Complimentary study on the traffic hypotheses of Nantes-Atlantique airport

Final Report

AUTHORS:

Angelo Martino

Marco Brambilla

Davide Fiorello

TRT Trasporti e Territorio

Milan, 18 July 2019

TRT

Document Control Sheet

Customer	Commission Nationale du Débat Publique
Contract Number	-
PROJECT NAME	Complimentary study on the traffic hypotheses of Nantes-Atlantique airport
FILE NAME	Final report 18July2019
VERSION	V2
DATE	18 July 2019

Document classification

Draft		Final	X	Confidential		Restricted		Public	X

Main editor	Angelo Martino
Contributors	Marco Brambilla and Davide Fiorello
Final approval	Angelo Martino
Available to	Commission Nationale du Débat Publique
This document should be referenced as	Martino, Brambilla, Fiorello, "Complimentary study on the traffic hypotheses of Nantes-Atlantique airport", Milano, July 2019

Contact

Angelo Martino
TRT Trasporti e Territorio
Via Rutilia 10/8
Milano - Italy
Tel: +39 02 57410380
e-mail: martino@trt.it
Web: www.trt.it

LIST OF CONTENT

LIST OF TABLES

LIST OF FIGURES

1 Executive summary

Objectives and methodology

The objective of this study is to assess the 2019 DGAC air traffic forecasts considering the opposite views of those claiming that future projections are either underestimated and the airport will be soon congested, or overestimated due to taxation, stabilisation of growth, different travellers' attitude and climate change regulations. The analysis is based on official documents and studies provided by the *Commission Nationale du Débat Publique* and integrated by additional reports and interviews.

Summary of air traffic data and forecasts

The volume of Nantes airport passengers has been significantly increasing over the 2000-2018 period. The low cost segment shows the largest increase and the majority of the volume, while the other scheduled flights increased at a slower pace. The analysis of the origins and destinations shows the international segment surpassing the domestic one in 2007 and currently accounting for 57% of the volume. The summer season coincides with demand peaks, whose intensity has been increasing through time, but at different paces for passengers and flights movements, respectively. The majority of the travellers is French with residence in Nantes region. The airport generates more outbound than inbound journeys and three quarters of the trips are for holiday, leisure and personal purposes.

DGAC forecast studies

The DGAC developed air traffic forecasts in 2013, 2016 and 2017; the last update was carried out in 2019 and elaborated on a step-wise approach based on the French national model. The methodology used for air traffic forecasts has some potentially questionable aspects, but looks internally consistent, matches well the 1990-2017 data and does not show evident flaws. However, no competition with other airports and no distinction between scheduled and low cost airlines have been assumed. The annual growth rates of the 2019 DGAC forecast are then compared with projections of France transport model, EU Reference scenario, EUROCONTROL and OECD-ITF.

Conclusions

Factors influencing air traffic growth

The operation of a dominant low cost airline could negatively influence future developments of an airport, but this is not the case at Nantes-Atlantique, because more low cost airlines operate in competition for some destinations. Projections of demography, population aging and migration flows could either positively, or negatively, change users preferences and attitude to travel in the future.

The competition with other French airports is found negligible or low, either because of the smaller size or because of minor overlaps. Also the competition with high speed trains (with the exception of trips to/from Paris) and long distance bus services is found low or negligible, due to the different nature of the destinations operated.

On the technical side, engines' efficiency improvements might partially compensate an increase of fuel taxation. Regarding political scenarios, they could negatively affect future developments, being the Brexit and political tension in the area of Persian Gulf some examples.

Our view on 2019 DGAC air traffic forecast

On a short/medium term (2030), the 2019 DGAC air traffic forecast seems not overestimating future development. The initial ramp-up period, followed by a linear growth, seems realistic. The average annual growth rate at this time horizon is found slightly higher compared to the other projections considered.

On the long term (2040/2050), the envisaged growth seems less likely to happen, because of market saturation. The average annual growth rate of 2019 DGAC air traffic forecast found higher with respect to other projections considered.

2 Objective and methodology of the study

2.1 Introduction

On January 17, 2018, the French Prime Minister announced the Government's decision to abandon the project for the construction of a new airport in Notre-Dame-des-Landes (Grand Ouest) and to redevelop the existing Nantes-Atlantique airport under the management of the Direction Générale de l'Aviation Civile (DGAC).

It is within the framework of this decision that the redevelopment project for the Nantes-Atlantic airport by 2040 is the subject to "prior consultation with guarantors" of the Commission Nationale du Débat Publique (CNDP). The purpose of this consultation is to inform in a transparent way the participants and discuss mobility needs, protection issues populations, environmental issues, socio-economic impacts as well as territorial integration of the project.

This consultation should allow the collection of opinions, stakeholder expectations and proposals for the redevelopment of the existing airport, and the options studied by the DGAC to meet needs in short (2025), medium (2030) and long (2040) terms. The opinion of the public and stakeholders is particularly expected on several "options" that proposes the DGAC to meet the objectives of the project: (i) options for the runway at Nantes-Atlantique airport, (ii) location, level of service and urban insertion the terminal that needs to be modernised and expanded and (iii) a "curfew" on the airport consisting of prohibiting the scheduling of flights between 00:00 and 06:00 am.

As part of such process, the DGAC assumes that the need for air mobility will be established at: 8.3 million passengers in 2025, 9.2 million in 2030 and 11.4 million in 2040, while commercial aircraft movements (excluding cargo) will be 71,000 in 2025, 76,000 in 2030 and 89,000 in 2040, respectively.

2.2 Objective

The objective of this analysis is to assess the solidity of such traffic forecast taking into account the criticisms of economic actors and civil society organisations that consider this (i) as underestimate in comparison to the traffic potential expected of the airport of the Grand Ouest and (ii) as overestimate due to the consequences of taxation, stabilisation of growth implied by the creation of a network of regional airports (possibly including Parisian airports) and climate change related regulations.

2.3 Methodology

The analysis of forecast has been based on the official documents and studies related to the airport traffic forecasts that were provided by the Contractor. Additional documentation has been gathered in relation to air transport market development and transport demand projections at different geographical levels.

All documents used are cited and cross references throughout the chapters.

3 Summary of Nantes airport traffic data and forecasts

This section presents the trend of observed passengers volume and aircrafts movements at Nantes-Atlantique airport for the 2000-2018 period. Available data is analysed with respect to different demand segments in section 3.1 (low cost and standard airlines and domestic and international), also including considerations on its seasonal variations. Section 3.2 summarises the main characteristics of the passengers according to a survey published by DGAC in 2017.

3.1 Observed traffic volumes

According to DGAC (2019)[1] data, the volume of passengers observed at Nantes-Atlantique airport has been significantly increasing over the 2000-2018 period, from 1.9 to 6.1 million (see Figure 3-1), which means an annual growth rate of 6.8%.

With respect to passengers travel segments, the low cost segment is the one found showing the largest increase, from around 12 thousand to 3.6 million passengers. Currently, it accounts for the majority of the passengers transported (i.e., 59%) and the highest annual growth rate, which is found equal to 37.1%.

Figure 3-1: Observed traffic at Nantes-Atlantique airport by passenger segment (absolute value)
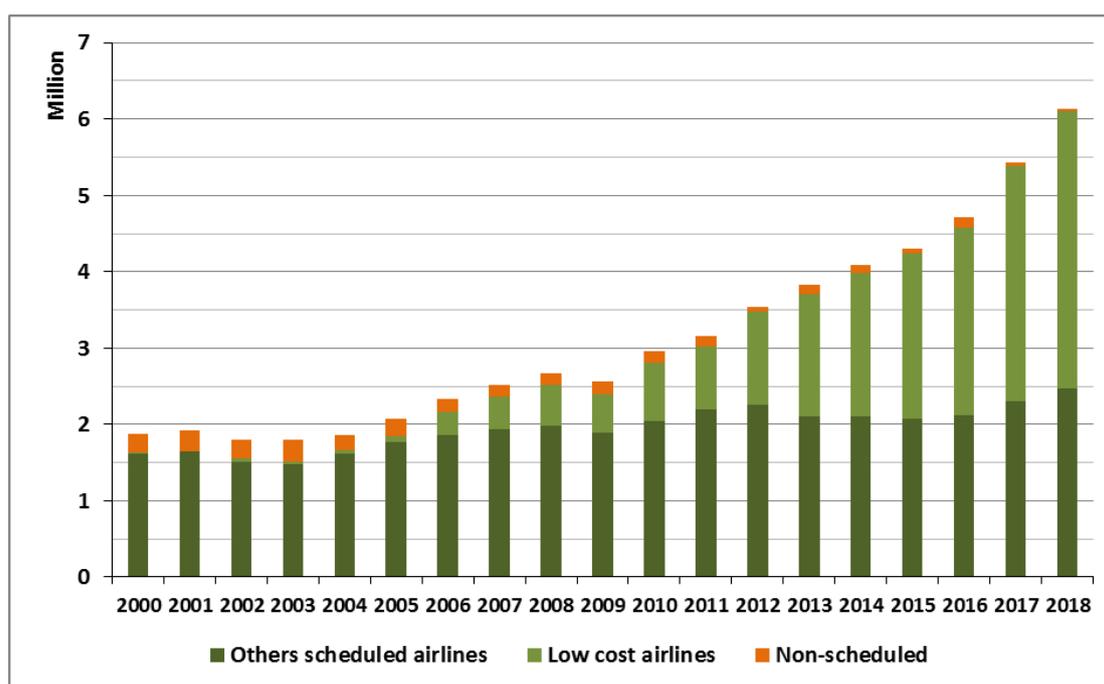
Source: TRT elaboration on DGAC data (2019)

The low cost travel segment is followed by the one of passengers generated by other scheduled flights, namely flights operated by traditional airlines. For this segment, the volume of passengers transported has been increasing at a slower pace, from 1.6 to 2.5 million, at 2.4% on average on annual basis. The percentage of passengers transported has more than halved, from 86.4% to 40.4%.

