between 2002 and 2013).

Segment	2013	2020	2030	2030 : 2013 in % p.a.
Passengers[1)] (mill.)	14,45	18,26	24,98	3,3
transfer share	4,5 %	5,1 %	6,5 %	2,2
Cargo (1000 t)	52	76	96	3,7
ATM (1000)	189	212	248	1,6
thereof pass-ATM	137	158	192	2,0
other ATM	52	54	57	0,5

1) totals, including scheduled and charter traffic, General Aviation, transit twice counted

Tab. 0-1: Overview of the forecast results for GVA (unrestricted demand)

Main drivers for the growth of passenger numbers is the stable and over average economic growth in the core catchment area of GVA, which will strengthen its role as one of the wealthiest regions in Europe and in the world. This demand growth is supported by an expansion of traffic supply in the low-cost segment and in intercontinental traffic. Growth in intercontinental traffic will also lead to a rise of the transfer share from 4,5 % to 6,5 % in GVA. Both segments, LCC and intercontinental traffic, profit also from rising capacity restraints in Zurich, whereas the French regional airports like Chambery, Grenoble pull minor traffic numbers away from GVA.

In consequence of the expansion of intercontinental passenger traffic, which lead also to increasing belly freight capacities, loading and unloading of **cargo** will rise from 52 thousand in 2013 to 96 thousand in 2030. This high growth (+ 3,7 % p.a. from 2013 to 2030), however, should even be seen in the context of the past, when GVA already handled cargo volumes of nearly 80 thousand tons in the nineties due to the than stronger intercontinental traffic in GVA operated by Swissair.

Total **ATMs** in GVA will grow from 189 thousand movements in this unrestricted forecast to 212 thousand in 2020 and 248 thousand in 2030 with a growth rate of 1,6 % p.a. in the average. ATM growth can nearly completely be assigned to passenger traffic, which will grow from 137 thousand movements in 2013 to 192 thousand ATMs in 2030. The average number of passengers per passenger flight would grow strongly from 106 to 130 passengers between 2013 and 2030. Growth rates concerning passengers/flight are at considerable 1,2 % p.a. in the average, however lower than in the past. This has to do with the fact, that structural changes, especially the rise of LCC, implementation of intercontinental flights and the fleeting out of smaller regional aircraft (50 - 70 seaters) at the network carriers, like SWISS, Air France and Lufthansa, are widely completed or at least rather advanced in GVA.

1. INTRODUCTION

In the context of the Aviation-Infrastructure-Planning-Process (PSIA-Plan sectoriel de l'infrastructure aéronautique resp. SIL-Sachplan Infrastruktur der Luftfahrt) basic forecasts of air traffic development for 2020/2030 in Switzerland have been prepared in 2005[1] including projections for the passenger-, cargo- and ATM development at Geneva airport.

Because the PSIA/SIL process so far focused on Zurich airport, the forecasts of 2005 have been updated and specified several times for this airport, but also with a general view on the air traffic development of Switzerland as a whole but without specific results for the other airports including Geneva.

With the study on hand a forecast for Geneva comparable with that for Zurich (early 2014) had to be prepared, using basically the scope of work as was used for Zurich resp. the whole PSIA/SIL-process.

The forecast for Geneva airport has been set up **without** taking infrastructure **capacity restraints** into consideration. This is comparable to the approach used for Zurich in the first step. Due to the specific questions in Zurich, where different operational variants had to be appraised, in a second forecast step specific slot limitations had to be taken into account. As in Geneva no similar planning process as for Zurich does exist, the second step wasn't here necessary.

1 Intraplan Consult GmbH: Entwicklung des Luftverkehrs in der Schweiz bis 2030, August 2005

2. FORECAST APPROACH AND METHODOLOGY

2.1 Overview

ITP forecasted the traffic numbers of Geneva (GVA) with a three-level top-down investigation procedure. This methodology is based on the precise knowledge of market development, the competition of airports for the share of the market and strategies of airlines at the various airports.

The **first level** of the forecasting methodology relies on the correlation between independent variables and the growth of the traffic market. These analyses are made for the whole study area (Switzerland plus neighbouring French regions) in line of those, undertaken for the Zurich airport forecast[2] and therefore appropriate for the general Switzerland-wide approach in the SIL/PSIA process. The historical development of the airports was analysed together with the development of local and national productivity indicators as well as the development of the supply side (e.g. the change of airfares in Europe). The robust relationship between passenger numbers and GDP can be examined at all of the investigated airports. Considering airfare development in the forecasts proved to refine the fit of the correlation at the airports, however with a considerably lesser influence that the macro environment. This strong correlation between the two independent variables and the dependent variable can be used to forecasts passenger numbers at air passenger markets.

On a **second level**, the methodology of ITP analyses competition between airports. This competition and future airport strategy defines the share an airport can have from the passenger demand in its market forecasted on the first level. Competitors of an airport are differentiated upon geographical and functional competition. The analysis of geographical competitors is crucial in understanding the demand of average origin-destination (O/D) flights at airports, whereas functional competition is decisive in future hub strategies as well as the airport decision of long-haul trip makers. The competing airports appear in ITP's model with their pull and push effects, strengthening or weakening the competitor or the investigated airport.

The **third level** of the prognosis encompasses the strategies airlines pursue at an airport and its competitors. These strategies appear similarly to the effects of airport competition in the model, generating pull and push effects on the transport demand of the original airport.

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2 Intraplan Consult GmbH: Aktualisierung der Prognosen für verschiedene Flugbetriebsvarianten mit unterschiedlichen Kapazitäten für den Flughafen Zürich - Ergänzung der Studien von 2005 und 2009 einschliesslich Aktualisierung der Basisprognose, im Auftrag des BAZL, Kanton Zürich and Flughafen Zurich AG, February 2014

This three-level approach creates an unconstrained forecast for the examined airport. However if constraints exists (e.g. terminal capacity) in a **fourth step**, not applied here, the model could be used adjusting demand by understanding the different possibilities of how the supply reacts to the restrictions in movements, number of passengers etc.

Other indicators of air-traffic (ATM, aircraft mix etc.) can be estimated by using historical sensitivities and interdependence between those and passenger growth. Similar to the passenger numbers, other indicators also adapt to constraints (e.g. runway capacity) by adjusting airline strategies (e.g. up-gauging) or limit growth (with a feedback on passenger development).

Consequentially, the methodology of ITP used in the prognosis of the named airports is estimating the future demand by understanding the share the airports can reach of developing markets under developing supply strategies.

2.2 Data sources

The air traffic forecast for GVA is based on a wide and detailed set of data. The data sources can be grouped as follows:

(1) Demand data overall

(1.1) ACI statistics of passenger figures/developments for all relevant airports (time series)

(1.2) Statistics of air traffic of the Office Federal de la Statistiques OFS (time series)

(1.3) Origin-destination matrices of the Swiss and other relevant air traffic 2012/2013 developed among others in the context of overall air traffic studies in Switzerland, Germany and France. Used also for the updated forecasts for Zurich and other Swiss airports.

(2) Supply data overall (base year)

(2.1) OAG 2013 world timetables, converted into a network model

(2.2) Road and rail networks combined with (2.1) to a complete air traffic network model including the land-based access to and egress from the airports and competition air - rail (road)

(3) Socio-economic data/airfares in time series

(3.1) Population per canton (Switzerland) and departments (France)

(3.2) GDP for Switzerland and France, regionally disaggregated

(3.3) Airline yields (AEA, EasyJet annual reports)

(4) Demand and supply data GVA

(4.1) Passenger surveys GVA 2013 (analysis, verification of catchment area)

(4.2) Flight record data 2012/2013, complete with arrival/departure times, aircraft type, number of passengers per flight, etc.

In the forecasting process these data sources have been used for the following subjects: The origin-destination matrices (1.3), originally for 2012, the base year for the Zurich study, have been updated to 2013 with help of (1.1) and (1.2) and verified with regard to the GVA catchment area (see 4.1). Correlation analyses between traffic growth and the relevant forecast drivers (GDP, airline yields as proxy for airfare levels) are based on (1.1) and (3.2/3.3).

The network models (sources 2.1/2.2) are used to calibrate GVA model based results with real statistics. The network models have been updated for the forecast years 2020 and 2030, implementing additional services and changes in the land-based networks (for example High Speed Lines)

2.3 Model

The traffic model used for the study is outlined in Fig. 2-1.

The forecast considers exogenous factors for the traffic demand (green box on the left) such as the socio-economic development as well as endogenous factors related to the air transport system (green box on the right). In the latter the airlines (and airports) dealing with the demand (and also stimulating the demand) with their services and their network and pricing strategies are considered.

There are mainly two forecast steps:

Step I: the forecast of the regional air traffic potentials (yellow box on the left) and

Step II: the assignment of the potentials to airports, airlines and single routes and destinations (yellow box on the right).

Only by the combination of these two steps a reasonable forecast for an airport like GVA can be processed.

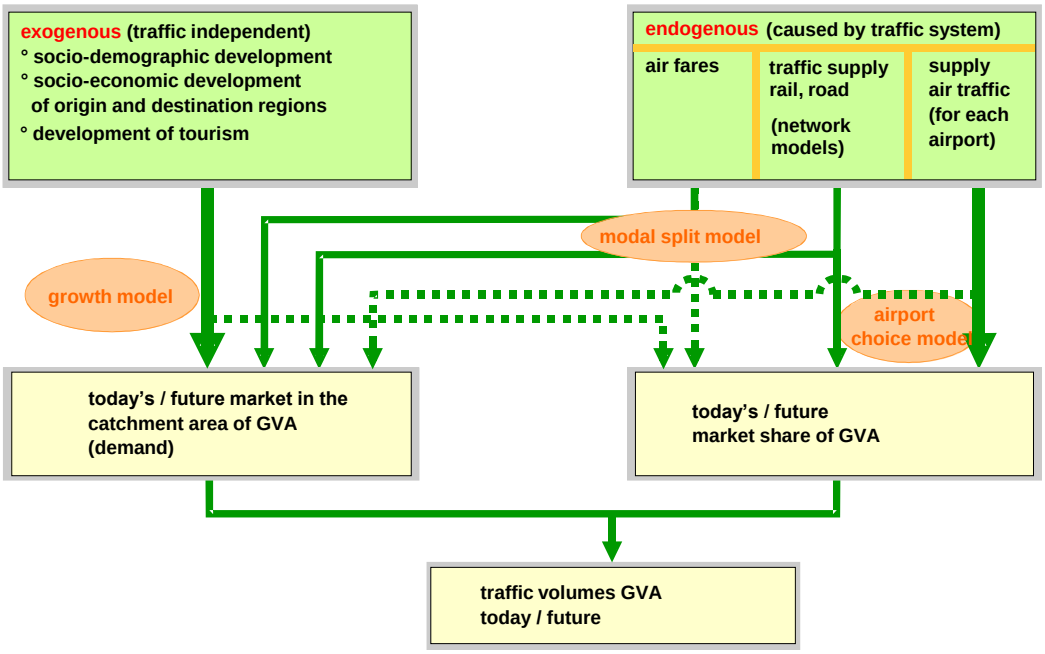


Fig. 2-1: Basic principles of the forecast model - demand model

Main variables for the forecast step I, the forecast of regional traffic potentials, are

- the regional GDP/per capita income
- the population and age structure per region
- the employment and employment structure
- air fares/user costs
- supply with air traffic and with other modes to calculate modal-split and access/egress

Main variables for the forecast step II, the assignment to airports/airlines and destinations, are

- the travel time, thereof time for access to and time for egress from the airports, in-system time components
- travel costs (airline/alliance related, lower for Low-Cost-airlines)
- transfers (penalty, transfers are mainly restricted to transfers within alliances and code-sharing partners, that means transfers between competing alliances and airlines are 'punished' in the model by high penalties)
- the service frequency ('availability') on the single destinations and indirectly for the potential transfer connections

° comfort aspects resp. service levels per airline modelized by factors on travel time

In the network model all relevant airports including all Swiss and relevant foreign airports (neighbouring, destinations, hubs) are explicitly considered. The demand forecasts consider also intermodality. By that the competition between air traffic and High Speed Rail (HSR) on short haul point to point traffic is considered explicitly as well as the competition between air traffic and HSR on short haul feeder traffic to/from hub airports like Paris CDG, Frankfurt Main, and Zurich.

The forecasts are calculated on the basis of the OD-matrices derived from the sources named in chapter 2.2. The single transport flows are expanded due to the development of the influencing variables. The assignment of the single transport flows to the airports resp. airlines, routes and destinations are even carried out on the basis of the OD-traffic flows.

Fig. 2-2 gives an overview about the principle of the **airport choice** and route choice model.

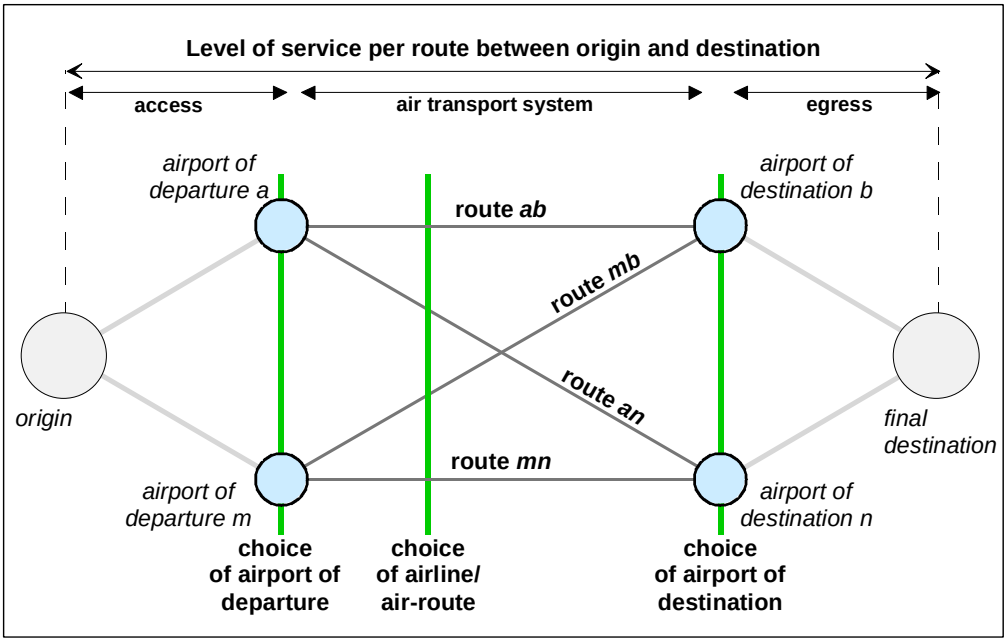


Fig. 2-2: Principle of the airport choice and route choice model

For each OD-flow the relevant routes in the form of transport chains are searched and weighted. The route search is similar to the airline or other booking systems but includes also the access- and egress-situation. The routes consist of the transport chains *origin (house) – connection/ mode to airport – airport of departure – airline/destination – (possible transfer airports/transfer destination) – airport of final destination – connection/mode to final destination (house)*. For each

OD-pair all sensible routes are **searched** and **weighted** due to the specific characteristics of each route (time, costs etc. see above). The networks of the different alliances are kept separately, transfer between alliances is only possible with a penalty (user has to pay anew), whereas within one alliance the charges of the feeder services are low. By this consideration of the airlines/alliances in the network models, a split between the market shares of the airlines can be calculated. Low-Cost-airlines are coded separately with lower fares but also lower service levels and no guided transfer connections are assumed contrary to the network carriers.