A minority role is played by the passengers travelling on non-scheduled flights, i.e. charter flights, of which the observed volume is found reducing, from 244 to 40 thousand. It is worth noticing that the percentage of this segment has been decreasing from 13.0% to 0.7% mainly to the benefit of low cost airlines.

---

[1]   Elaboration based on sde1_3278b_data_airport_2juillet2019.xls.

Figure 3-2: Observed traffic at Nantes-Atlantique airport by passenger segment (percentage)
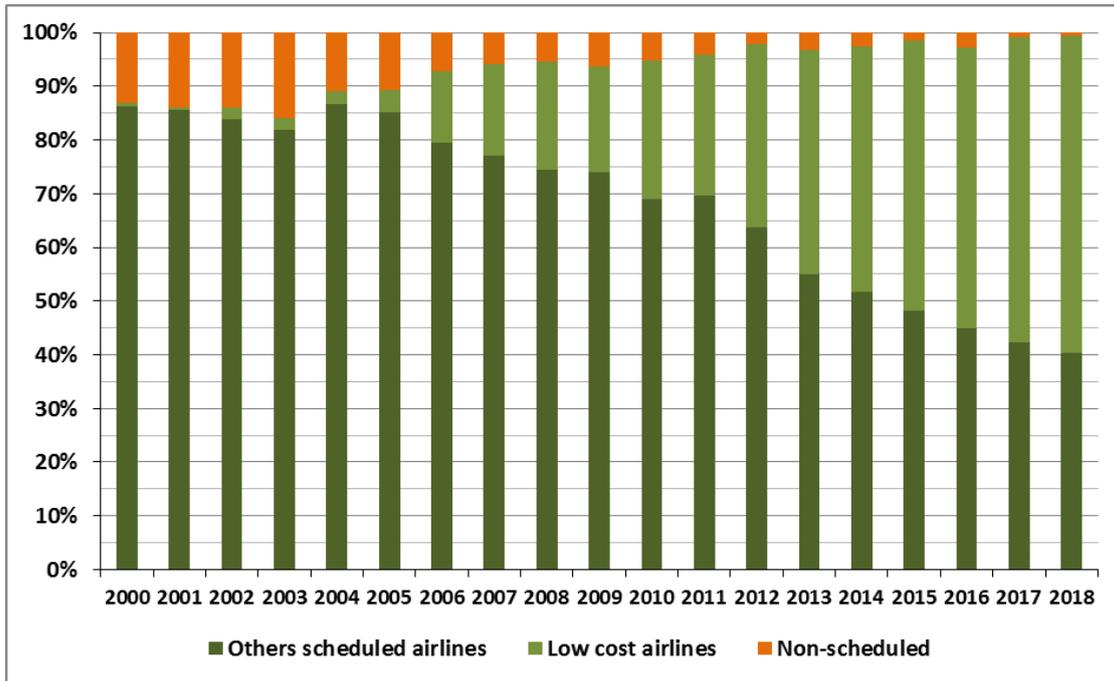
Source: TRT elaboration on DGAC data (2019)

The analysis of passengers' volume with respect to flights origin/destination shows that the International segment has surpassed the Domestic one in 2007 and is currently accounting for around 57% of the total observed volume. Because the share of the International segment is found relatively stable, i.e. around 40%-41%, up to 2004 and then steadily increasing afterwards, this might suggests a possible correlation with the development of the low cost demand segment at Nantes-Atlantique airport. Figure 3-3 and Figure 3-4 present the trends of passengers travelling on Domestic and International segments respectively, in terms of absolute value and percentage.

Figure 3-3: Observed traffic at Nantes-Atlantique airport by passengers' origin/destination (absolute value)
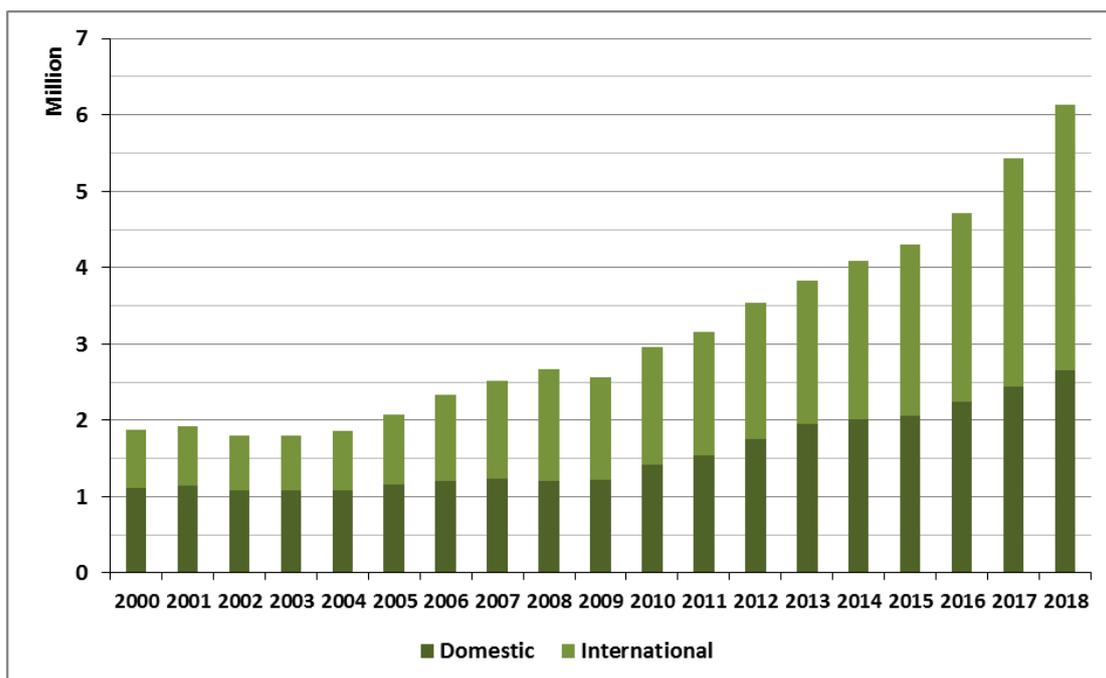
Source: TRT elaboration on DGAC data (2019)

Figure 3-4: Observed traffic at Nantes-Atlantique airport by passengers' origin/destination (percentage)
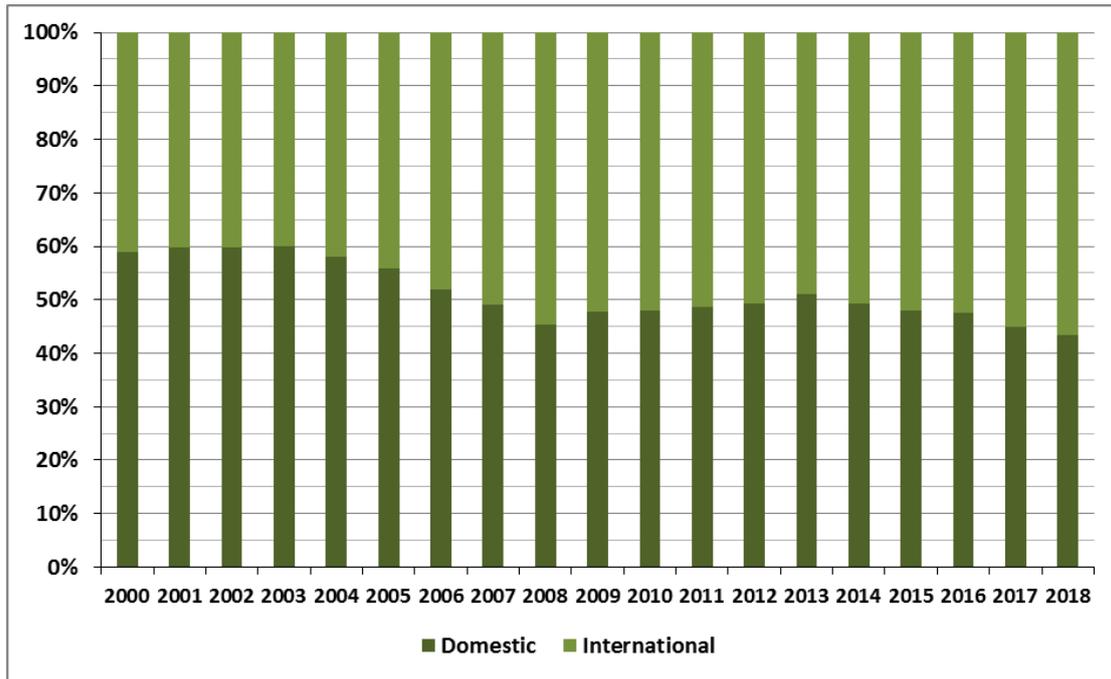
Source: TRT elaboration on DGAC data (2019)

Data disaggregated on a monthly basis allows to analyse the seasonal variation of passengers and movements, with respect to the same segments discussed above. Not surprisingly, annual summer peaks clearly identify the period of the year at which passengers volume concentrates.