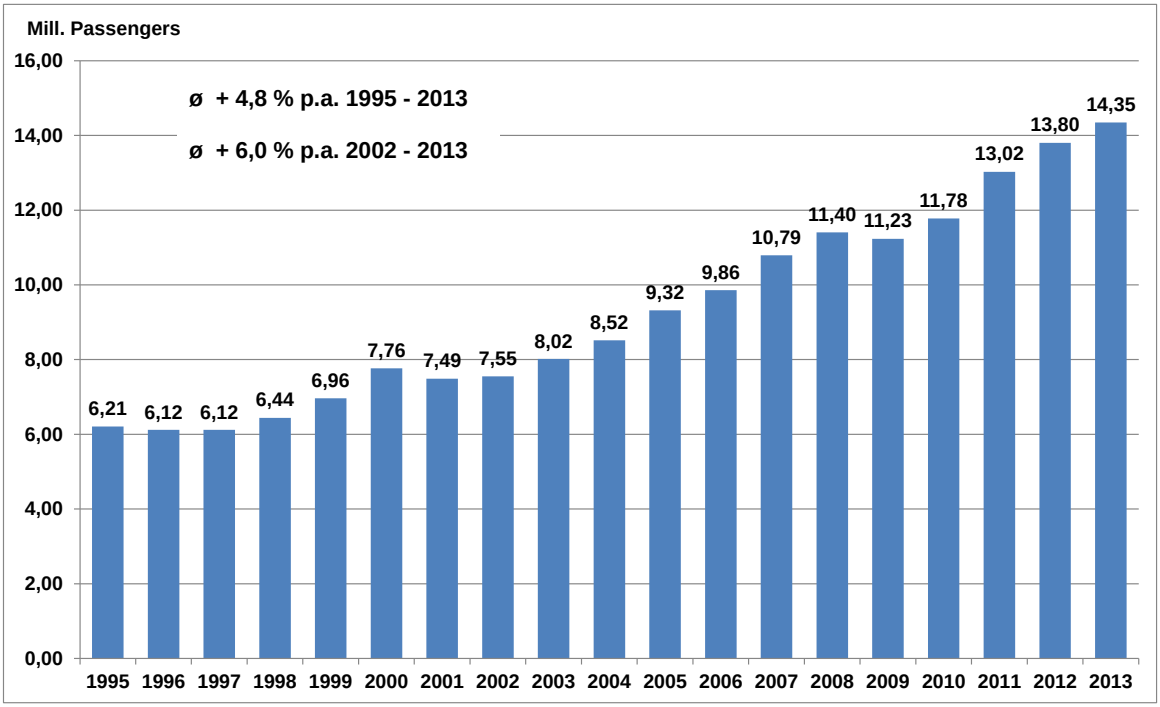
A forecast air network including services per airport, airline and destination is developed from the existing timetables respectively networks, taking capacity of the airport, possible strategies of the airlines and the general growth (from forecast step I, see Fig. 2-1) into consideration. The first assignment of the forecast demand shows loads per destination and flight. The service frequencies and destinations are adjusted to the demand. On this basis a second assignment is carried out. The process stops if a reasonable equilibrium between supply and demand is reached. By this approach already the aircraft mix (aircraft categories by number of available seats) is calculated.

The relevant connections per OD pair are listed with their characteristics, which are travel time (incl. access/egress) and travel costs (price model), transferred into generalized costs by considered Value of Time (VoT), which is of course different for business and leisure. Other variables like service frequency are transferred into time and costs (service level as a comfort factor). By the relationship of generalized costs between the different connections the route split can be calculated using a logit model (type box-cox-logit). As named above this model is calibrated by up-to-date traffic data, comparing for example calculated with real traffic loads for single airport-airport-connection.

3. ANALYSIS OF THE CURRENT AND PAST TRAFFIC DEVELOPMENT IN GVA[3]

3.1 Traffic development since 1995

Passenger traffic in GVA grew from 6,21 million in 1995 to 14,35 million in 2013. This is an average growth rate of 4,8 % per year (see Fig. 3-1).



Source: ACI

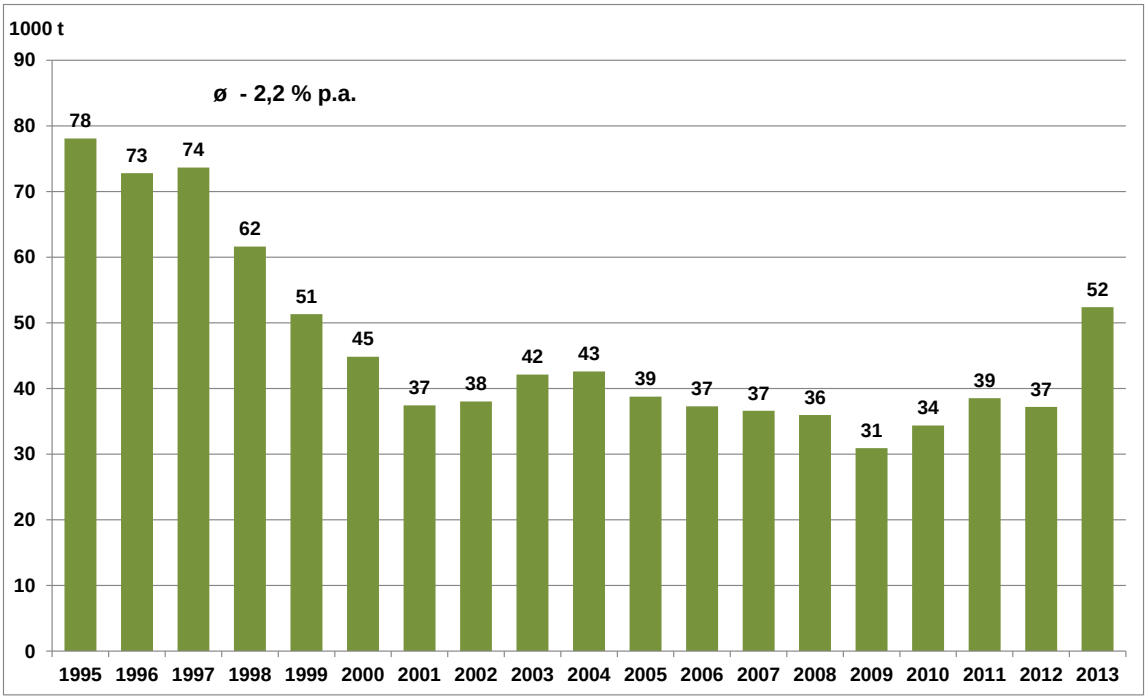
Fig. 3-1: Traffic growth in GVA 1995 to 2013 – Passengers

After a phase of slow growth in the 90s, the reason for that was a concentration of Swissair traffic in Zurich, in 2000 a first peak with nearly 7,8 million passengers was reached. 2001/2002 the economic crisis (dot.com-crisis of 2001/2002), the nine eleven crises and the Swissair grounding of end 2001 led to a slight traffic decrease in GVA. Since then with the introduction of low-cost-traffic in GVA there is a strong traffic growth, in the average 6 % per year to 2013, only slightly interrupted by the world economic crisis of 2009, hitting GVA much less than other airports in Switzerland, in Europe and in other world regions. In recent years growth was also strengthened next to the low-cost traffic by the development/renaissance of intercontinental traffic which due

3 Source: ACI: Worldwide Airport Traffic Reports, yearly

to the runway length of GVA airport and the strong origin/destination market could succeed in an impressive way, in spite of the fact that GVA is not a hub airport.

The renaissance of intercontinental traffic, especially due to the activities of the Middle East (Gulf) carrier (Emirates, Qatar, Etihad), is also resulting in a growth of cargo traffic from 37 thousand (2012) to 52 thousand tons in 2013, after a longer period of stagnation since the shift of the century (see fig. 3-2). Before then cargo handling in GVA declined by half from 78 to 37 thousand tons between 1995 and 2001. As the growth in 2013 the decline between 1995 and 2001 had its reason in the intercontinental passenger traffic, because in wide-body intercontinental flights there is belly capacity for cargo. Before 2001 intercontinental flights in GVA decreased in numbers considerably. In 2013 there was a sharp growth of these flights. Cargo in GVA is mainly loaded to and unloaded from intercontinental passenger flights. Full freighter aircraft services do not play an important role in GVA apart from feeder flights with smaller aircraft to the integrator hubs (UPS, FEDEX, DHL, etc.).

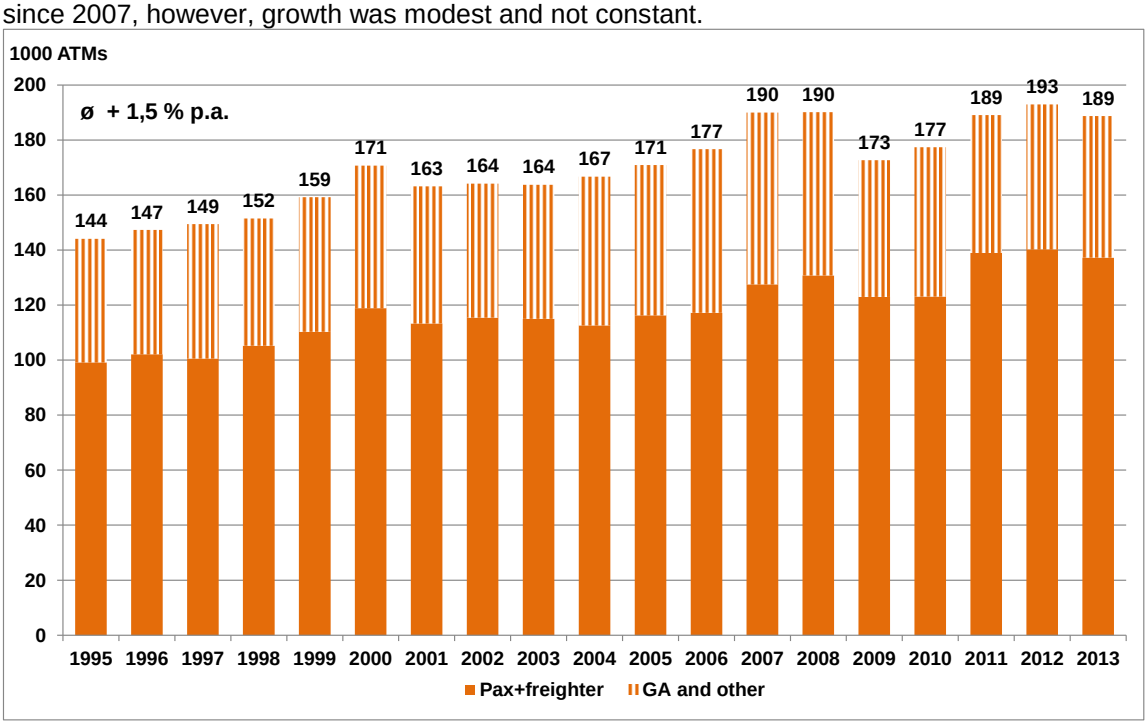


Source: ACI

Fig. 3-2: Traffic growth in GVA 1995 to 2013 - Cargo

Growth of **ATM** (see Fig. 3-3) was much lower than for passenger traffic: in the average: 1,5 % per year compared to the growth of 4,8 % p.a. for the passenger numbers. Since 2007 there was no growth of ATMs at all despite growing passenger numbers (see Fig. 3-1).

This stagnation, however, is mainly related to **General Aviation**. Scheduled traffic grew even since 2007, however, growth was modest and not constant.



Source: ACI

Fig. 3-3: Traffic growth in GVA 1995 to 2013 - ATM

3.2 Comparison of real traffic development from 2004 with the forecast figures of 2005

In the forecast of 2005[4] (base year 2004), we expected in the long term, that means in 2030, 17,3 million passengers for GVA. For 2020 the forecast for GVA was at 14,5 million passengers (see Fig. 3-4).

The latter is nearly the figure, which already has been realised in 2013 (14,3 million passengers). In 2014 probably the forecast figures for 2020, according to the study of 2005, will be surpassed. That means the current development of passenger numbers is **more than six years ahead** of the figures expected in the forecast of 2005.

4 Intraplan Consult GmbH: Entwicklung des Luftverkehrs in der Schweiz bis 2030, August 2005

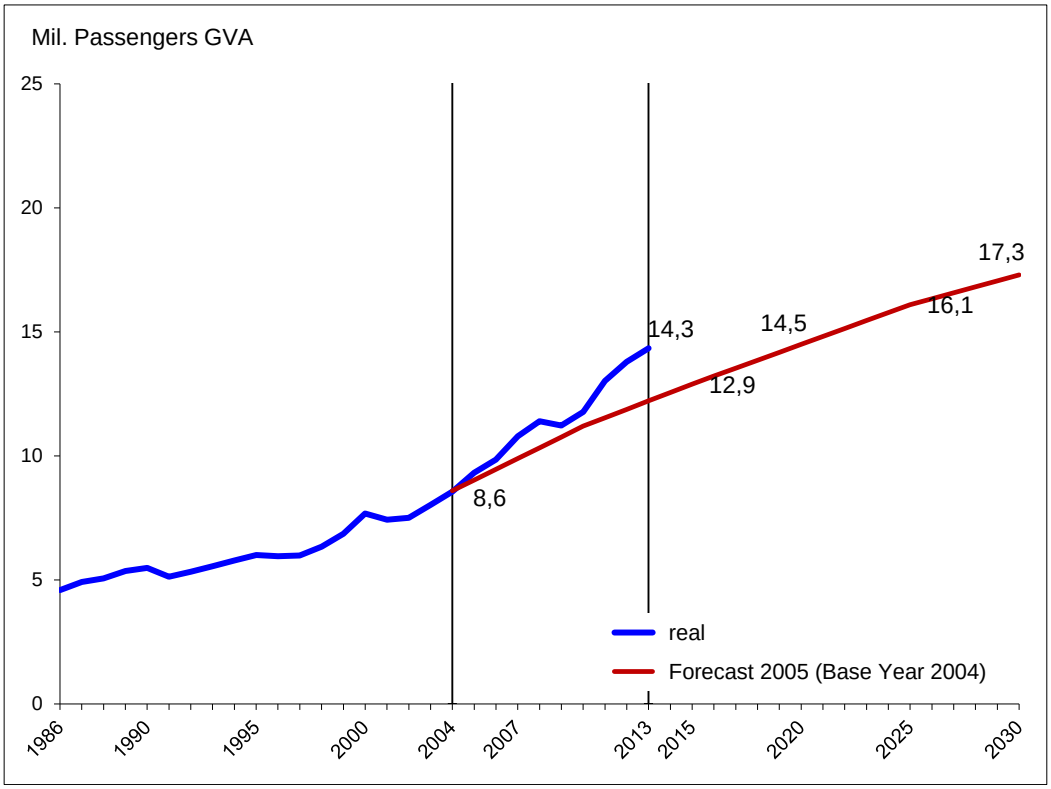


Fig. 3-4: Comparison of real traffic development with the forecast of 2005 - passengers

For the ATMs, however, the actual development is below the forecast path of the 2005 study (see Fig. 3-5), that means, despite higher than expected passenger growth, ATM development (scheduled + charter) is below the forecast trend of 2005.