The overall trend of passengers demand peaks is found steadily increasing (see Figure 3-5). Different paces can be observed for Domestic and International segments, being the latter more pronounced. This pattern is probably due to passengers demand to travel to holiday destinations. Interestingly, the deviation of the summer peaks from the annual average monthly volume is found increasing over time. After a relatively flat period between 2000 and 2004, since 2005 a constant increase is visible.

A similar pattern is found for the flights movements, but to a smaller extent (see Figure 3-6). Overall, their number has been reducing until 2004, for both type of connections. Afterwards, the movements of Domestic is relatively flat, while for International flights, again a constant increase can be observed.

Figure 3-5: Observed monthly variation of passengers' volume
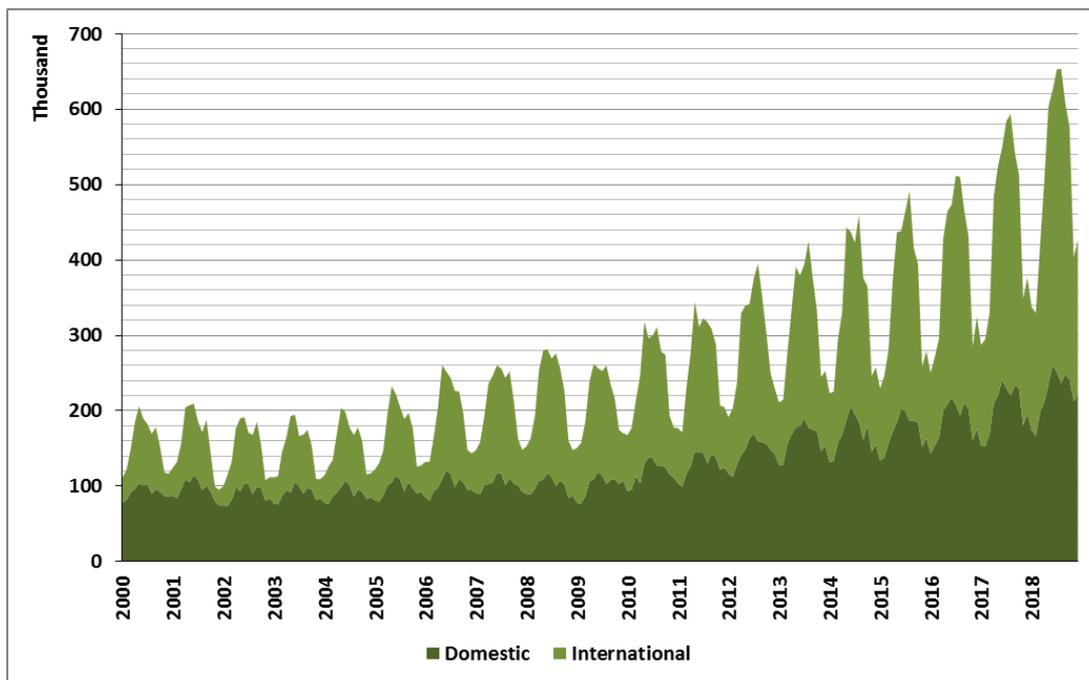
Source: TRT elaboration on DGAC data (2019)

Figure 3-6: Observed monthly variation of flights movements
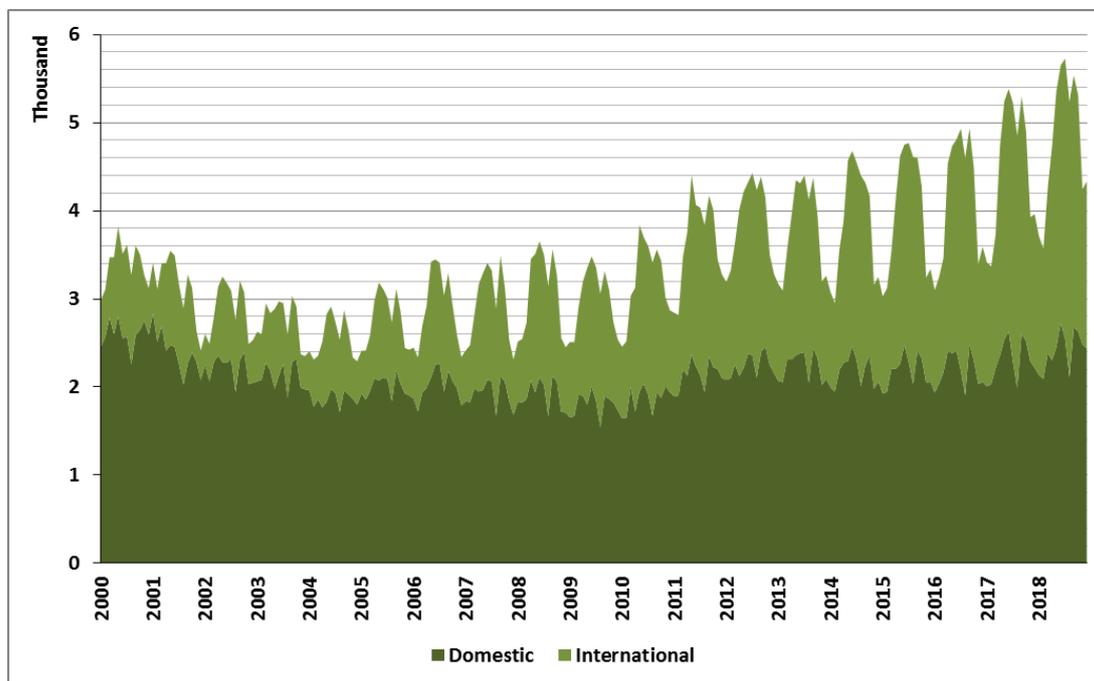
Source: TRT elaboration on DGAC data (2019)

The different patterns found for (monthly) passengers volume and movements imply that the load factor has been increasing over time, as far as the load factor of Domestic flights is concerned, the increase of passengers volume combined with the relatively unchanged number of movement has resulted in a higher load factor through time. In 2018, the load factor is approximately three times larger than the value

calculated at the beginning of the period of observation. This is assumed to be the consequence of the increased share of low cost flights within the segment.

For International flights, the load factor does not show a stable and unique trend and seasonal peaks are more pronounced. After the increase observed between 2000 and 2008, the effect of the economic downturn is evident from 2009 to 2011. The recovery to the pre-crisis level has been reached in 2016.

Figure 3-7 shows.

As far as the load factor of Domestic flights is concerned, the increase of passengers volume combined with the relatively unchanged number of movements has resulted in a higher load factor through time[2]. In 2018, the load factor is approximately three times larger than the value calculated at the beginning of the period of observation. This is assumed to be the consequence of the increased share of low cost flights within the segment.

For International flights, the load factor does not show a stable and unique trend and seasonal peaks are more pronounced. After the increase observed between 2000 and 2008, the effect of the economic downturn is evident from 2009 to 2011. The recovery to the pre-crisis level has been reached in 2016.

Figure 3-7: Observed load factor (passengers per flight movement)
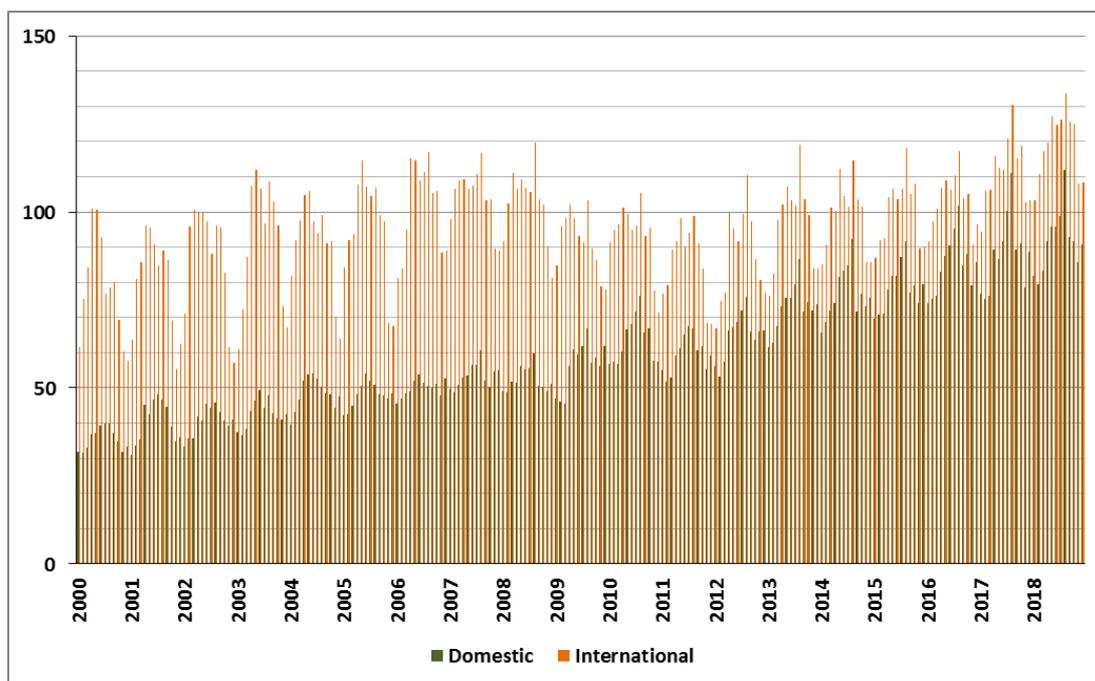
Source: TRT elaboration on DGAC data (2019)

3.2 Passengers characteristics

The profile of the passengers travelling at Nantes-Atlantique airport is available from the survey that the DGAC carried out between October 2015 and March/July 2016 (Duffau and Green, 2017)[3].

As regards the nationality of the interviewees, the majority was found French (84.3%). The citizenship of foreign travellers was found manly from other European countries (11.4%) and the rest from North

---

[2] The capacity of the aircrafts can be assumed unchanged through time.
[3] Duffau E. and Green A. (2017). Enquête Nationale Auprès Des Passagers Aériens Résultats Globaux Octobre 2015, mars et juillet 2016, Rapport Nantes, 3 mars 2017. The survey considered a sample of 1,472 persons.

America, Africa and South America. The residence of French citizens was stated within Nantes' department (Loire-Atlantique, 34.3%), or in neighbouring administrations of the north-west of France (34.2%).

The airport originating the journey was stated to be in France for almost all the interviewees (99.8%), while the airport of destination was found diversified mainly between other Member States (44.6%) and France (40.3%). Interestingly, 68% of the respondents had stated that they were returning, which means that the airport generates more outbound than inbound journeys.

The main travel purpose was stated for holiday or leisure (52%), followed by professional reasons (business or education, 27%) and other personal reasons (visit to the family, 21%). The duration of the stay was found relatively long, being 63% for a period of 4-15 days and longer than 15 days for 9% of the interviewees.

The characteristics of the ticket purchased (i.e., non-refundable, no change of the date allowed, with return, the average number of days before the purchase (53) and the purchase at own expenses), alongside with the destinations of the journey, the duration of the stay and the share of outbound journeys[4], suggest that holiday or leisure abroad was one of the main motivations to travel for the respondents. This also considering that French passengers had stated that, over one year before the date of the survey, they had travelled occasionally (i.e., 0 or 1 flight).

The characteristics of the travellers also fit with the seasonality of the demand, which concentrates during the summer (there are no observed winter peaks). The fact that the destinations are more likely in Europe is also suggested by the type of aircrafts normally operate at Nantes-Atlantique airport. Available data shows that 64% of the movements was operated by narrow-body medium-haul aircrafts in 2018 (i.e., A318, A319, A320 and B737NG), which typically are also the backbone of in low cost airlines fleets.

---

[4] Outbound indicates journeys that are originated in Nantes-Atlantique airport to other destinations.

4 DGAC forecast studies

This section discusses the main characteristics of the DGCA model to forecast passengers' volume and aircrafts movements at Nantes-Atlantique airport over the recent years.

Section 4.1 focuses on the model developed in 2013 and its updates carried out in 2016 and 2017. Section 4.2 presents a brief overview of the 2019 model commenting on the methodological approach, internal consistency and main outputs. Section 4.3 presents the scenarios of air transport projections at national, EU and multi-national levels. The main findings are cross-compared and discussed in section 4.4, with respect to the average annual growth rates found at medium and long term time horizons.

As regards the outputs of the models, it is worth anticipating that the level of disaggregation of the information made available can vary. The forecasts of 2013 and 2017 present aggregate outputs for passengers and aircrafts movements, while 2016 and 2019 provide them more disaggregated and with respect to relevant segments (i.e., domestic and international).

4.1 Previous DGAC air traffic forecasts

4.1.1 2013 forecast

In 2013 the DGAC had developed traffic forecasts for Nantes-Atlantique airport for medium (2018) and long term (2030) horizons, starting from the observed traffic in 2012 (Ministère de la Transition Ecologique et Solidaire and DGAC, 2013)[5]. The modelling exercise was developed considering different categories of destinations: Paris (CDG and ORY), other domestic, the EU, non-EU and overseas. The model was based on the following general assumptions:

- GDP evolution over the 2018-2030 period;

- characteristics of air connections, also assuming that (i) tickets price would have incorporated the changes of fuel price and (ii) variation of the number of flights operated per connection (i.e., frequency);

- the airport was not a base for the operations (i.e., a *hub*) of the airlines over the period considered;

- a 45% market share of low cost airlines at 2030;

- the opening of high speed railway lines (i.e., TGV services).

Specific methodologies (and assumptions) were considered for medium and long term forecasts.

- For the medium term horizon (2018), the number of movements was simulated on the basis of the number and type of aircrafts in 2012 and the average load factor was assumed to be a function of the destination and type of aircraft.

  Besides, the competition of TGV services was also introduced assuming (i) improvements of high speed services offer and (ii) the opening of the TGV line *Bretagne Pays de la Loire*. Because of the effect of the TGV, the volume of passengers at the airport was estimated to reduce by 120 thousand units.

- For the long term horizon (2030), the number of movements and the load factor was assumed to be increasing at a slower pace due to an envisaged change of the type of aircrafts used. This had implied that the number of movements was assume to be increasing at a halved pace compared to that of the passengers. In particular, these scenarios was developed by assuming:

---

[5] Ministère de la Transition Ecologique et Solidaire and DGAC (2013). Simulation de trafic à Nantes Atlantique dans l'hypothèse d'un maintien des activités commerciales Note technique.

→   a high value of oil price (i.e., USD 125 per barrel), which would have determined a reduction of the flights operated with the smallest (and less profitable) aircrafts (50-70 seats);

→   an increase of the number of destinations offered by low cost airlines;

→   that flight tickets of standard airlines are being sold following the business model of low cost airlines;

→   the elasticity of passengers with respect to (i) GDP and (ii) flights ticket price as shown in Table 4-1.

Table 4-1: Assumed elasticity[6] to GDP and flights ticket price

Demand segment	Elasticity to GDP	Elasticity to flights ticket price
Domestic	+0.7	- 0.9
International	+1.0	- 0.7

Source: Ministère de la Transition Ecologique et Solidaire and DGAC (2013)

Table 4-2 summarises the envisaged growth rates of passengers volume and flights movements, according to 2013 DGAC estimations. Figure 4-1 shows corresponding outputs, also comparing 2013 flights movements forecast with respect to the actual observed figures.

Table 4-2: Annual growth rates of passengers' volume and movements of 2013 DGAC forecasts

Period	Year	Annual growth rate with respect to the previous year [%]	
		Passengers	**Movements**
Medium term	2013	8.4	4.2
	2014	5.4	2.7
	2015	5.0	2.5
	2016	4.5	2.3
	2017	3.5	1.8
	2018	2.0	1.0
Long term	2019	2.2	1.1
	2020	2.1	1.0
	2025	2.0	1.0
	2030	2.1	1.0

Source: TRT elaboration on Ministère de la Transition Ecologique et Solidaire and DGAC (2013)

---

[6]   For example, increasing by 1% the GDP, the domestic demand increases by 0.7%. Or increasing by 1% the flights ticket price, the domestic demand reduces by 0.9%.