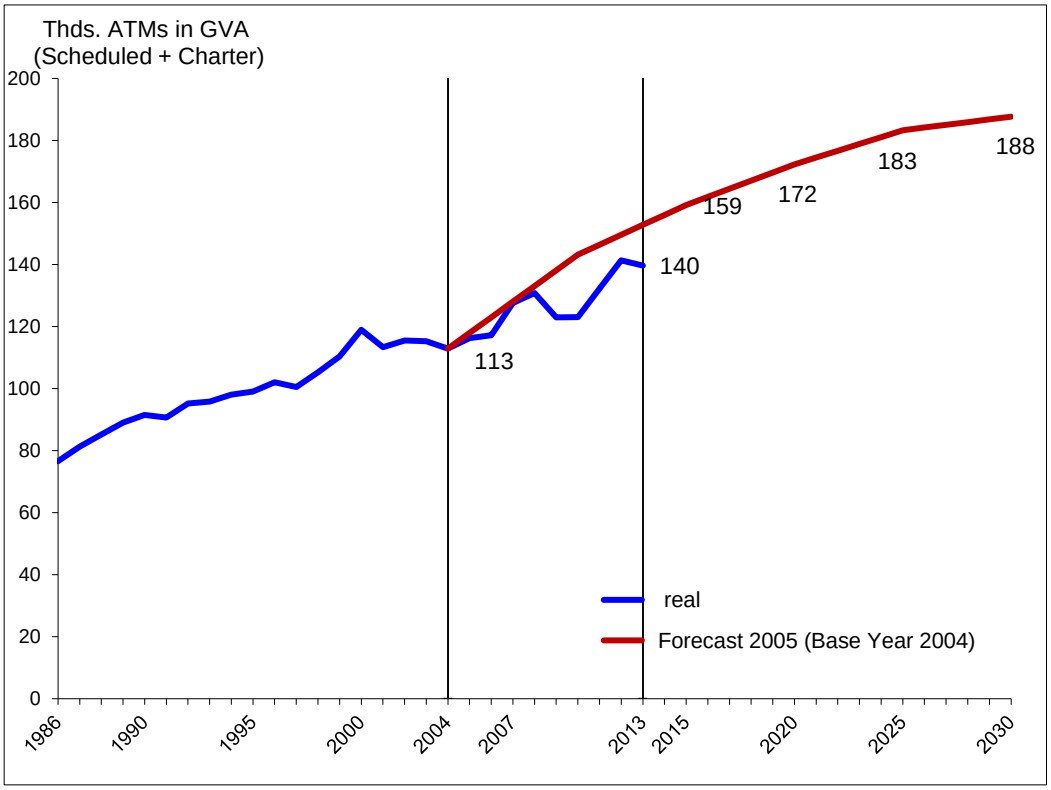


Fig. 3-5: Comparison of real traffic development with the forecast of 2005 - ATM (scheduled and charter, both passenger and freight traffic).

The growth of passengers per flight is much stronger than expected in 2005 (based on trends in the past): since about 2002 the average number of passengers per ATM has jumped from 66 to 105. This is mostly the effect of low-cost traffic, in recent years additionally due to intercontinental flights which are carried out with large aircraft.

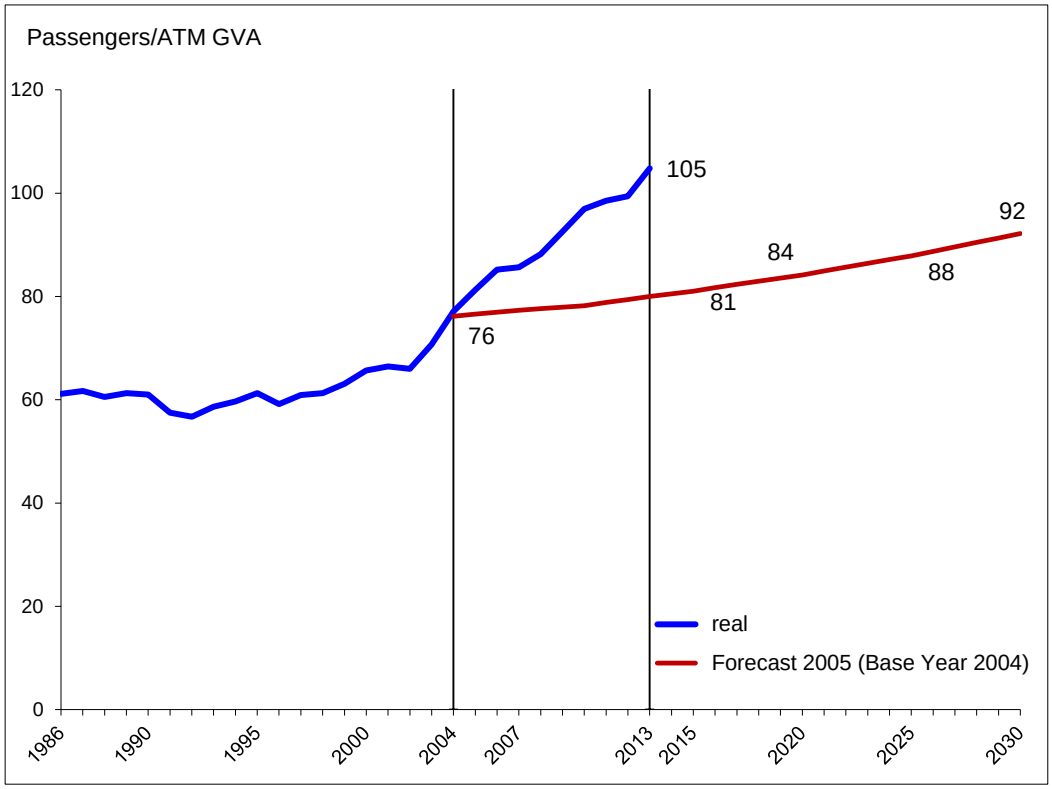
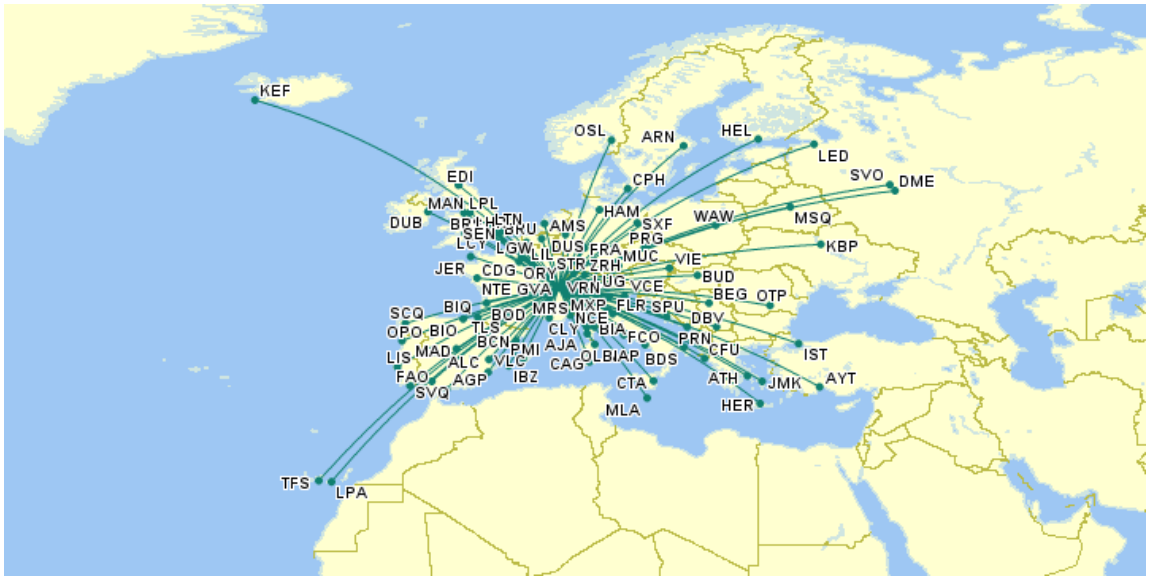


Fig. 3-6: Comparison of real traffic development with the forecast of 2005 - passengers per ATM (scheduled and charter passenger traffic).

3.3 Traffic supply

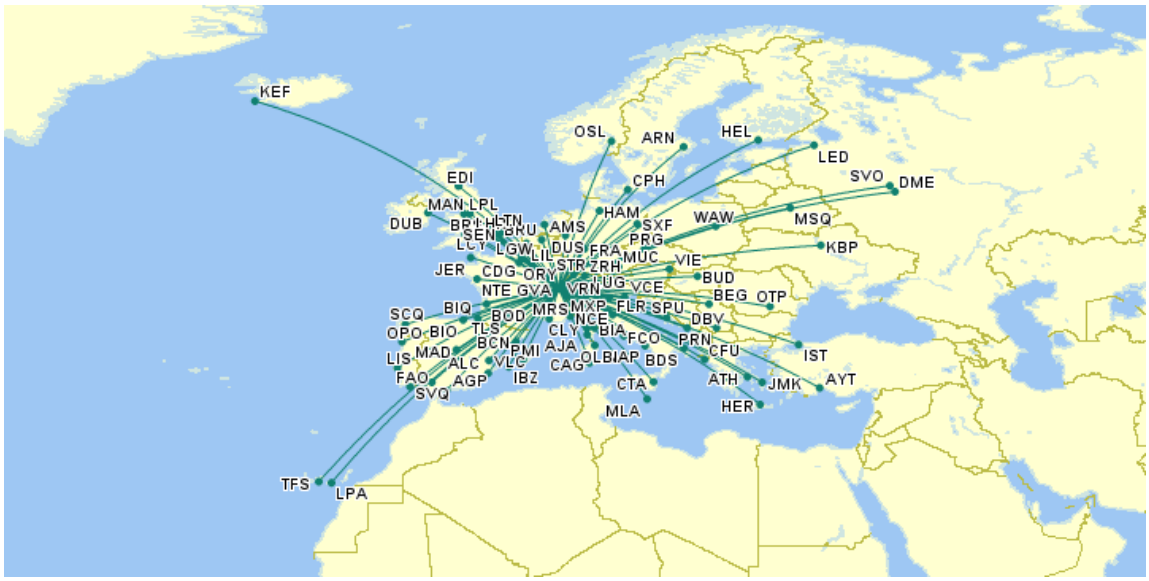
On many airports in Europe traffic supply recovered after the downturn following the 2009 world economic crisis, but the network density hardly reached the level of the pre-crisis situation. This, however, is different in Geneva, where the number of destinations, which already grew strongly before the crisis, continued to expand.

Continental destinations grew from 69 to 86 destinations between 2008 and 2014 (summer period, see Fig. 3-7a and 3-7b).



Source: Analysis of OAG, transformed into Great Circle Mapper

Fig. 3-7a: Analysis of traffic supply: Destinations Europe-wide 2008 (summer period) - 69 destinations



Source: Analysis of OAG, transformed into Great Circle Mapper

Fig. 3-7b: Analysis of traffic supply: Destinations Europe-wide 2014 (summer period) - 86 destinations

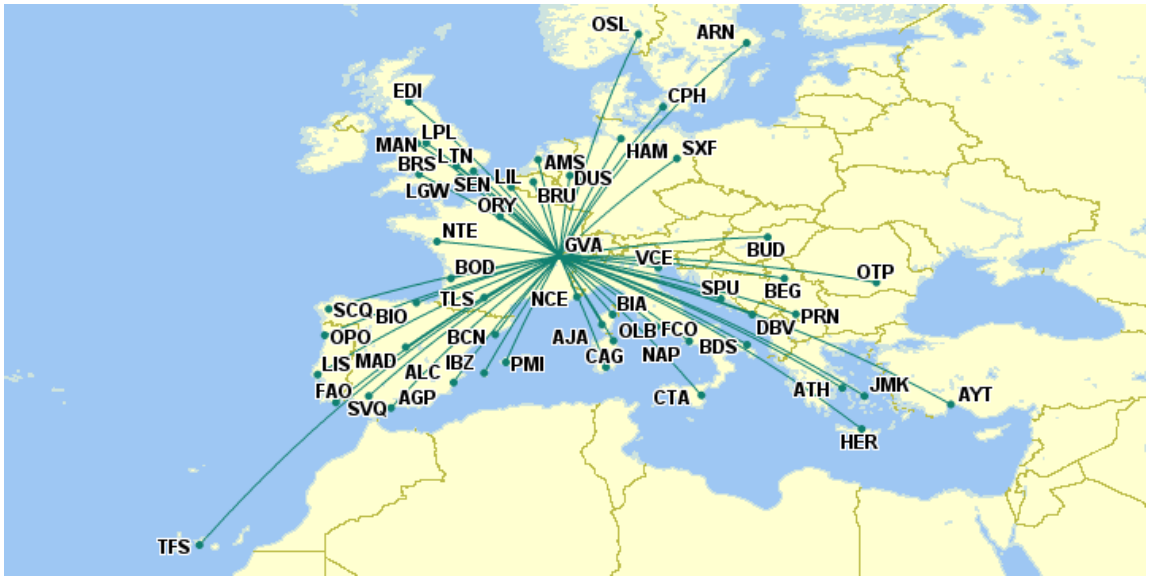
The destinations, however, were served with a lower service frequency in the average.

This is also typical for low-cost carrier, which try to maximise occupancy resp. the number of passengers per flight, differently form network carriers, which try to connect airports to their main hubs with a high service frequency, offering as many transfer connections as possible

The growth of the number of continental destinations in Geneva indeed is exclusively caused by low-cost carriers (see Fig. 3-8a and 3-8b). Low-cost destinations grew from 31 to 53 destinations between 2008 and 2014 (summer period).

Source: Analysis of OAG, transformed into Great Circle Mapper

Fig. 3-8a: Analysis of traffic supply: Destinations by low-cost carrier 2008 (summer period) - 31 destinations



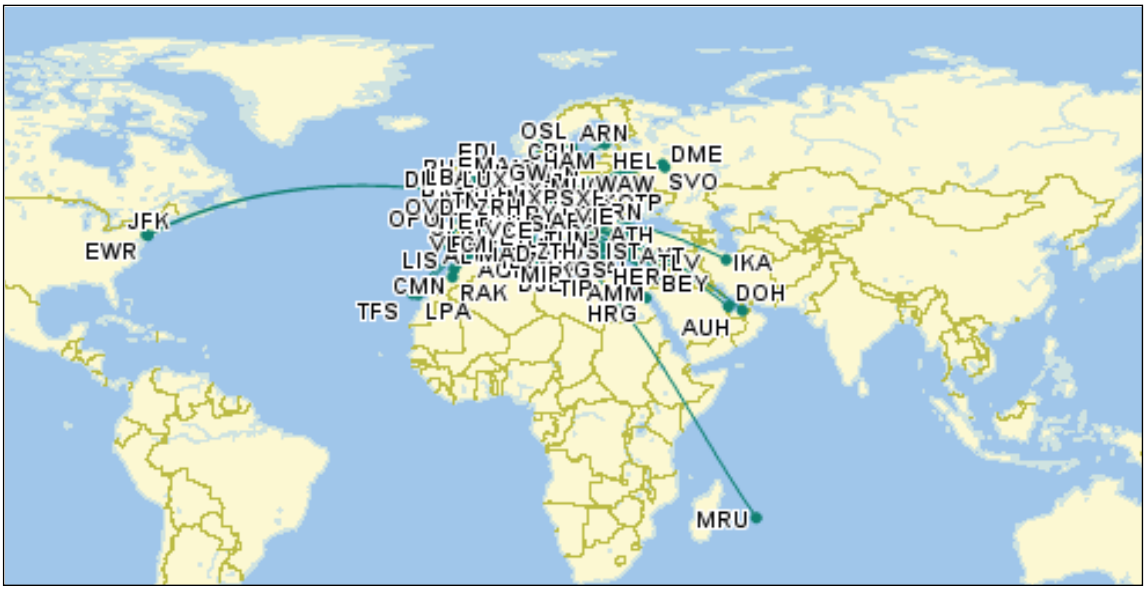
Source: Analysis of OAG, transformed into Great Circle Mapper

Fig. 3-8b: Analysis of traffic supply: Destinations by low-cost carrier 2014 (summer period) - 53 destinations

That means, the other non-LCC European destinations decreased from 38 to 33 in this period.

Another reason for an over average growth in Geneva is the intercontinental traffic (see Fig. 3-9a and 3-9b). There were 18 non-European destinations in 2008 (summer), mainly to North Africa. 6 destinations were long haul destinations, Doha (DOH) and Abu Dhabi (AUH), Teheran (IKA) in the Middle East, the tourist destination Mauritius (MRU) and the New York airports JFK and EWR.

In 2014 there are 22 non-European destinations, four more than in 2008. Due to the political crises in North Africa and Syria traffic to/from the non-Europe Mediterranean did not grow. The long haul destinations, however, grew from 6 to 10, including Dubai, Beijing/China, Montreal and Washington in Northern America.