Figure 4-1: Passengers volume and movements of 2013 DGAC forecasts
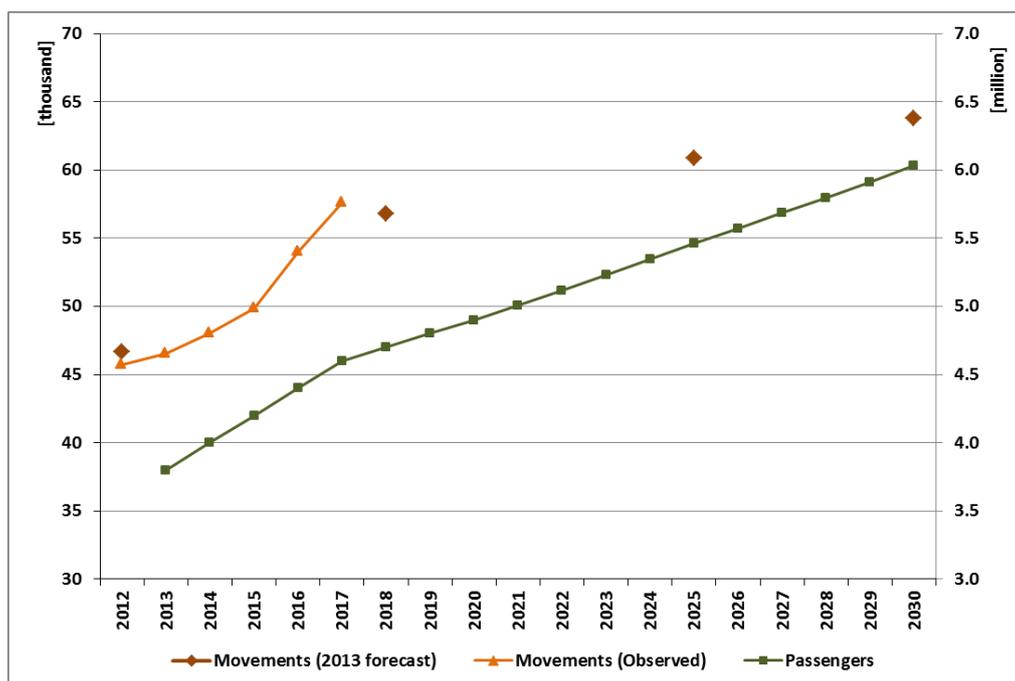
Source: TRT elaboration on Ministère de la Transition Ecologique et Solidaire and DGAC (2013)

4.1.2 2016 forecast

The first update of 2013 forecast was developed in 2016 to take account of the remarkable growth of the passengers volume observed in 2015-2016 (+9.4%) and 2016-2017 (i.e., 11.7%) respectively (Ministère de la Transition Ecologique et Solidaire and DGAC, 2017)[7].

Starting from an estimated volume of 5.2 million passengers in 2017, determined on the basis of the trend of the previous year, the forecast showed that an average annual growth rate of 2.6% would have been sufficient to reach a volume of 7.7 million passengers in 2035. This corresponded to an average annual growth rate of 1.9% in terms of aircrafts movements.

The estimation was developed assuming (i) annual growth rates of GDP at national and local level (i.e., 1.5% for France and 1.8% for Pays de la Loire, respectively) and (ii) the oil price equal to USD 120 per barrel. Moreover, the share of low cost airlines market was assumed equal to 55% in 2035, while long-haul low cost airlines were not considered for this exercise. The tables below summarises the main outputs at 2025 and 2035 for passengers volume, flights movements and load factor, distinguishing with respect to domestic and international connections.

Table 4-3: Passengers' volume of 2016 DGAC forecast (million)

Passengers	Observed		Forecast		Average annual growth rate		
	2015	2016	2025	2035	15-25	15-35	16-35
Domestic	2,062	2,242	2,689	3,213	2.7%	2.2%	1.9%
International	2,246	2,470	3,381	4,444	4.2%	3.5%	3.1%
Total	**4,308**	**4,712**	**6,070**	**7,657**	**3.5%**	**2.9%**	**2.6%**

Source: TRT elaboration on Ministère de la Transition Ecologique et Solidaire and DGAC (2017)

---

7   Ministère de la Transition Ecologique et Solidaire and DGAC (2017). Previsions de traffic, Médiation NDDL – 30 juillet 2017.

Table 4-4: Flights movements of 2016 DGAC forecast (thousand)

Movements	Observed		Forecast		Average annual growth rate		
	2015	2016	2025	2035	15-25	15-35	16-35
Domestic	26.19	26.08	30.11	34.05	1.4%	1.3%	1.4%
International	21.82	23.79	29.98	36.69	3.2%	2.6%	2.3%
Total	**48.01**	**49.87**	**60.09**	**70.74**	**2.3%**	**2.0%**	**1.9%**

Source: TRT elaboration on Ministère de la Transition Ecologique et Solidaire and DGAC (2017)

Table 4-5: Load factor of 2016 DGAC forecast (passengers per aircraft)

Load factor	Observed		Forecast		Average annual growth rate		
	2015	2016	2025	2035	15-25	15-35	16-35
Domestic	79	86	89	94	1.3%	0.9%	0.5%
International	103	104	113	121	0.9%	0.8%	0.8%
Total	**90**	**94**	**101**	**108**	**1.2%**	**0.9%**	**0.7%**

Source: TRT elaboration on Ministère de la Transition Ecologique et Solidaire and DGAC (2017)

4.1.3 2017 forecast

Following the debate concerning the previous two forecasts, the DGAC updated its estimations in 2017 to take account of points of concern regarding (i) the evolution of the load factor and (ii) the pace of the annual growth rate over the long term horizon (2040). Table 4-6 summarises the main outputs of the updated forecast in 2017 (Ministère de la Transition Ecologique et Solidaire, 2017)[8].

Table 4-6: **Passengers volume and flights movements of 2017 DGAC forecasts (absolute values and average annual growth rate)**

	2025	2030	2040
Passengers (million)	6	7	9
Average annual growth rate (%)		*3.1%*	*2.5%*
Movements	60.000	65.000	80.000
Average annual growth rate (%)		*1.6%*	*2.1%*
Load factor	100	108	113
Average annual growth rate (%)		*1.6%*	*0.5%*

Source: TRT elaboration on Ministère de la Transition Ecologique et Solidaire (2017)

---

8   Ministère de la Transition Ecologique et Solidaire (2017). Rapport établi par Anne Bouquet, Michael Badré et Gérard Feldzer, Membres de la Commission de médiation. Avec le concours d'Emmanuel Constantin, rapporteur.

4.2 The 2019 DGAC model

4.2.1 Methodological approach

The 2019 DGAC model to carry out traffic forecasts for Nantes-Atlantique airport at 2040 develops a step-wise approach[9] as follows.

1. Calculation of the variation of fuel cost over the 1990-2017 period, starting from the variation of oil price and aircrafts energy efficiency. The model also develops the effect of the Emission Trading System (ETS). The model assumes that oil price variations are fully transferred to ticket price.

2. For each year in the 1990-2017 period, by applying elasticity parameters to fuel cost, the variation of travel demand (measured in passenger-km), which would have occurred because of the variation of the fuel costs only, is estimated.

3. The variation of the travel demand obtained from the previous step is then subtracted to the observed demand to estimate the trend net of the effect of fuel price.

4. A model to explain travel demand (domestic and international demand separately) net of the fuel cost effect as a function of two variables – namely (i) GDP[10] and (ii) number of aircraft movements at the airport – is estimated. A parameter is estimated for each of the two variables[11]. According to available data, the model fits travel demand net of fuel price for the observed period.

5. Assumptions on the future evolution of relevant variables (i.e., fuel cost, GDP and number of flights movements) by the application of estimated parameters to forecast the future demand. The elasticity with respect to the GDP is assumed decreasing over the period considered to take into account the increasing maturity of the market[12] and to consider that forecasted GDP growth in the median scenario is relatively high compared to other sources.

Some comments can be made on the methodology sketched above and they are listed in the box below.

---

1. Competition is not explicitly considered in the methodology adopted. One form of competition is "within mode", i.e. with other airports. It could be argued that this form of competition is implicitly considered when the future number of movements is assumed.

   Another form of competition is "between modes". Competition with other modes is probably not relevant dealing with international demand (given the main foreign destinations served by the Nantes airport). In principle, considering that in France a developed high speed railway network exists, domestic demand might be influenced by modifications of the supply of train services (e.g. new connections, different fares). However, competition with high speed services has taken place also in the period used for the estimation of the elasticity parameters with respect to GDP and movements, so that also for this element one might assume an implicit modelling.

   It is difficult to assess if this "implicit" treatment of competition is appropriate. In principle, it would be interesting to see if the same methodology is able to explain the observed trend of demand in other airports and, in case, if the parameters assume similar values.

2. The assumption that the variation of fuel cost (which seems based on general assumptions) is fully

---

[9]   See Note méthodologique prévision Nantes (2050) (note technique), as provided by the DGAC.
[10]   Within the model, the variable GDP is the geometric average of the index number (1990 = 100) of the GDP of the Region Pays de la Loire and either the French GDP (for explaining domestic demand) or the World GDP (for explaining the international demand.
[11]   A logarithmic transformation of the two variables is used.
[12]   As reported by the authors of the model, the same approach is adopted by the UK Civil Aviation Authority.

transferred to the price of the flight tickets is a bit crude. The price of flight tickets is highly variable even within the same flight and is based on complex mechanisms. At the same time, exactly because of the complexity of mechanisms underlying flight tariffs, any other method to link energy price and air ticket price would require heroic assumptions. So, the one used in the methodology is not necessarily worse than others.