Source: Analysis of OAG, transformed into Great Circle Mapper

Fig. 3-9a: Analysis of traffic supply: Destinations worldwide 2008 (summer period) - 18 destinations (thereof 4 long haul)

Source: Analysis of OAG, transformed into Great Circle Mapper

Fig. 3-9b: Analysis of traffic supply: Destinations worldwide 2014 (summer period) - 22 destinations (thereof 10 long haul)

3.4 Analysis of the Catchment Area of GVA

In Fig. 3-10 the catchment area of GVA is mapped, showing on the one hand the MT distance classes, on the other hand the traffic zones of the model which are the administrative areas in Switzerland (cantons), France (departments) and Italy (regions) with approximate travel times to/from Geneva airport.

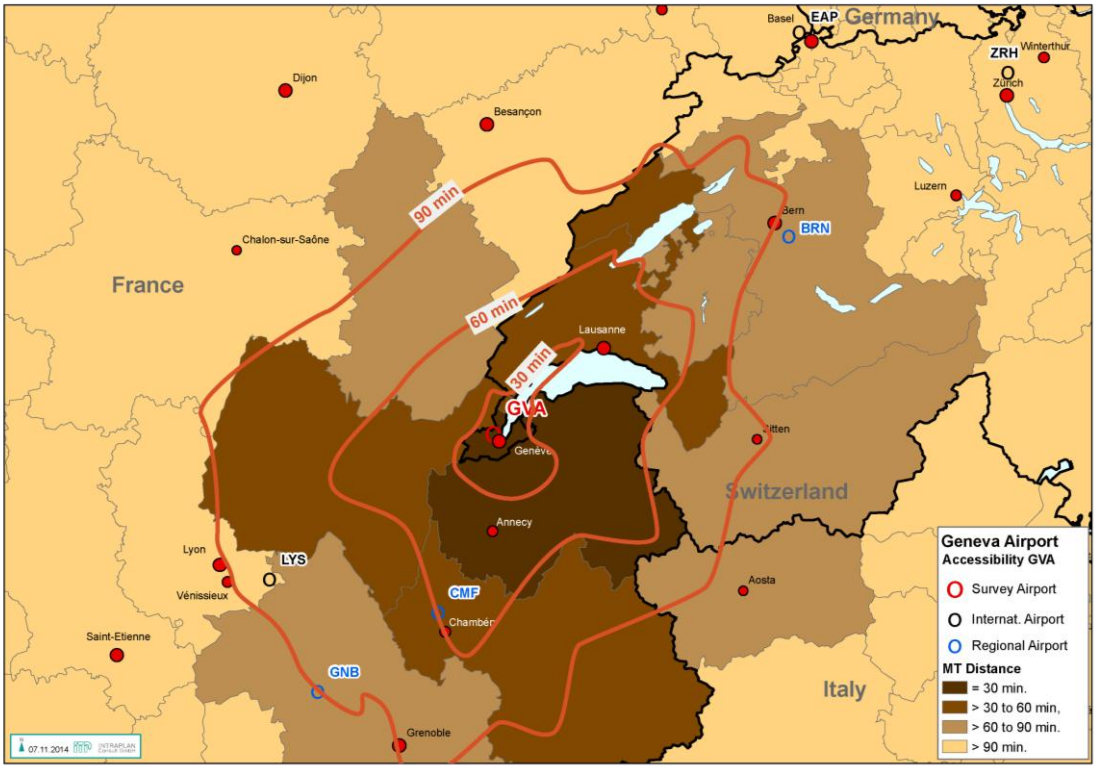


Fig. 3-10: Catchment Area of GVA in MT distances (shown are also the zones considered in the study)

To the 'core catchment area' the Canton Genève and Vaud in Switzerland and the department Haute-Savoie can be assigned (see Tab. 3-1) with together 2,6 million inhabitants.

As 'relevant catchment area' it can be regarded additionally the cantons Fribourg, Neuchâtel, Berne, Valais in Switzerland and the départements Savoie, Isère, Jura and in Italy Valle d'Aosta with altogether 3,8 million inhabitants.

Category	Région	Population (1000)
Core	Ct. Genève	463
	Ct. Vaud	764
	Dept. Haute Savoie	757
	Dept. Ain	611
	Total	**2.595**
Relevant	Ct. Fribourg	291
	Ct. Neuchâtel	175
	Ct. Bern	993
	Ct. Valais	322
	Dept. Savoie	422
	Dept. Isère	1.224
	Dept. Jura	261
	Valle d'Aosta	128
	Total	**3.816**
Total core and relevant		**about 6,4 million**
Remote	Reste Suisse	5.031
	Reste Région Franche-Comté	915
	Reste Région Rhône-Alpes	3.937
	Total	**9.883**

Tab. 3-1: Catchment area of GVA - Categories, region and inhabitants

Core and relevant catchment area together host 6,4 million inhabitants, the 'remote catchment area', the other Swiss cantons and the rest of the French regions Franche-Comté und Rhône-Alpes have another 9.9 million inhabitants.

The demand potential, which is the number of trips independently from the airport, which the travellers use for access to or egress from the airports, for the catchment area of Geneva is shown in Fig. 3-11.

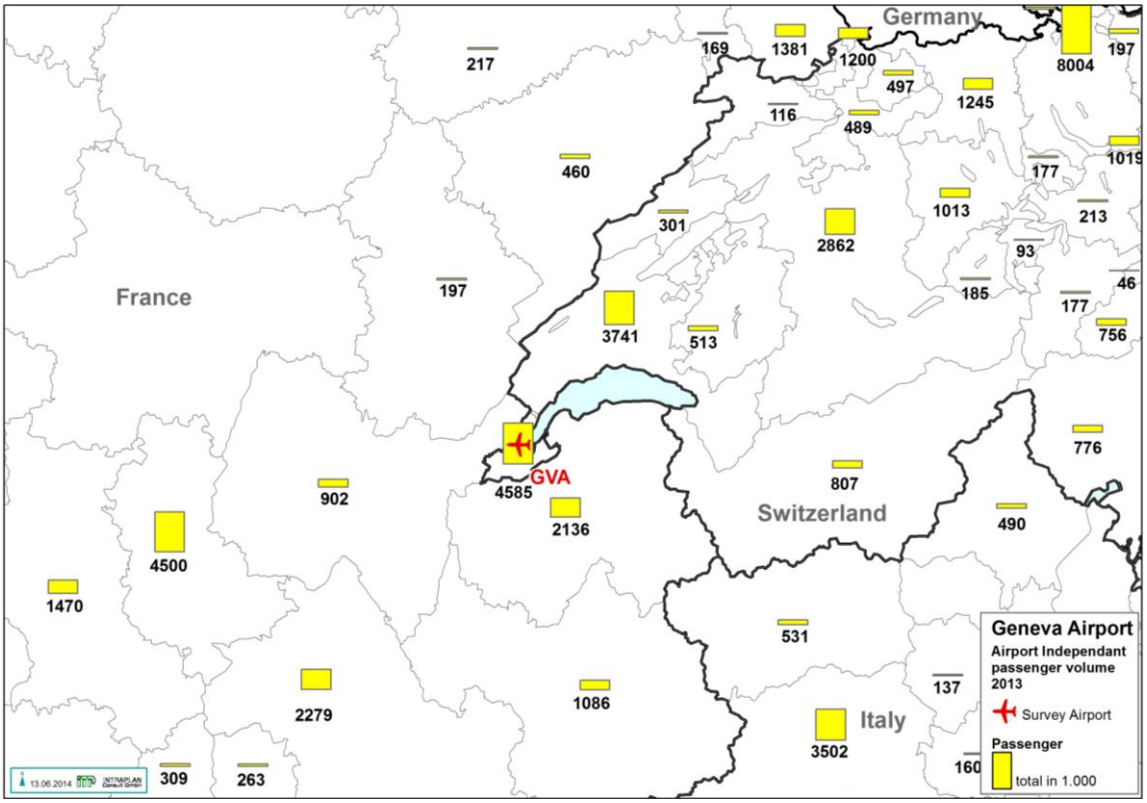


Fig. 3-11: Demand potential (independently from the airport of access/egress) per region in 2013 (in 1000 passengers)

From that it can be seen, that in the core catchment area, Lac Leman incl. Haute-Savoie, the number of passengers is at 10,4 million in total. Of that the canton Genève generates 4,6 and the canton Vaud 3,7 million passenger trips and the department Haute-Savoie is origin or destination for 2,1 million trips (two way totals, originating and destination trips). Other important markets in the surrounding are the area Lyon/Rhône (5 million) and Berne (3 million). The areas of Zurich (10 million with neighbouring cantons) and Bâle (4 millions) is in the remote part of the catchment area of GVA.

The passengers using GVA airport from these regions are shown in Fig- 3-12.

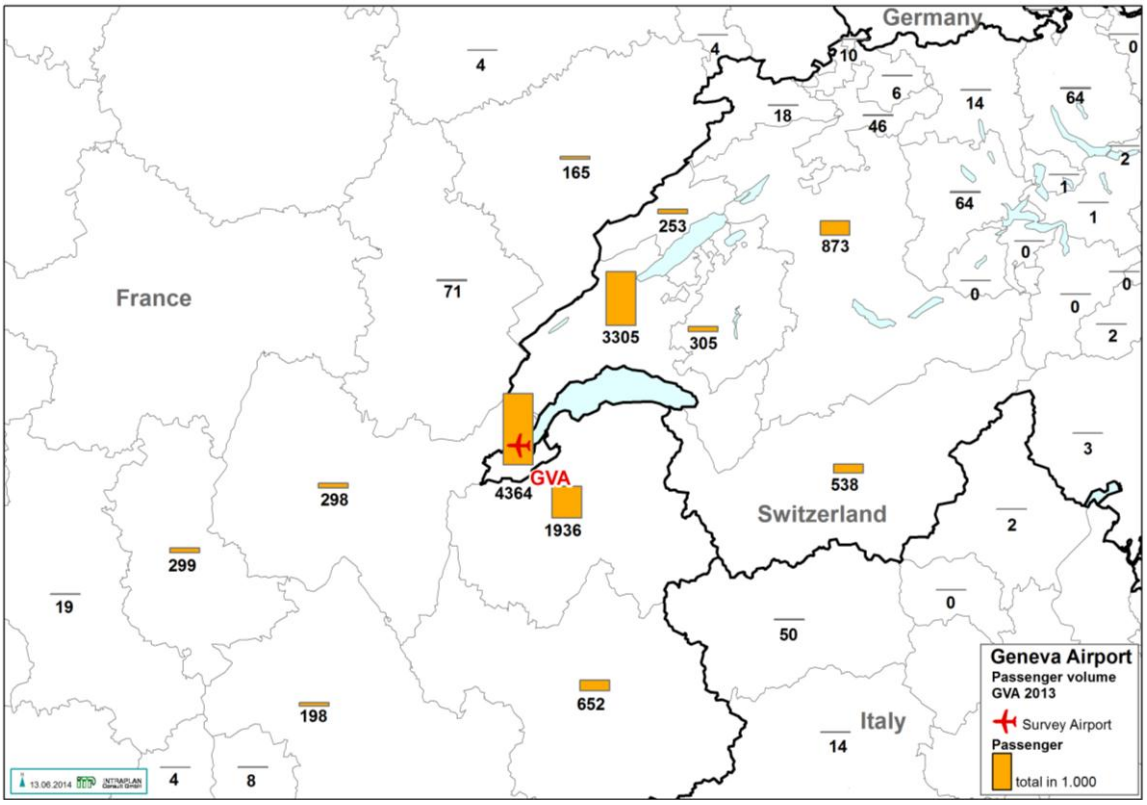


Fig. 3-12: Passengers using GVA per region in 2013 (in 1000 Passengers)

The main single markets for Geneva, that is the part of the total traffic shown in Fig. 3-11, for which actually GVA airport is used, are the cantons Genève with4,4 million passengers, Vaud with 3,3 million and department Haute-Savoie with 1,9 million, altogether 9,6 million passengers which is about 70 % of the total local passengers in 2013 of 13,7 million in GVA.[5]

That means in the core catchment area (here: Genève, Vaud, Haute-Savoie) the market share of GVA is around 92 % (see fig. 3-13), the rest is mainly oriented to Zurich (Vaud, Genève) and Grenoble or Lyon (Haute-Savoie). On the other hand 30 % of the GVA origin-destination traffic is generated in other areas, mainly in Berne (0,9 million) Savoie (0,7 million), Valais (0,5 million), Fribourg, Ain, Neuchâtel (around 0,3 million each).

5 The difference to 14,3 million are transfer and transit passengers (in 2013 around 4,5 % of total passenger traffic).

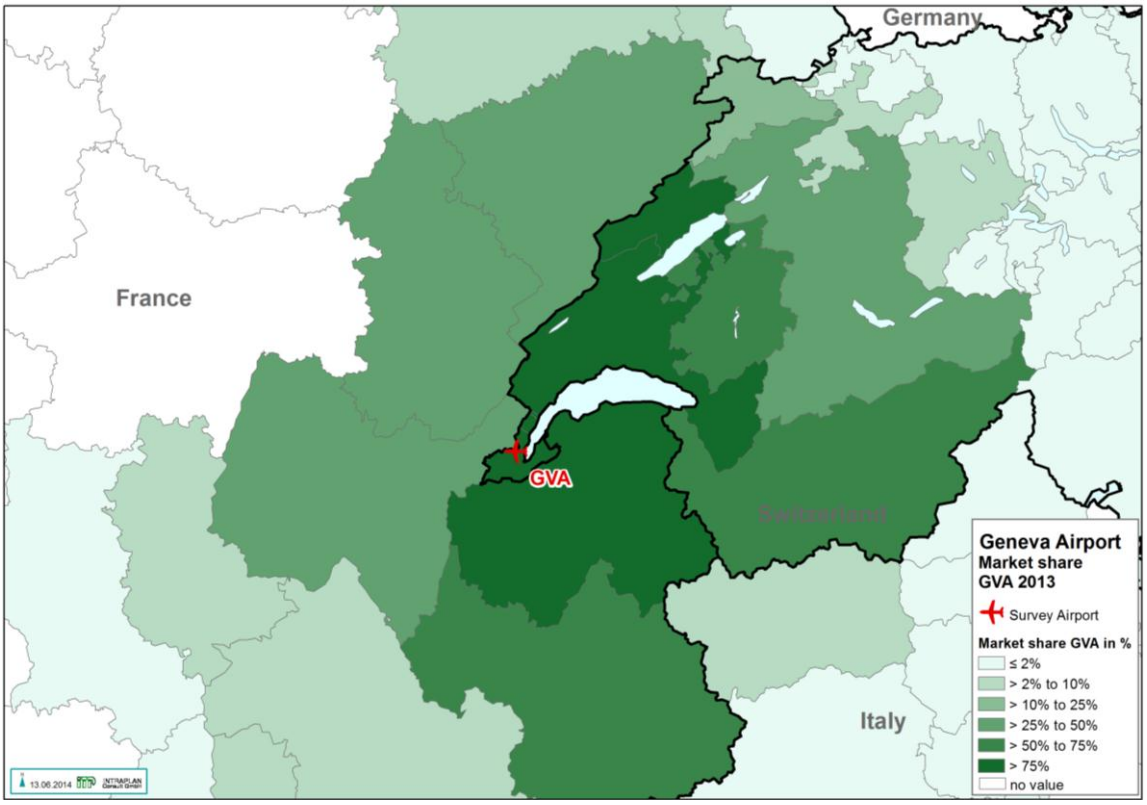


Fig. 3-13: Market Share of GVA in the landside regions in 2013 (in percent)

That means, the catchment area of GVA is in spite of neighbouring airports with a widespread air traffic supply (mainly Zurich, but also Lyon, Bâle/Mulhouse), quite large, both with regard to area as with regard to population and traffic. The reason for that is the good supply in GVA in the low-cost-segment, but also for intercontinental flights which generally attract passengers also from remote areas. The good railway access of the airport helps to feed GVA also from areas relatively distant from the airport.