3. An elasticity parameter with respect to fuel cost is taken from another model where it was correlated to the number of travels, while for this exercise the elasticity is used to compute passengers-km. In this manner, average distance of movements is assumed to be constant. This assumption could not be fully realistic, but here again there are probably limited chances to make better assumptions.

The model estimated on the basis of the data of the 1990-2017 period fits with the observed data and therefore the model seems valid. It cannot be excluded that other variables – diverse from GDP and movements - contribute to explain the observed trend. Should these variables exist, they might have been strongly correlated with the ones assumed to develop the model in the period used for the parameter estimation. This correlation might disappear in the future, so that the explanatory capacity of the model might deteriorate. However, there are no clear candidates for diverse explanatory variables.

In the estimated model, the elasticity with respect to GDP is larger than the elasticity with respect to the number of movements. Even if GDP enters in the model as (logarithm) of an index number, while the number of movements enters as such (in logarithm form), the former seems the main explanatory element of past and forecasted demand trend. The cautionary assumption that the elasticity with respect to GDP is decreasing over time is therefore quite significant. The estimation of a high scenario provides insight on how forecasts might change if the assumption is not used.

In the end, the methodology used for the forecasts includes some potentially questionable aspects, but looks internally consistent and does not show evident flaws.

4.2.2 Outputs of the 2019 air traffic forecast

The methodological approach described in the previous section has been developed to elaborate new air traffic forecasts. They have been developed for three scenarios (i.e., low, medium and high), each considering the possibility of a period of airport closure during night time (i.e., curfew).

Figure 4-2 presents the forecast of passengers volume in 2019 with respect to the three scenarios (DGAC, 2019)[13]. Figure 4-3 provides a magnified version of the medium scenario without curfew, where the actual observed figures of the 2000-2018 period are joined with 2019 forecast, also distinguishing by domestic and international passengers. The average annual growth rates are summarised in Table 4-7.

Table 4-7: Annual average growth rate of passengers' volume (2019 DGAC forecast)

Scenario	2018-2025	2025-2030	2030-2040	2018-2030	2018-2040
Low	-	1.1%	1.1%	-	-
Medium	4.4%	2.1%	2.1%	3.5%	2.9%
High	-	3.1%	3.1%	-	-

Source: TRT elaboration on DGAC (2019)

The 2019 DGAC air traffic forecast envisages a sharp increase of passengers' volume until 2020, especially due to the announced expansion of low cost airlines networks in 2018 and 2019. Such growth is expected to be higher for international travellers, because of the larger number of destinations abroad connecting

---

[13] Elaboration based on DGAC sde1_3243d_nte_recap_previ_26mars2019.xls.

Nantes. After 2020, the passengers' growth is expected to continue at a slower pace, but with the international segment predominant with respect to the domestic one.

Figure 4-2: Passengers' volume of 2019 DGAC forecast (million) by scenario (curfew consists of prohibiting flights between 00:00 and 06:00 am)
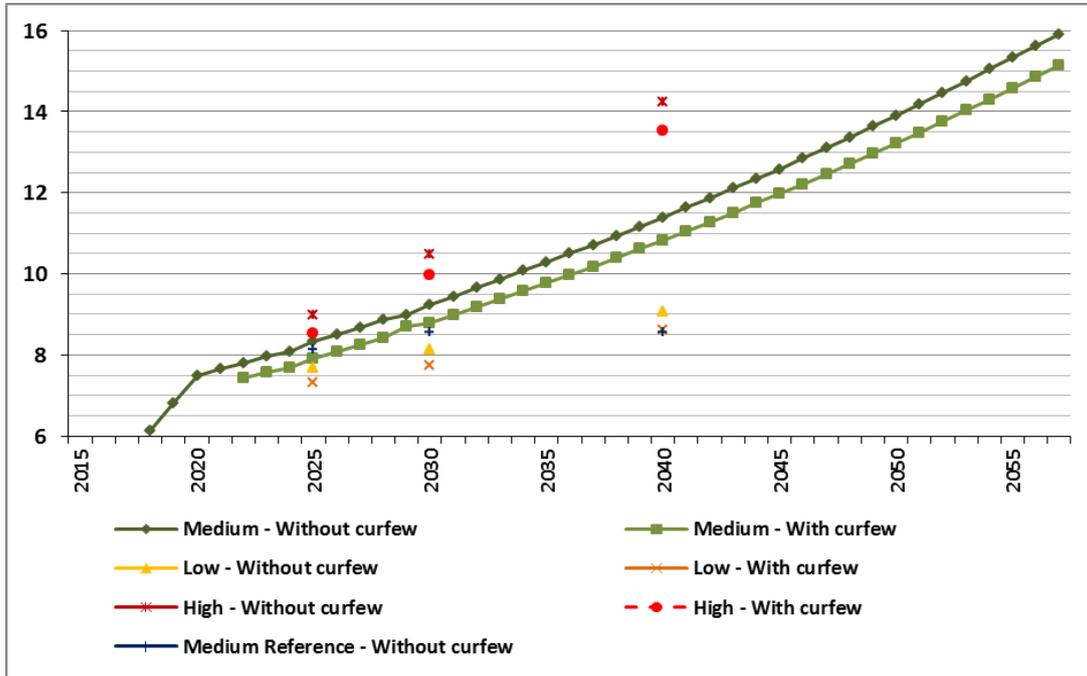
Source: TRT elaboration on DGAC (2019)

Figure 4-3: Passengers volume observed and 2019 DGAC forecast (million) (medium scenario without curfew) - Absolute value by type of flight
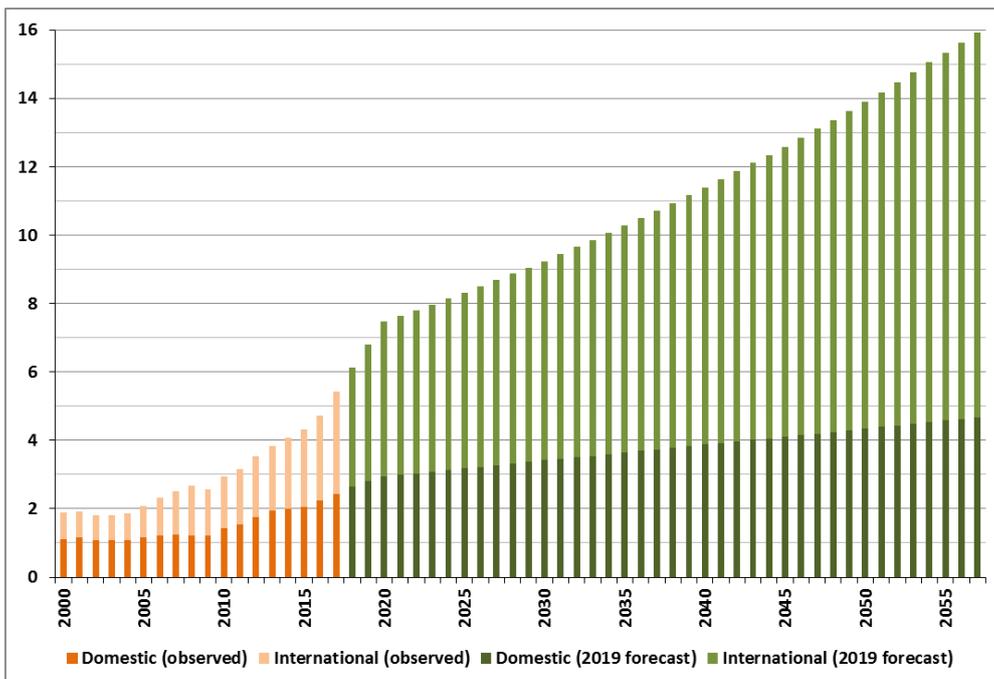
Source: TRT elaboration on DGAC (2019)