4. FORECAST ASSUMPTIONS

The main forecast drivers for the traffic development with regard to 'autonomous growth' (not dependent from infrastructure/supply or other transport related factors) are

- the development of population and
- the development of GDP.

With regard to the transport system the relevant variables are

- the development of infrastructure and supply including access to and egress from the airports
- the development of user costs (air fares).

4.1 Population Development

For the population development, for which the data are processed in detail per zone and age group, available and widely accepted forecasts have been used:

- for Switzerland the population forecast 2010 - 2025 per canton from the Federal Statistical Office[6]
- for France the population forecast to 2050 from INSEE[7]
- for the other relevant countries and for the regions of destinations population forecasts of the European Union

For **Switzerland** (see Tab. 4-1) in the forecast period a population growth of 9,4 % is expected. In Genève the growth will be above average (+ 12,6 %), for Vaud below average (+ 17,1 %).

6 Office fédéral de la statistique BFS 2011: "Scénarios de l'évolution de la population des cantons de 2010 à 2035" - Scénario moyen

7 INSEE: Population - Forecast France per Département "La population des régions en 2040"

Canton	Habitants en 1000				Changement en %	
	2012*	2013*	2020	2030	2020 : 2012	2030 : 2012
Genève	463,1	469,2	494,6	521,5	6,8	12,6
Vaud	734,4	748,8	803,4	860,0	9,4	17,1
Valais	321,7	326,6	335,9	346,8	4,4	7,8
Neuchâtel	174,6	176,3	176,3	178,4	1,0	2,2
Fribourg	291,4	297,5	316,8	336,6	8,7	15,5
Jura	70,9	71,7	72,2	72,6	1,8	2,4
Berne	992,6	1.000,9	1.015,4	1.028,3	2,3	3,6
Tessin	341,7	346,5	353,7	361,2	3,5	5,7
Soleure	259,3	261,4	268,4	277,2	3,5	6,9
Bâle-Ville	187,4	189,3	192,8	192,8	2,9	2,9
Bâle-Campagne	276,5	278,6	287,0	295,9	3,8	7,0
Argovie	627,3	636,2	675,6	717,6	7,7	14,4
Lucerne	386,1	390,3	412,0	434,0	6,7	12,4
Zurich	1408,6	1425,1	1491,7	1566,4	5,9	11,2
Zoug	116,6	118,1	121,3	124,9	4,0	7,1
Uri	35,7	35,9	36,1	36,3	1,0	1,8
Schwyz	149,8	151,4	155,3	160,9	3,7	7,4
Obwald	36,1	36,5	38,6	40,6	6,8	12,6
Nidwald	41,6	41,9	43,4	45,1	4,4	8,3
Glaris	39,4	39,6	40,6	41,7	3,0	5,8
Schaffhouse	78	78,8	78,9	80,0	1,1	2,6
Thurgovie	256,2	260,2	273,9	286,7	6,9	11,9
Saint-Gall	487,1	491,6	504,1	517,3	3,5	6,2
Appenzell Rh.-Ext.	53,4	53,7	54,6	56,2	2,2	5,3
Appenzell Rh. -Int.	15,7	15,8	16,4	16,8	4,3	7,2
Grisons	193,9	194,9	196,0	198,2	1,1	2,2
Suisse	**8.039,1**	**8.136,8**	**8.457,1**	**8.794,8**	**5,2**	**9,4**

* population according to bfs.admin.ch (Population résidante permanente par canton, à la fin de l'année)

Tab. 4-1: Forecast of Population in Switzerland

In most of the regions in **France** there will be a considerable population growth in the forecast period. Among others in the department Haute-Savoie the population will grow by 17,4 % between 2012 and 2030. In the whole region Rhône-Alpes, the most important French part of the catchment area of GVA, population growth will be at 12,7 %, whereas in the also relevant region Franche-Comté growth will be lower, at 5 % (see Tab. 4-2).

Région	Département	Habitants en 1000				Changement en %	
		2012	2013	2020	2030	2020 : 2012	2030 : 2012
Région Rhône-Alpes	Ain	611,4	618,6	669,3	727,6	9,5	19,0
	Ardèche	319,2	320,9	341,2	365,5	6,9	14,5
	Drôme	491,3	494,4	523,1	557,0	6,5	13,4
	Isère	1.223,9	1.232,3	1.312,0	1.405,4	7,2	14,8
	Loire	751,5	753,6	769,0	786,9	2,3	4,7
	Rhône	1.762,7	1.780,8	1.851,8	1.936,9	5,1	9,9
	Savoie	422,3	425,4	449,5	478,2	6,4	13,2
	Haute-Savoie	757,2	767,5	824,0	888,8	8,8	17,4
	Total	6.340	6.393	6.740	7.146	6,3	12,7
Région Franche-Comté	Doubs	530,9	532,5	544,6	562,3	2,6	5,9
	Jura	261,2	261,2	265,6	272,0	1,7	4,1
	Haute-Saône	239,9	240,2	245,4	253,1	2,3	5,5
	Territoire de Belfort	143,8	144,0	145,2	147,0	1,0	2,3
	Total	1.176	1.178	1.201	1.234	2,1	5,0

Tab. 4-2: Forecast of Population in the relevant regions in France

4.2 GDP Development

The by far most important driver of the air traffic development is the **economy** resp. the dynamics of **economic growth**. In our times economic forecasts are rather volatile due to the Euro-crisis and only a few institutions dare to provide long term forecasts for the European countries.

The long term forecasts used for the study on hand have been provided by OECD[8]. They have been adjusted and supplemented by short term forecasts of the European Union and the Swiss institutes SECO, KOE and CS. The regional disparities, which are important here due to the fact that not the whole Switzerland and the whole France is in the catchment area of GVA resp. the regions of these countries are in a different degree in the catchment area of GVA, have been derived from past trends.

8 OECD Economic Outlook 2014

Economic growth as expected in the catchment area is shown in Tab. 4-3: Growth in **Switzerland** is 2,1 % in 2014 and 2,4 % in 2015. Between 2015 and 2020 a growth of 2,3 % per year is expected. In the long term (2020 - 2030) still 2,1 % p.a. is expected. In the core catchment area, the canton Genève and Vaud, growth is slightly higher, by about 0,2 percent per year.

In **France,** contrary to Switzerland, short term forecasts show a slow growth in 2014 (+1 %) and 2015 (1,5 %). Long term forecasts (from 2016), however, are in the similar level of magnitude to Switzerland with a growth of about 2 % in the average. The region Rhône-Alpes including the for GVA important department Haute-Savoie will grow above average (+0,2 per-cent-points) whereas in the region Franche-Comté, bordering Switzerland in the North West, economic growth is lower than in France as a whole.

	real GDP growth in %			
	2014	**2015**	**2016 - 2020**	**2020 - 2030**
Switzerland	2,1	2,4	2,3	2,1
thereof cantons				
Genève	2,3	2,6	2,5	2,3
Vaud	2,4	2,7	2,5	2,3
France	1,0	1,5	2,0	2,0
thereof regions				
Rhône-Alpes	1,1	1,7	2,2	2,2
Franche-Comté	0,8	1,3	1,8	1,8

Source: long term: OECD Economic Outlook 2014; short term: forecast of EU, SECO, KOE, CS
regional: difference to country growth due to past trends

Tab. 4-3: GDP-growth assumptions in the catchment area

For the other countries, important with regard to the origin-destination traffic, the assumed economic growth is shown in Tab. 4-4.

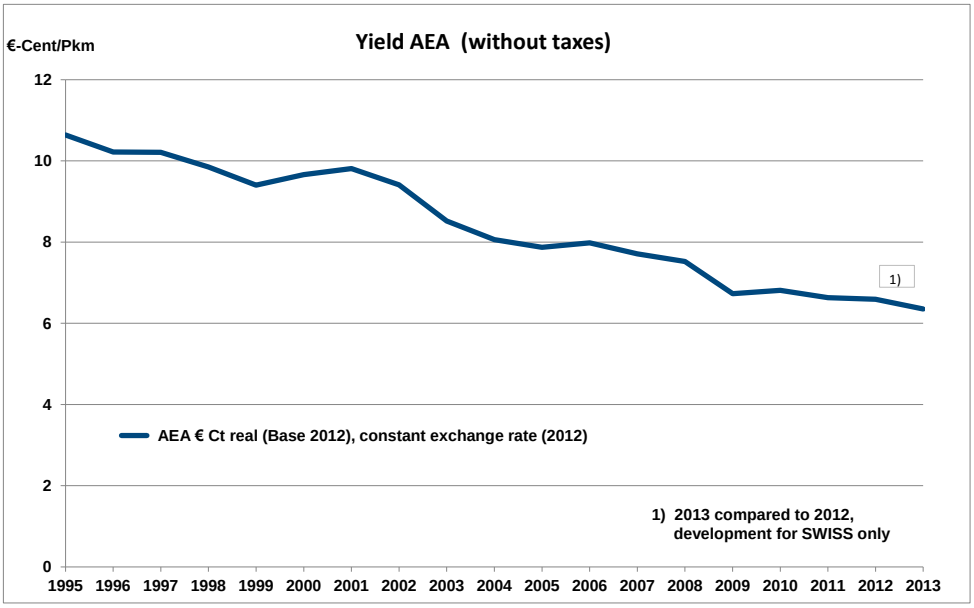
GDP	Analysis	Forecast
	1995 – 2013	2013 - 2030
World	**3,3**	**3,7**
Euro Area	**1,5**	**1,7**
Western Europe	1,9	2,4
Central Europe	1,4	1,2
Northern Europe	2,1	2,1
Southern Europe	1,2	1,5
South East Europe	3,4	3,8
Central East Europe	3,6	2,4
CIS	3,8	2,7
Northern America	2,4	2,4
Latin America	3,2	3,5
South America	3,3	3,5
Northern Africa	3,9	4,5
Central Africa	5,3	5,3
South Africa	3,2	4,5
Middle East	4,1	3,7
Far East	5,4	5,1
Australia/Oceania	3,2	3,1

Source: OECD

Tab. 4-4: GDP forecasts as assumed in the forecast for other world regions

Another important factor stimulating air traffic growth is the **development of airfares** resp. airfare levels. Airfare development can be handled continentally or globally. In general, airfares (including service charges) show a decreasing tendency in the last decades. Reasons for this decrease are on one hand the fierce competition between airlines and the appearance of the low-cost-carriers (LCC), as well as competition between transport modes and increase in the efficiency of airlines from sales to the flights themselves. The development of price levels are

difficult to measure due to rather volatile airfares per destination and over time and due to different airfare models of the airlines, for example using "economy" instead of "business" fares for business travellers. The best indicator for the price levels resp. the development of airfares are average yields (revenues per passenger kilometre for which statistics are available. Yield per passenger kilometre. For European airlines (AEA) yields are given in Fig. 4-1, showing a nearly continuous decrease in revenues per passenger kilometre. Not included in Figure 4-1 are non-airline relevant charges (for example security charges[9], so price reductions for their users were somewhat lower than shown here. Considering that there is still a remarkable decrease in airfare levels in the last two decades.

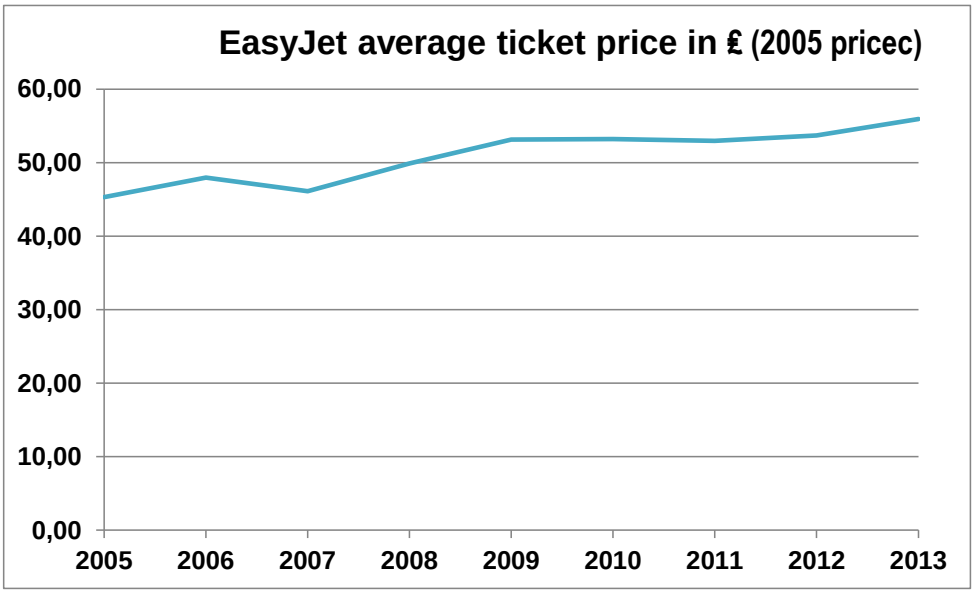


Source: AEA, Intraplan

Fig. 4-1 Development of yields per passenger kilometre in the past - AEA (mostly network carriers) (€-cent per Revenue Passenger Kilometre, constant 1991 prices)

Whereas full-service and leisure carrier, which are mostly members of AEA, are recording falling yields per PKT (see Fig. 4-1), EasyJet's (as Ryanair) average fares have grown slightly, but constantly (see fig. 4-2). That means price level differences between LCC and conventional airlines are in tendency decreasing.

9 Kerosene surcharges, however, are included in the results, shown in fig. 4-5



Source: EasyJet annual reports, Intraplan

Fig. 4-2 Development of Yields per passenger kilometre in the past - AEA (mostly network carriers) (€-cent per Revenue Passenger Kilometre)

The effect of fuel prices in air traffic development is already included in the effects of the airline yields, i.e. airfares. Fuel costs are approximately included with a 20 % weight in the development of the airfares, resulting in an elasticity of 0.2 between the price of oil and the total airfares. The leading international energy research institutions see still rising crude oil prices but with lower growth rates than in the past (see Tab. 4-6). But this is counterbalanced by efficiency gains[10] due to advanced aircraft (e.g. Boeing 787, A320NEO) and optimized operation (more passengers per flight and higher load factors and other). Productivity of staff and aircraft is still rising so there is potential for a decrease of airfare levels (Tab. 4-5). Considering the need of consolidation resp. profitability of the airline industry, we assume a constant airfare level on to 2030 for the conventional airlines and an increase for low-cost-airlines of 0,5 % p.a.

10 Fuel cost growth factor (c) = fuel price growth factor (p) x fuel efficiency factor (e)

Segment	Share of total costs	cost drivers	
		past	forecast
fuel costs	20 %	++	0
taxes incl. emission trade	3 %	+ (2011)	+
aircraft use	15 %	-	-
fees	5 %	+	+
staff/incl. handling	> 50 %	-	-
profit	< 3 %	-	+
total		**-**	**(-)**

Tab. 4-5 Drivers of airfares and assumed changes in the lifetime of the forecasts ('+' means cost-driving, '-' cost-relieving, '0' neutral)

Institution	Date of fore-cast	Forecast Horizon							
		2005	2010	2015	2020	2025	2030	2035	2040
IEA (WEO 2011), Szen. "New Policies"	Nov. 11			102	109	114	117	120	
Szen. "Current Policies"				106	118	127	135	140	
"450 Scenario"				97	97	97	97	97	
IHS / Global Insight	Nov. 11			99	73	87	96	98	
Energy Venture Analysis (E-Mail an EIA)	Jan. **12**			82	85	89	95	102	
INFORUM (Univ. of Maryland)	Feb. 12			82	106	113	118	117	
SEER (E-Mail an EIA)	Feb. 12			94	102	107	111	122	
EIA (Annual Energy Outlook) Reference	Jun. 12		79	117	127	133	138	145	
Low Oil Price Case				58		59		62	
High Oil Price Case				182		193		200	
Airbus (Global Market Forecast 2012)	Sep. 12				105		128		
IEA (WEO 2012), Szen. "New Policies"	Nov. 12			116	120	122	124	125	
Szen. "Current Policies"				118	128	136	141	145	
"450 Scenario"				115	113	109	105	100	
Szen. "Efficient World"					116			109	
IHS / Global Insight (30-year U.S. and Regional Ec	Nov. 12					93		86	81
Energy Venture Analysis (E-Mail an EIA)	Dez. 12					78		82	87
INFORUM (Univ. of Maryland)	Dez. 12					137		150	
EIA (Annual Energy Outlook) Reference	Apr. **13**			96	106	117	130	145	163
					104	115	128	143	161
Low Oil Price Case				80	69		72		75
High Oil Price Case					155		192		237
IEA (WEO 2013), Szen. "New Policies"	Nov. 13								
EIA (Annual Energy Outlook) Reference	Apr. **14**				97	109	119	130	141
Assumptions ITP					120		130		

Tab. 4-6 Available forecasts of Crude Oil Price (US$/b)

Concerning the **policy framework** the following assumptions have been made:

- EU: no additional membership are assumed until 2030
- Air transport agreements Switzerland co-ordinated with EU-transport agreements
- Schengen no changes (British Islands, Bulgaria, Romania stay outside)
- ETS Swiss ETS is coordinated with EU-regulations
- Airport fees/taxes no airport fees/taxes in Switzerland (as in Germany, Austria, United Kingdom and some other countries)
- Free trade agreement EU – NAFTA, CH – China
- Exchange rate SFR – EURO Corridor 1,2 as today, EURO – US $ as 2013

With regard to **rail infrastructure** the following relevant projects have been considered in the forecast:

- Gotthard base tunnel (2016)
- TGV Rhin-Rhône, 2. stage Belfort – Mulhouse (until 2020)
- Mt. Cenis (Lyon – Torino) (after 2030, not relevant here)
- Airport ground access EAP (from 2021)
  (direct services from major cities in CH and Alsace)

For the airport of **Geneva** as a working hypothesis **no capacity restraints** are considered. That means that market growth and capacity needs could be met in the forecast period. With regard to the **traffic supply** it is assumed for GVA

- still growing LCC-hub, mainly EasyJet (homebase carrier), but also other airlines from outside (Norwegian, Vueiling etc.)
- tourist traffic, in summer mainly outbound, in winter mainly inbound (skiing)
- frequent full service connections with all relevant hubs in Europe
- several intercontinental services, mainly with the Middle East, but also some direct origin-destination-services

For the other relevant airports the following assumptions have to be mentioned (in line with the studies for Zurich and others)

Zurich	capacity restraints (only limited optimisation of the existing runway system), but remains hub of Swiss
Bâle/Mulhouse (EAP)	no capacity restraints, train access (2021)
Lyon (LYS)	no constraints, widespread continental traffic, regional hub southern France
Chambery	no basic changes (mainly tourist traffic), some LCC-flights
Grenoble	LCC from/to United Kingdom and tourist traffic
Dôle Jura Airport	Limited LCC-services
Berne Belp	only regional traffic (because of short runway)
Annecy	only General Aviation and regular services to Paris Orly (no major expansion due to short runway)

5. DEMAND FORECAST FOR PASSENGER TRAFFIC[11]

5.1 Relationship between air traffic growth and economic grows

Analyzing air traffic development in the wider study area (here: local passengers on airports in Switzerland and the French regions of Rhône-Alpes, Franche-Comté and Alsace) and comparing this growth with the GDP-development in this area a clear relationship can be found (see Fig. 5-1).

In spite of the special effect of the Swissair grounding end of 2001, reducing traffic on all Swiss airports, the correlation between GDP on the one hand and air traffic on the other hand is quite good, giving a correlation coefficient of R^2 = 0,90 and an elasticity of traffic growth to GDP growth of around 2,3.

11 If not specified, the passenger figures include all segments: scheduled and charter traffic, General Aviation, transit

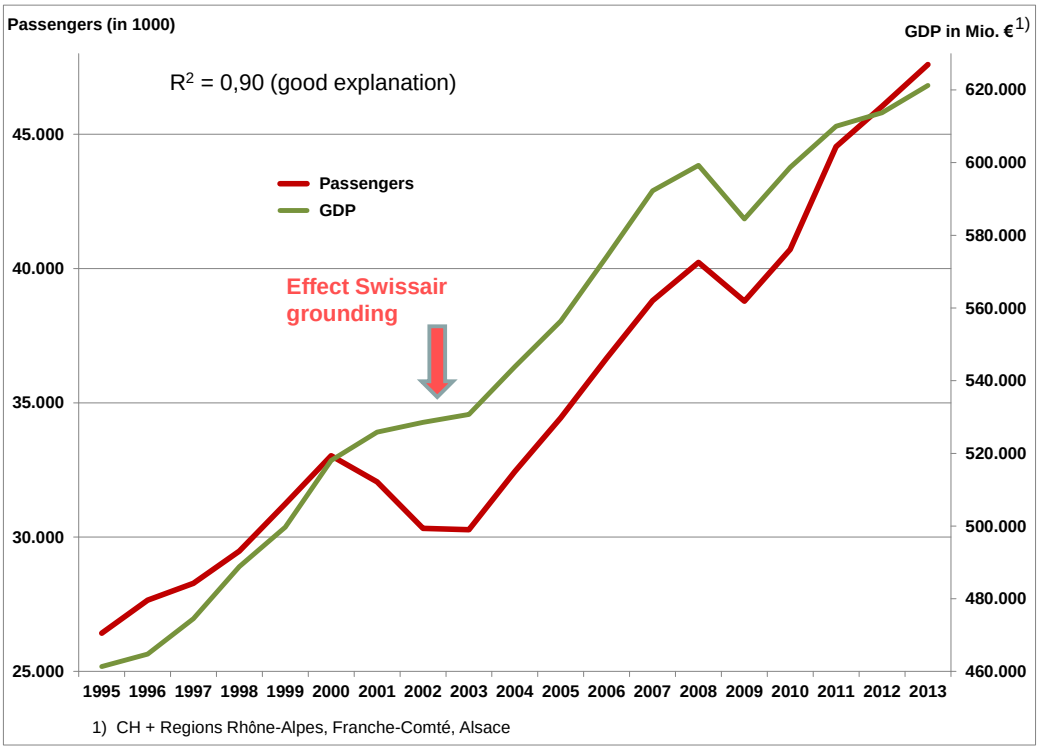


Fig. 5-1: Relationship between development of air traffic (all Swiss airports (without transfer) and all airports in Rhône-Alpes, Franche-Comté and Alsace) and GDP (in the regions named) between 1995 and 2013

Under consideration of the **development of airfares** (here: yield development as shown in chapter 3 above) and a correction of the Swissair grounding effect (2 mill. local passengers for the years after grounding of Swissair) the following regression model can be set up for the air traffic development in the study area

$$\mathbf{y} = -22.344 + 0{,}117x_1 - 826{,}1x_2$$

with:

y: local passengers on the airports in the study area (1000)

x_1: GDP (mil. €, 2005 prices)

x_2: yield per PKT in US-Cent (AEA[12]), 1991 prices

The explanation of the model is very good (R^2 = 0,96). From this equation the following elasticities can be derived (see Tab. 5-1).

12 AEA: Summary of Traffic and Airline Results (S.T.A.R.) yearly

Elasticities	
air traffic growth to GDP	
2013	1,61
air traffic growth to Yield[1)]	
2013	- 0,25

1) Revenues per Passenger kilometer as indicator of airfares

Tab. 5-1: Elasticity (traffic growth in percent : GDP resp. yield growth)

An elasticity of 1,61 means that a GDP growth of 1 % results in air traffic growth of about 1,6 %. If the yield continues to fall, here by 1 %, an additional traffic growth of 0,25 % would be the result.

5.2 Market Development

When using the regression model resp. the elasticities shown above, including a consideration of **regional different GDP and population growth,** as shown in chapter 4, by weighting factors, the following market development can be calculated (see. tab 5-2).

	2013 to 2020	2013 to 2030
Switzerland	+ 26,6 % (3,4 % p.a.)	+ 66,9 % (3,1 % p.a.)
thereof		
Genève + Vaud	+ 28,6 % (3,7 % p.a.)	+ 69,9 % (3,2 % p.a.)
France	+ 20,8 % (2,2 % p.a.)	+ 56,7 % (2,7 % p.a.)
thereof		
Dept. Haute-Savoie	+ 23,8 % (3,1 % p.a.)	+ 64,8 % (3,0 % p.a.)

Tab. 5-2: Forecast of passenger numbers (local passengers) independently from the airport of embarking/disembarking according to the forecast model

If market shares per region would stay stable compared to 2013 (see chapter 3.4 above) GVA would grow as shown in Tab. 5-3):

Segment	2013	2020	2030	Change 2030 : 2013
local passengers (1000)	13.829	17.350	22.808	3,0 % p.a.
total, incl. transfer/ transit	14.453	18.143	23.836	3,0 % p.a.

Tab. 5-3: Demand growth in GVA due to market development if market shares would not change compared to 2013

Per region the traffic development until 2020 (see Fig 5-2) and until 2030 (see Fig. 5-3) compared to 2013 (see Fig. 3-12 above) can be seen in the following maps.

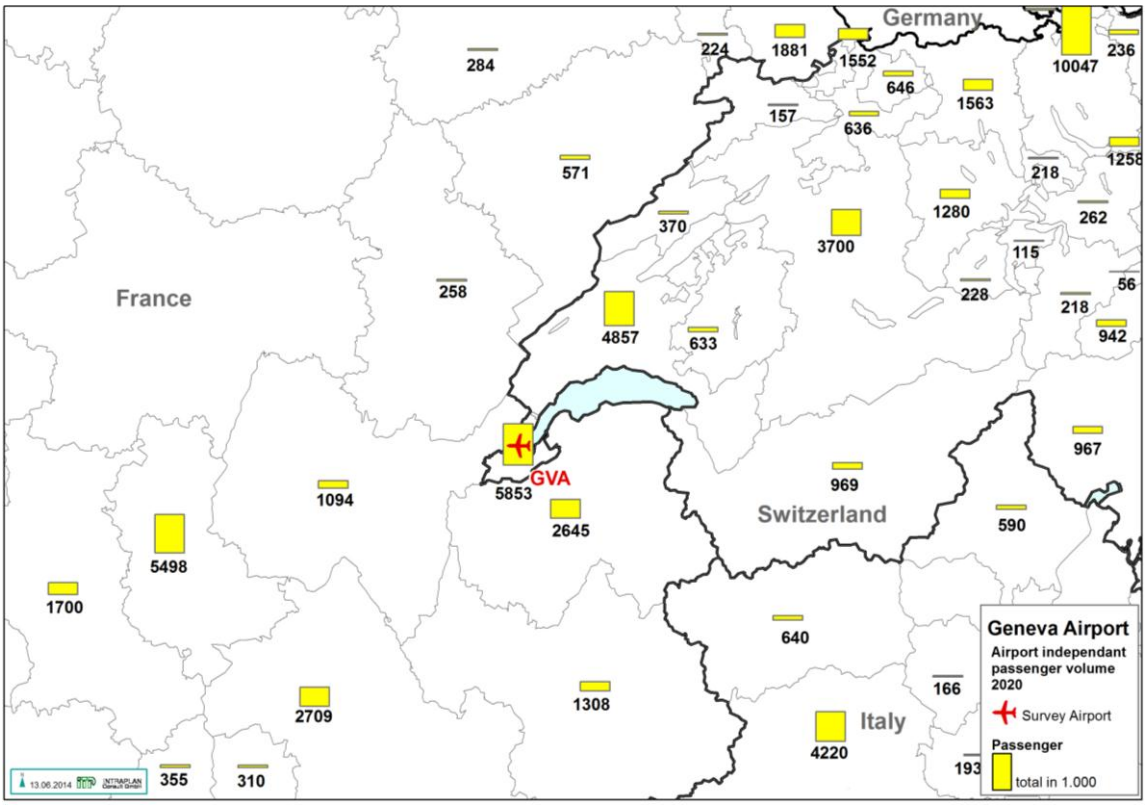


Fig. 5-2: Regional Passengers 2020 (in 1000, independent from airport used)

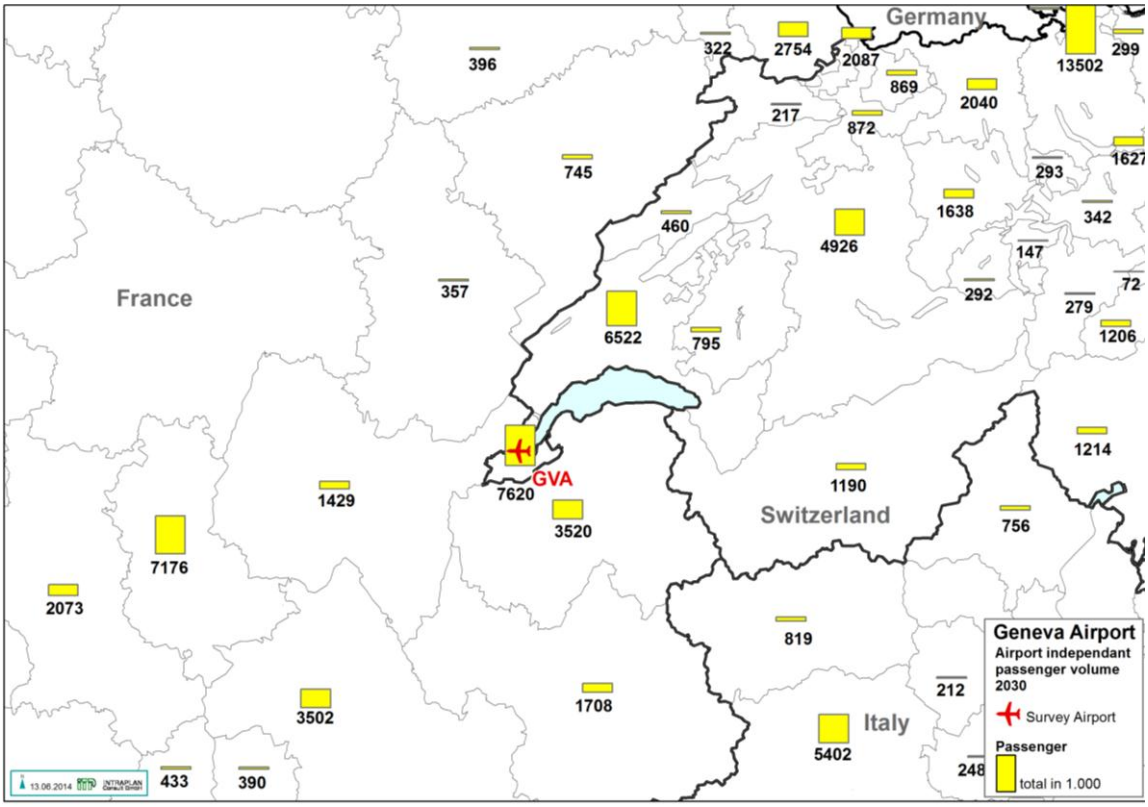


Fig. 5-3: Regional Passengers 2030 (in 1000, independent from airport used)

In the core catchment area (cantons Genève, Vaud and department Haute-Savoie) the traffic potential would grow from 10,4 million passenger trips in 2013 to 13,4 million in 2020 and 17,7 million in 2030.

5.3 Change of Market Shares

The market shares, however, will not stay constant. We expect market share changes due to the following factors.