Figure 4-4: Passengers volume observed and 2019 DGAC forecast (million) (medium scenario without curfew) – Percentage by type of flight
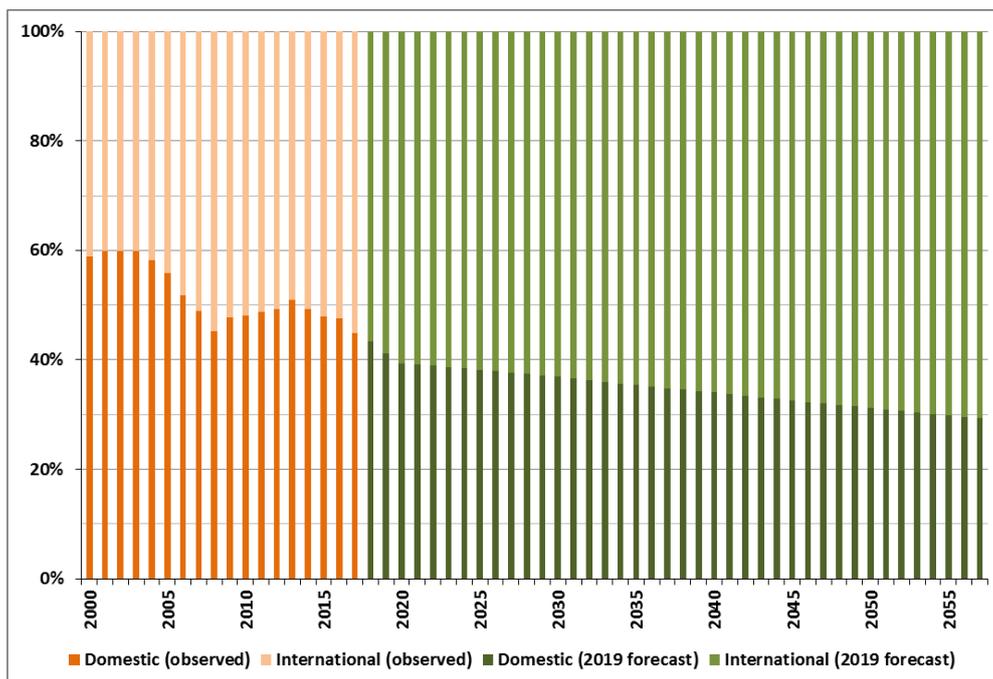
Source: TRT elaboration on DGAC (2019)

Figure 4-5 presents the forecast of flights movements in 2019 with respect to the three scenarios. Figure 4-6 provides a magnified version of the medium scenario without curfew, where the actual observed figures of the 2000-2018 period are joined with 2019 forecast, also distinguishing by domestic and international passengers. The average annual growth rates are summarised in Table 4-8.

The 2019 forecast of aircrafts movements is relatively similar to the trend envisaged for passengers' volume, but at slower pace over time. This implies that the average load factor of the aircrafts is expected to increase led by the higher exploitation of seats capacity by low cost airlines and especially for the international destinations connected (see Figure 4-8).

Table 4-8: Annual average growth rate of flights movements (2019 DGAC forecast)

Scenario	2018-2025	2025-2030	2030-2040	2018-2030	2018-2040
Low	1.9%	0.4%	0.5%	1.3%	0.9%
Medium	3.1%	1.4%	1.6%	2.4%	2.0%
High	4.2%	2.4%	2.5%	3.5%	3.0%

Source: TRT elaboration on DGAC (2019)

Figure 4-5: Number of flights movements of 2019 DGAC forecast (thousand) by scenario
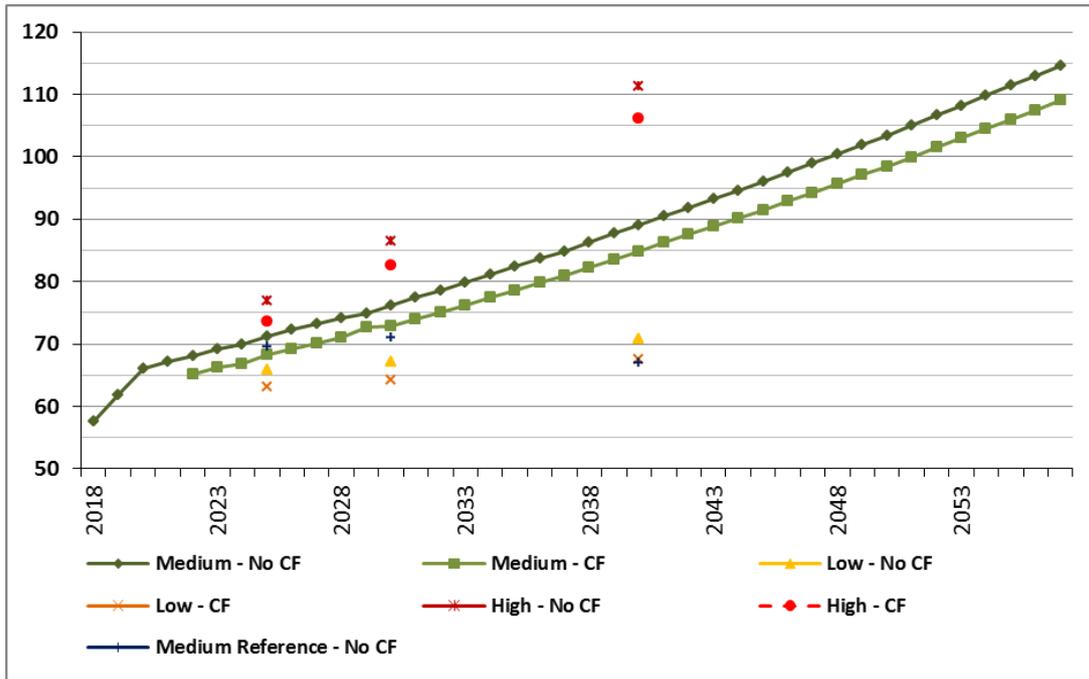
Source: TRT elaboration on DGAC (2019)

Figure 4-6: **Number of flights movements observed and 2019 DGAC forecast (thousand) (medium scenario without curfew) - Absolute value by type of flight**
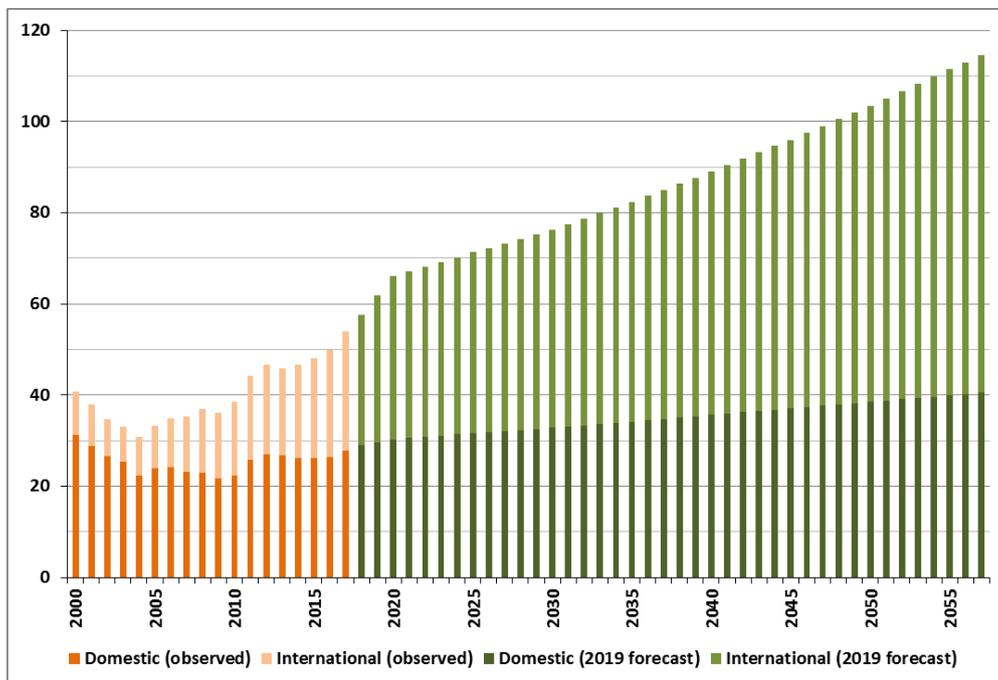
Source: TRT elaboration on DGAC (2019)

Figure 4-7: **Number of flights movements observed and 2019 DGAC forecast (thousand) (medium scenario without curfew) - Percentage by type of flight**
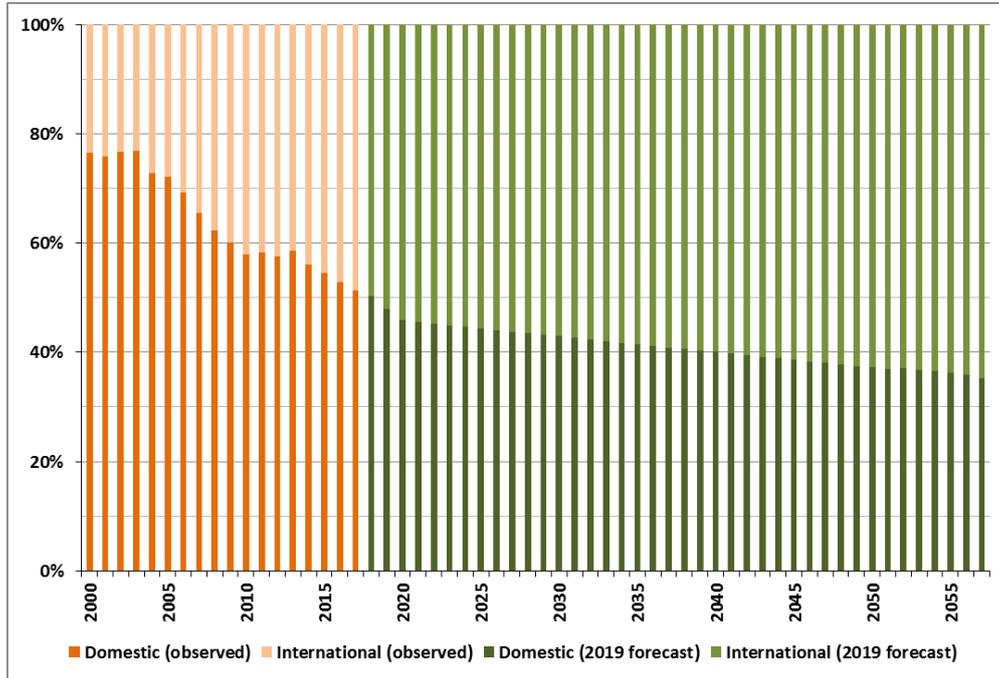
Source: TRT elaboration on DGAC (2019)