- **Push effects** (from other airports):
  - dynamic development of the GVA offer also due to the assumptions that there are no relevant constraints
  - capacity restraints Zurich
  - higher transfer share in GVA due to the growth of intercontinental flights in GVA

- On the other hand there are **pull effects** (to other airports):
  - the development of French regional airports in the neighborhood
  - the planned EAP railway access, attractive for example for Berne, Neuchâtel and other regions in the catchment area of GVA
  - a reduced price advantage of GVA due to the assumption, that the price gap between LCC and other airline gets smaller in the long-term

These factors have been considered in the route choice model as described in chapter 2. The main driver is the market development in the catchment area, due to GDP development. The expansion of the traffic supply curbs this effect mainly to 2030, but is partly reduced by a sinking price gap between LCC and other airlines. The railway access in Bâle/Mulhouse (EAP) is relevant only after 2020 (- 250 thousand passengers in 2030 for GVA. Capacity restraints in Zurich will increase traffic in GVA only slightly up to 2020 (110 thousand), but considerably in 2030 (650 thousand local passengers). Due to a higher transfer share in GVA this effect is even higher when considering non local passengers as well (+ 500 thousand). However, it has to be put emphasis on the fact, that this development in GVA is made under the **assumption** that there are, in the contrary to Zurich, **no** major **capacity restraints in GVA**.

The effects, however, in total are quite small and neutralize each other, as in the following Tab. 5-4 for 2020 and 5-5 for 2030 can be seen.

Passengers GVA 2013	14.453
market growth	3.690
expansion offer GVA	170
reduced price advantage	-130
better accessibility EAP	0
capacity restraints ZRH	110
French airports expansion	-140
higher transfer share GVA	110
Result GVA 2020	**18.263**

Tab. 5-4: Traffic growth in GVA from 2013 to 2020, step by step due to single drivers

Passengers GVA 2013	14.453
market growth	9.395
expansion offer GVA	700
reduced price advantage	-240
better accessibility EAP	-250
capacity restraints ZRH	650
French airports expansion	-230
higher transfer share GVA	500
Result GVA 2030	**24.978**

Tab. 5-5: Traffic growth in GVA from 2013 to 2030, step by step due to single drivers

Under these circumstances the number of passengers in GVA would grow from 14,5 million to 18,3 million in 2020 and to 25 million in 2030. The average annual growth is at 3,4 % per annum between 2013 and 2020 and 3,3 % p.a. between 2013 and 2030. For comparison: growth between 1995 and 2013 was at 4,6 % p.a. in the average (see Fig. 5-4).

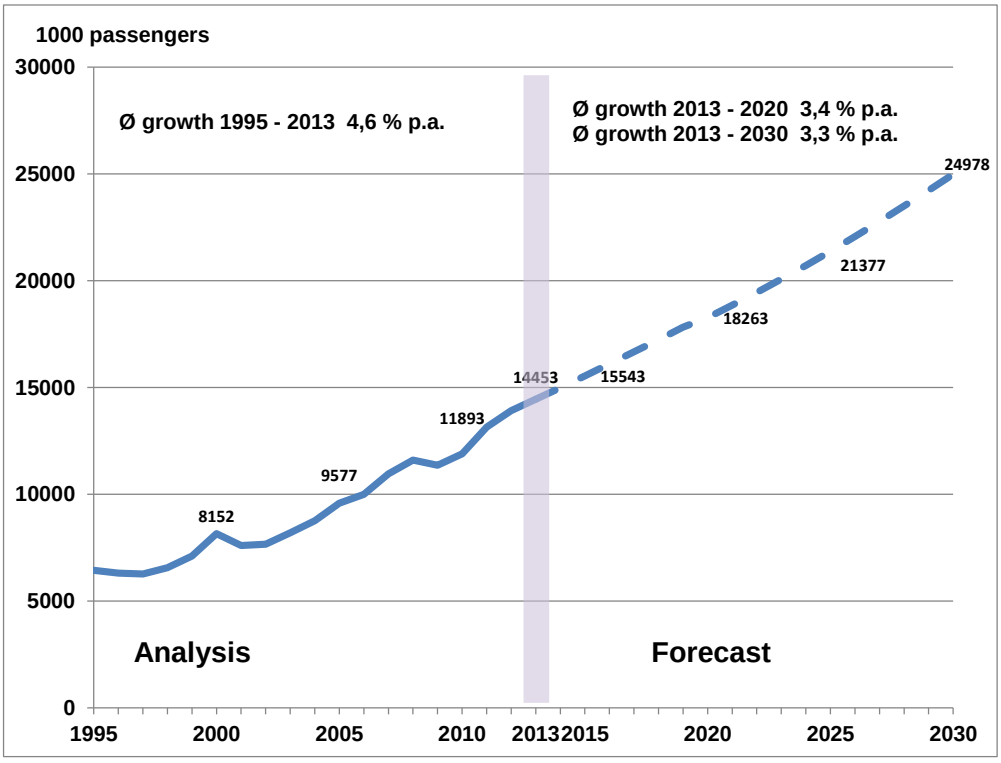


Fig. 5-4: Forecast time series GVA (1995 -) 2013 to 2030

As market shares in effect do not change much, GVA growth is mainly caused by the regional market growth. The figures for 2020 (see Fig. 5-5) and for 2030 (see Fig. 5-6) can be compared to the corresponding Figure 3-12 in chapter 3 above. From the core catchment area (cantons Genève, Vaud and department Haute-Savoie) in 2020 around 12,3 million passengers and in 2030 16,6 million passengers would use GVA airport. Market share of GVA would be higher than 90 % in this area. But also from the cantons Berne (1,9 million in 2030), Valais (0,8 million), Fribourg (0,6 million) and Neuchâtel (0,4 million) in Switzerland and the departments Savoie (0,9 million), Ain (0,5 million) and Rhône (0,4 million), there are relevant traffic numbers for GVA in the forecast years.

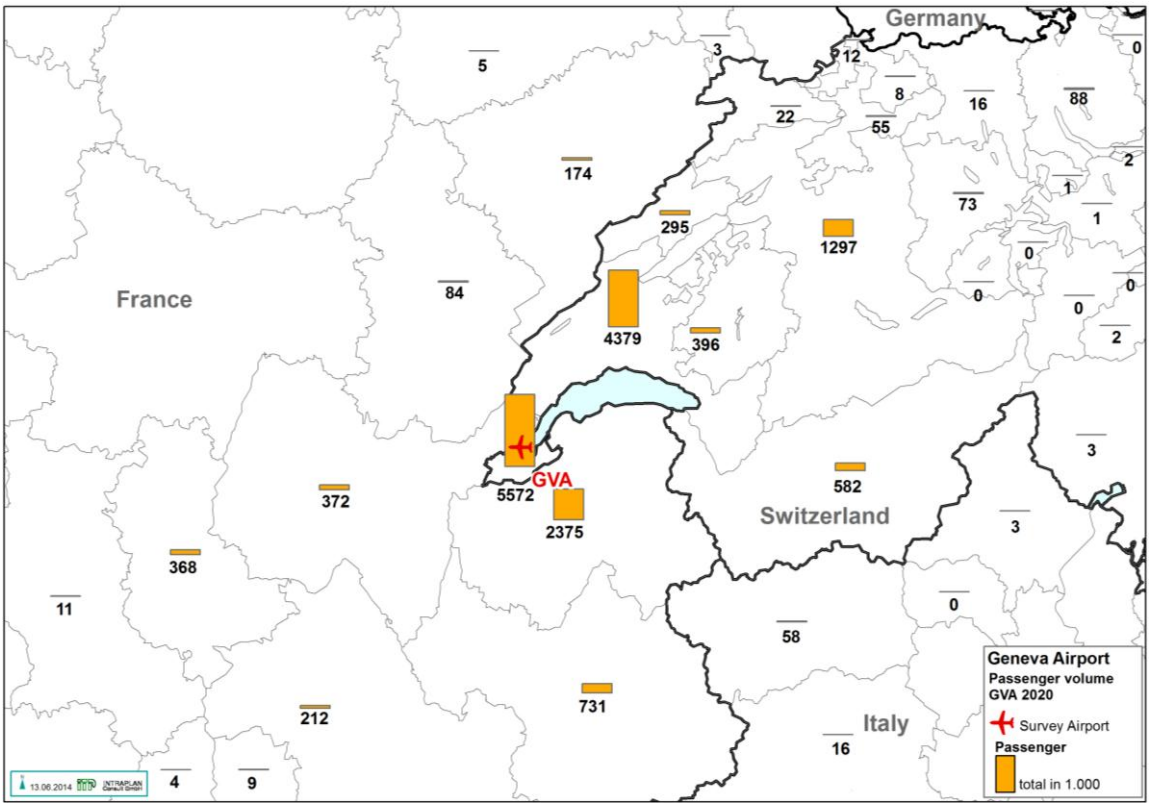


Fig. 5-5: Passengers using GVA per region in 2020 (in 1000 Passengers)

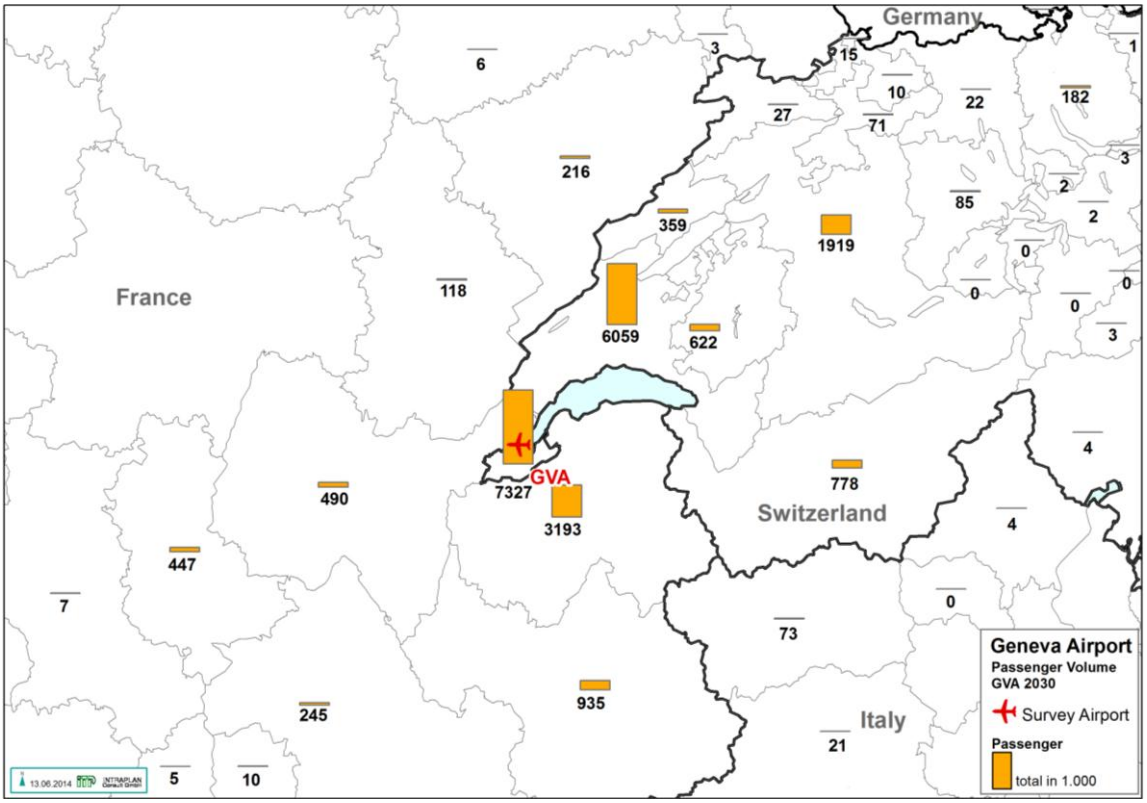


Fig. 5-6: Passengers using GVA per region in 2030 (in 1000 Passengers)

The results of the passenger forecast per **airside region** are shown in Table 5-6.

Region	Passengers (in 1000)			Growth rate in % p.a. 2030 : 2013
	2013	2020	2030	
Switzerland	514	501	469	-0,5
France	1.879	2.378	3.218	3,2
Italy	645	784	1.029	2,8
Germany. Austria	1.075	1.306	1.648	2,5
BENELUX	1.220	1.532	2.042	3,1
United Kingdom and Ireland	3.274	4.044	5.309	2,9
Northern Europe	517	664	960	3,7
Spain. Portugal	2.523	3.065	3.992	2,7
South East Europe and Turkey	646	947	1.551	5,3
Eastern Central Europe and Baltic States	281	395	623	4,8
CIS	388	546	860	4,8
Africa[1)]	397	566	921	5,1
Middle East near Mediterranean	172	228	374	4,7
Middle East Gulf and Arab. Peninsula	447	692	1.112	5,5
Asia, Australia	40	47	62	2,8
America	434	567	808	3,7
Total	**14.453**	**18.262**	**24.978**	**3,3**

1) mainly Northern Africa

Tab. 5-6: Results per traffic area to/from GVA[13] (in 1000)

Generally it can be seen, that traffic growth is higher for intercontinental traffic than for continental traffic. For the latter the traffic with South East Europe/Turkey has the highest growth followed by Eastern Central Europe and CIS. For the first the highest growth rate is for the Gulf area (mainly transfer passengers to Asia via Dubai, Abu Dhabi, Doha).

In total **Non-Schengen** traffic (+ 3,8 % p.a.) will grow stronger than the **Schengen** traffic (+ 3,0 % p.a.) as shown in Tab. 5-7. Schengen passenger numbers will grow from 8,9 million to 14,6

13 Airport-airport-connection, that means incl. transfer in GVA and in the regions (for example in Dubai, Paris CDG and others)

million in 2030 (+ 65 %), whereas Non-Schengen traffic would grow from 5,5 million to 10,3 million (+ 93 %). Non-Schengen share in GVA, today 38 %, would rise to 41 % in 2030.

ICAO-Code	1000 passengers			Growth rate 2030 : 2013
	2013	2020	2030	
Schengen Passengers	8.929	11.028	14.640	3,0
Non-Schengen Passengers	5.524	7.234	10.338	3,8
Total	**14.453**	**18.262**	**24.978**	**3,3**

Tab. 5-7: Passenger Forecast GVA - Schengen/Non-Schengen

6. OTHER TRAFFIC SEGMENTS AND ATMS

6.1 Aircraft Movements Passenger Traffic

From the passenger traffic forecast per destination (and airline) the number of ATMs can be derived for this most important traffic segment, this is **scheduled and charter traffic** (passenger flights):

Region	Passenger ATM			Growth rate in % p.a. 2030 : 2013
	2013	2020	2030	
Switzerland	7.830	7.581	6.817	-0,8
France	16.017	18.039	21.498	1,7
Italy	7.200	7.962	9.299	1,5
Germany. Austria	16.570	15.839	16.135	-0,2
BENELUX	13.037	14.962	17.191	1,6
United Kingdom and Ireland	27.585	32.025	37.400	1,8
Northern Europe	5.366	6.700	8.905	3,0
Spain. Portugal	19.722	23.077	27.456	2,0
South East Europe and Turkey	5.217	8.015	12.594	5,3
Eastern Central Europe and Baltic States	3.329	4.619	6.869	4,4
CIS	3.785	5.097	7.301	3,9
Africa[1)]	3.623	4.783	6.756	3,7
Middle East near Mediterranean	1.433	1.883	2.901	4,2
Middle East Gulf and Arab. Peninsula	3.382	4.195	5.626	3,0
Asia, Australia	255	295	351	1,9
America	2.568	3.327	4.501	3,4
Total	**136.919**	**158.400**	**191.600**	**2,0**

1) mainly Northern Africa

Tab. 6-1: Results of passenger-ATM (scheduled and charter) per traffic area to/from GVA

In the average yearly growth of passenger ATMs is at about 2 % in the period 2013 to 2030 (2,1 % between 2013 and 2020). ATMs in passenger traffic (scheduled + charter) grow from 136,9 thousand in 2013 to 158,4 thousand in 2020 and to 191,6 thousand in 2030.

As for the passenger numbers the strongest growth for ATMs is for intercontinental traffic, apart from Eastern and Southeastern Europe. For the latter we expect more destinations and more regular services to/from the Hub airport Istanbul so that here the number of passengers per flight in the average is not growing.

In this context we expect a continuing growth in the number of passengers per flight, by 1,2 % per year in the average. In total, passengers per ATM would grow from 106 in 2013 to 115 in 2020 and 130 in 2030.

Region	Passengers/Pax-ATM			Growth rate in % p.a. 2030 : 2013
	2013	2020	2030	
Switzerland	66	66	69	0,3
France	117	132	150	1,4
Italy	90	98	111	1,2
Germany. Austria	65	82	102	2,7
BENELUX	94	102	119	1,4
United Kingdom and Ireland	119	126	142	1,1
Northern Europe	96	99	108	0,7
Spain. Portugal	128	133	145	0,8
South East Europe and Turkey	124	118	123	0,0
Eastern Central Europe and Baltic States	84	86	91	0,4
CIS	103	107	118	0,8
Africa[1)]	110	118	136	1,3
Middle East near Mediterranean	120	121	129	0,4
Middle East Gulf and Arab. Peninsula	132	165	198	2,4
Asia, Australia	156	161	176	0,7
America	169	170	179	0,3
Total	**106**	**115**	**130**	**1,2**

1) mainly Northern Africa

Tab. 6-2: Passengers per passenger-ATM in the traffic areas to/from GVA

6.2 Cargo

We expect nearly a doubling of loaded and unloaded **cargo** in GVA until 2030 (growth from 52 to 96 thousand tons), at an average growth rate of 3,6 % p.a. (see Fig. 6-1). This is a considerable growth; however Fig. 6-1 reveals, that in 1995 already 78 thousand tons of cargo were handled in Geneva.

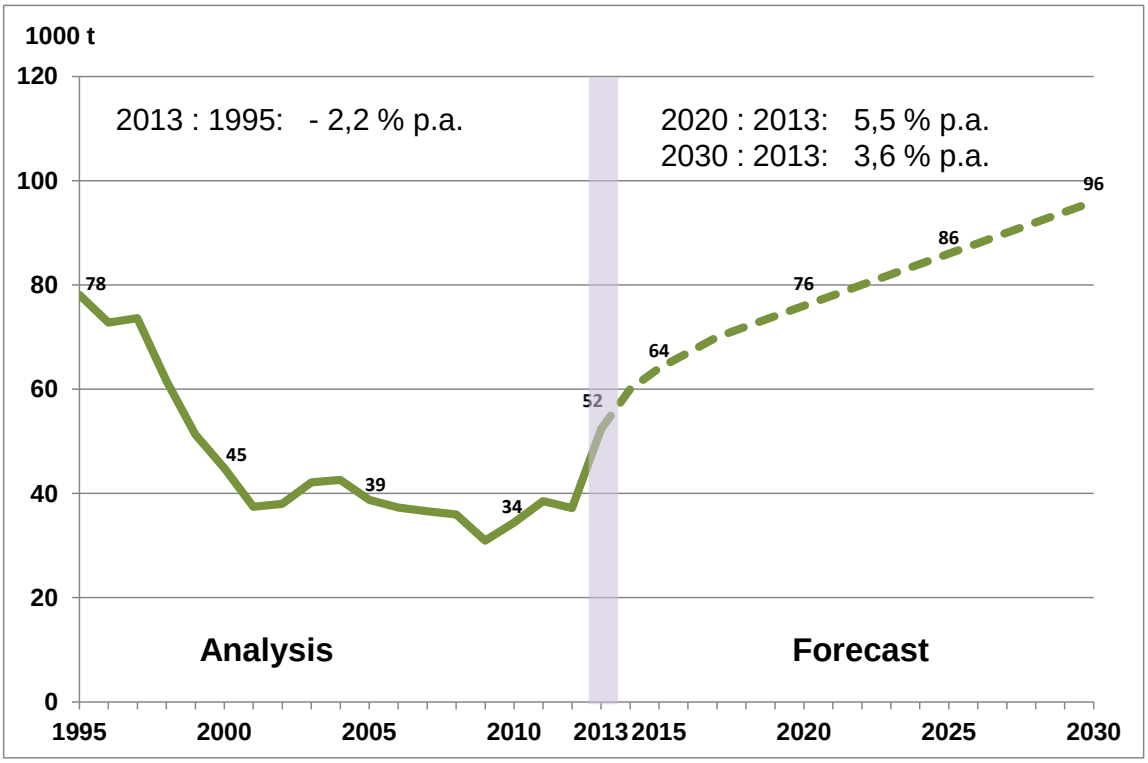


Fig. 6-1: Forecast time series GVA (1995 -) 2013 to 2030 in 1000 t Cargo (loaded + unloaded)

The growth is in line with intercontinental passenger traffic (belly freight). We expect a traffic jump from 2013 to 2015 due to the expansion of the Gulf Carrier passenger services, then a continuous growth until 2030. Aircraft movements in the cargo segment will stay roughly constant at under 2 thousand ATMs until 2030.

6.3 General Aviation

The structure of ATMs in GVA in the base year 2013 is shown in tab. 6-3. General Aviation, that is the quite heterogeneous traffic not related to (scheduled/charter) passenger flights and to cargo, has in total with 50,3 thousand of 188,8 thousand ATMs a considerable share of 27 % in GVA.

Type	ATMs in 1000
Passenger flights (scheduled/charter)	136,9
Cargo flights	1,6
Business Aviation	19,0
Training	4,5
Other non-commercial flights	23,8
Government, Military, Ambulance	1,7
Ferries/test flights	1,2
Total	**188,8**
thereof General Aviation	**50,3**

Tab. 6-3: Structure of ATMs in 2013 in GVA

Of that traffic we expect only in the segments Business Aviation and ferries (these together with the small number of fest flights) a relevant growth:

- According to forecasts in the business aviation sector[14] we expect a growth in this segment of 1,25 % to 2020 and of 1,1 % p.a. to 2030
- The same rate has been assumed for cargo flights. The assumption is here that due to economies of scale some additional flights arise even if the main share of cargo is belly cargo.
- For ferry flights it has been assumed that there is a correlation with the number of scheduled and charter flights (more connections, more aircrafts, more necessity for ferry flights due to maintenance or other technical reasons), however it is, as can be seen in the past, underproportional.

The results for this expansion of General Aviation (including the few cargo flights) are shown in tab. 6-4.

[14] Eurocontrol: Briefing: Business Aviation in Europe 2011

	ATMs in 1000		
Type	**2013**	**2020**	**2030**
Passenger flights (scheduled/charter)[1)]	136,9	158,4	191,6
Cargo flights	1,6	1,7	1,7
Business Aviation	19,0	20,8	23,2
Training	4,5	4,5	4,5
Other non-commercial flights	23,8	23,8	23,8
Government, Military, Ambulance	1,7	1,7	1,7
Ferries/test flights	1,2	1,3	1,5
Total	**188,8**	**212,2**	**248,2**
thereof General Aviation and Cargo	**51,8**	**53,8**	**56,6**

1) see chapter 1

Tab. 6-4: Development of the ATMs per segment in GVA

That means, traffic growth in GVA is mainly related to passenger flights and only for a minor extent to the other traffic segments.

6.4 Total ATM

Total ATMs per region are shown in Table 6-5.

Total growth in ATMs is from 189 thousand to 248 thousand in 2030 (+ 31 % or 1,6 % per year in the average). The growth of ATMs is mainly caused by passenger traffic (see Tab. 6-4). Other traffic (here cargo and General Aviation) is growing at a low rate: From 51,8 thousand ATMs in 2013, traffic will grow by 3,8 % to 2020 (53,8 thousand). In 2030 there will be 56,6 thousand movements in this segment, which is a growth of 9,2 % compared to 2013 (= 0,5 % p.a.).

Region	Total ATMs			Growth rate in % p.a. 2030 : 2013
	2013	2020	2030	
Switzerland	19.188	18.671	17.705	-0,5
France	30.721	33.580	38.025	1,3
Italy	11.016	11.957	13.506	1,2
Germany. Austria	20.386	19.719	20.141	-0,1
BENELUX	15.097	17.057	19.354	1,5
United Kingdom and Ireland	33.183	37.772	43.395	1,6
Northern Europe	5.905	7.259	9.488	2,8
Spain. Portugal	21.913	25.349	29.849	1,8
South East Europe and Turkey	6.770	9.672	14.373	4,5
Eastern Central Europe and Baltic States	4.131	5.482	7.805	3,8
CIS	6.368	8.036	10.756	3,1
Africa[1)]	4.380	5.651	7.810	3,5
Middle East near Mediterranean	1.732	2.229	3.333	3,9
Middle East Gulf and Arab. Peninsula	4.231	5.127	6.674	2,7
Asia, Australia	396	458	539	1,8
America	3.349	4.184	5.448	2,9
Total	**188.766**	**212.201**	**248.201**	**1,6**

1) mainly Northern Africa

Tab. 6-5: Results of total ATMs per traffic area to/from GVA

The growth of ATMs in the forecast period is at the same level of magnitude as in the past (see Fig. 6-2).

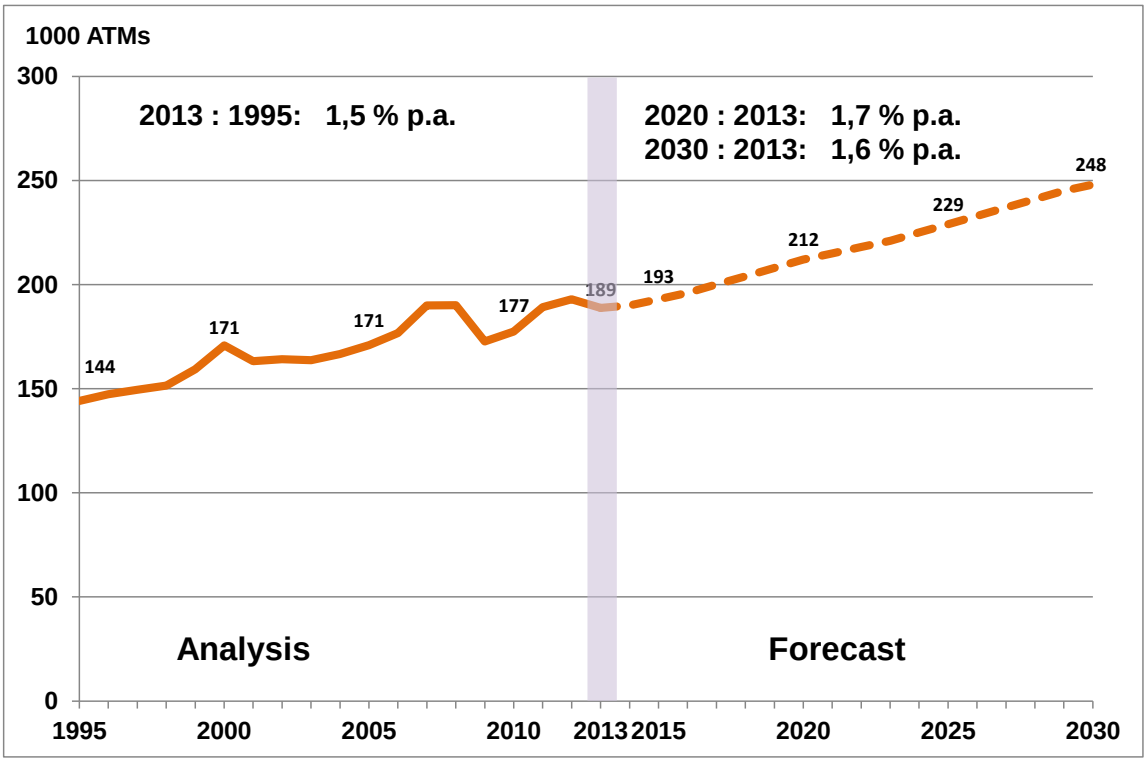


Fig. 6-2: Forecast time series for GVA (1995 -) 2013 to 2030 - ATMs

The highest absolute growth is in ICAO Annex 14 aircraft category C (standard single aisle aircraft and larger regional aircraft). Movements in this category will grow by 51 thousand, from 132,8 thousand in 213 to 183,8 thousand in 2030. The share of Code C aircraft movements in Geneva will rise from 70 % to 74 %. The highest relative growth, however, will be in category E (mainly modern two engine wide-body aircraft such as Boeing 777, 787 and Airbus A330, 350). AMTs in this category will grow from 2,8 thousand to 6 thousand in 2030 (+ 115 %, see Tab. 6-6).

ICAO Annex 14[1)] Code	Aircraft Movements			Growth rate 2030 : 2013
	2013	2020	2030	
Helicopter	2.951	3.020	3.115	0,3
A[2)]	15.928	16.071	16.559	0,2
B[3)]	27.012	28.392	30.319	0,7
C[4)]	132.805	153.009	183.821	1,9
D[5)]	7.269	7.986	8.337	0,8
E[6)]	2.801	3.722	6.037	4,6
F[7)]	0	0	13	--
Total	188.766	212.201	248.201	1,6

1) Aerodrome Reference Code Element 2
2) small aircraft
3) larger GA aircraft, small regional aircraft
4) larger regional, standard aircraft (B737, AB 319-324)
5) B757, MD 11 etc.
6) wide-body A 330, 340, 350, B747, B767, B777, B782
7) A380

Tab. 6-6: Aircraft movements per ICAO-category

The most majority of traffic is in the C-category, that are mainly standard aircrafts (B737, A319/ 320/321) incl. larger regional jets (E 190/195, C-series).

7. SUMMARY OF FORECAST RESULTS

The results of the forecast are summarized in Table 7-1.

Passenger numbers in Geneva would grow from 14,5 million in 2013 to 18,3 million in 2020 and reaching 25 million in 2030. Average yearly growth would be at 3,3 % per year which is less than the demand growth in the past (4,6 % p.a. between 1995 and 2013, 5,9 % p.a. between 2002 and 2013).

Segment	2013	2020	2030	2030 : 2013 in % p.a.
Passengers (mill.)	14,45	18,26	24,98	3,3
transfer share	4,5 %	5,1 %	6,5 %	2,2
Cargo (1000 t)	52	76	96	3,7
ATM (1000)	189	212	248	1,6
thereof pass-ATM	137	158	192	2,0
other ATM	52	54	57	0,5

1) totals, scheduled and charter traffic, General Aviation and transit

Tab. 7-1: Overview of the forecast results for GVA (unrestricted demand)

Main drivers for the growth of passenger numbers is the stable and over average economic growth in the core catchment area of GVA, which will strengthen its role as one of the wealthiest regions in Europe and in the world. This demand growth is supported by an expansion of traffic supply in the low-cost segment and in intercontinental traffic. Growth in intercontinental traffic will also lead to a rise of the transfer share from 4,5 % to 6,5 % in GVA. Both segments, LCC and intercontinental traffic, profit also from rising capacity restraints in Zurich, whereas the French regional airports like Chambery, Grenoble pull minor traffic numbers away from GVA.

In consequence of the expansion of intercontinental passenger traffic, which lead also to increasing belly freight capacities, loading and unloading of **cargo** will rise from 52 thousand in 2013 to 96 thousand in 2030. This high growth (+ 3,7 % p.a. from 2013 to 2030), however, should even be seen in the context of the past, when GVA already handled cargo volumes of

nearly 80 thousand tons in the nineties due to the than stronger intercontinental traffic in GVA operated by Swissair.

Total **ATMs** in GVA will grow from 189 thousand movements in this unrestricted forecast to 212 thousand in 2020 and 248 thousand in 2030 with a growth rate of 1,6 % p.a. in the average. ATM growth can nearly completely be assigned to passenger traffic, which will grow from 137 thousand movements in 2013 to 192 thousand ATMs in 2030. The average number of passengers per passenger flight would grow strongly from 106 to 130 passengers between 2013 and 2030. Growth rates concerning passengers/flight are at considerable 1,2 % p.a. in the average, however lower than in the past. This has to do with the fact, that structural changes, especially the rise of LCC, implementation of intercontinental flights and the fleeting out of smaller regional aircraft (50 - 70 seater) at the network carriers, like SWISS, Air France and Lufthansa, are widely completed or at least rather advanced in GVA.