Figure 4-8: **Load factor observed and 2019 DGAC forecast (number of passengers per type of flight) (medium scenario without curfew)**
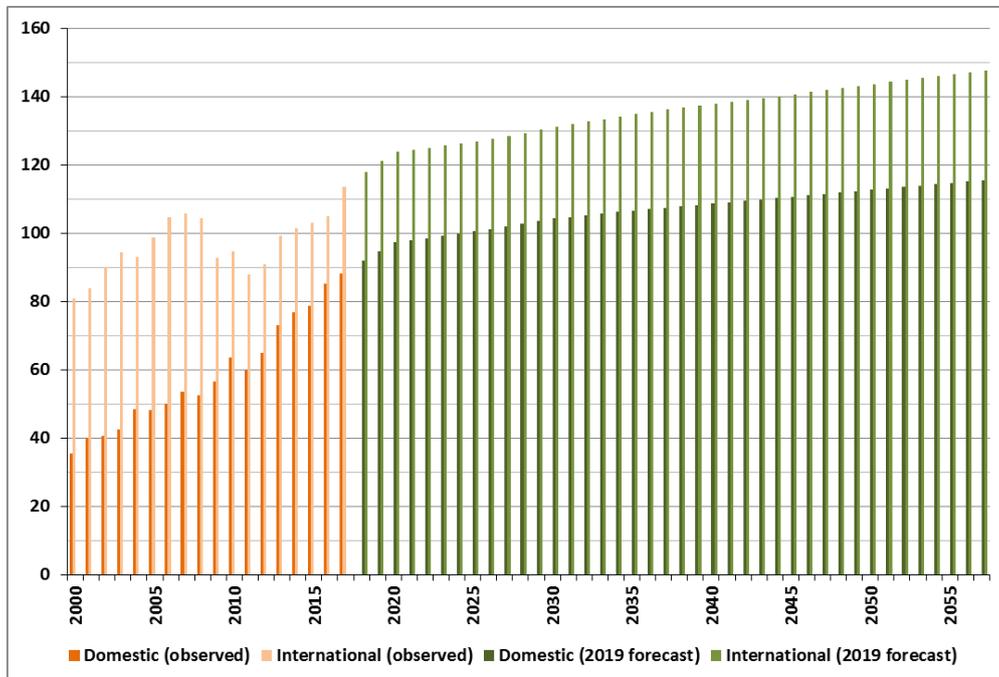
Source: TRT elaboration on DGAC (2019)

Figure 4-9 and Figure 4-10 summarise the various DGAC forecasts of passengers volume and flights movements for Nantes-Atlantique airport.

Figure 4-9: Summary of passengers' volume forecasts[14]
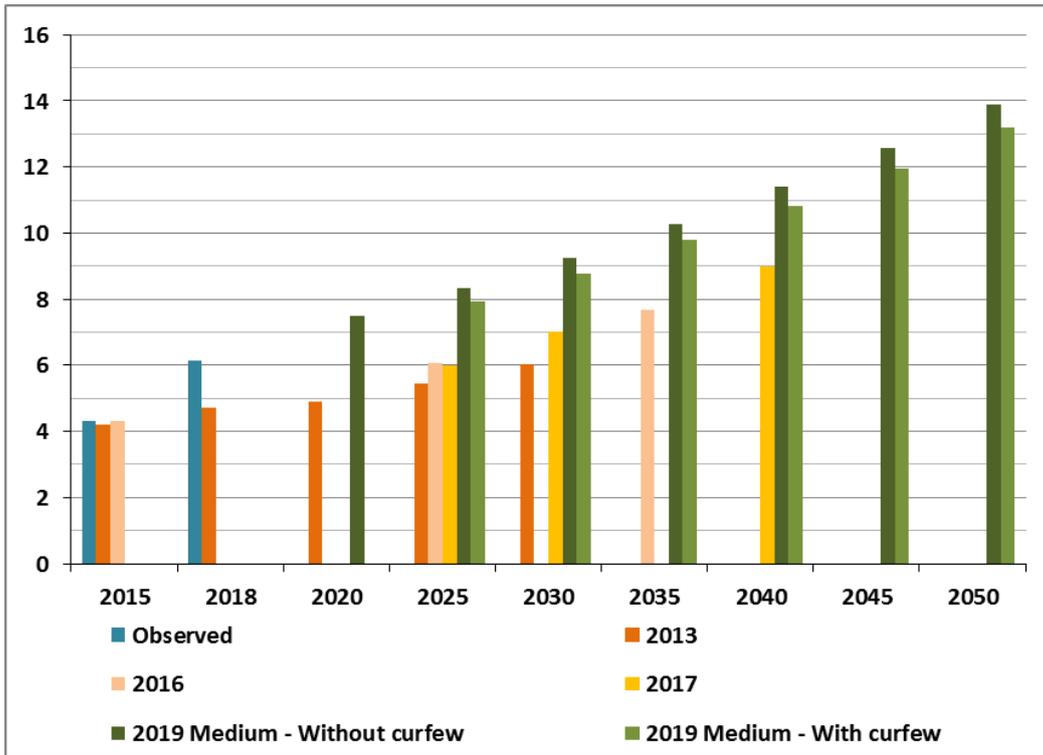
Source: TRT elaboration on DGAC data (2013, 2017 and 2019)

Figure 4-10: Summary of flights movements' forecasts
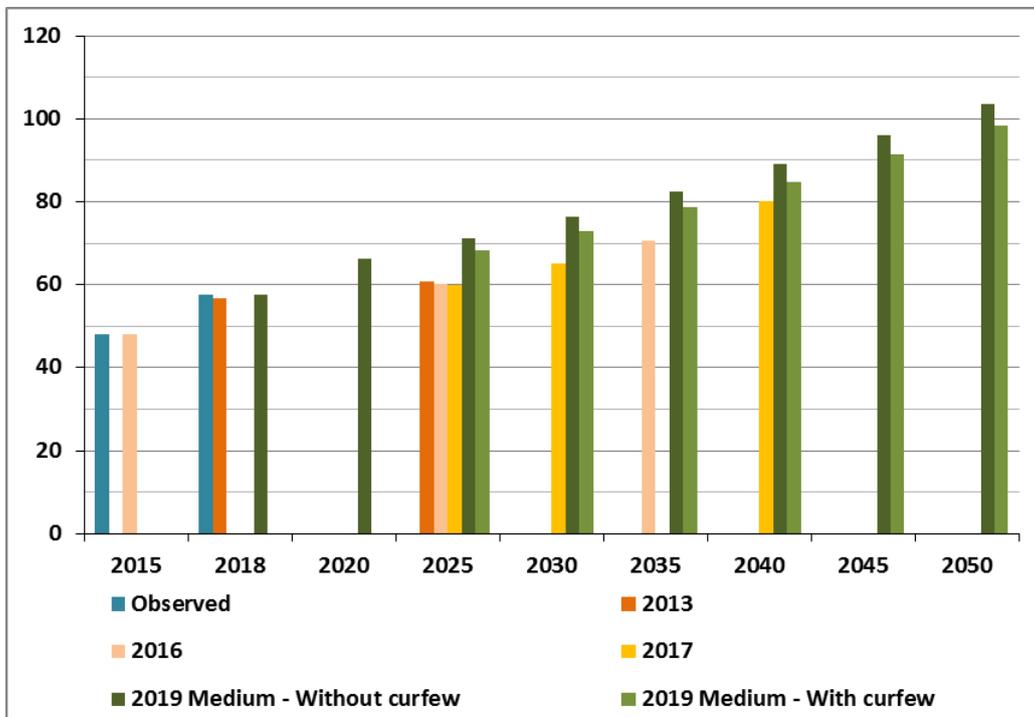
Source: TRT elaboration on DGAC data (2013, 2017 and 2019)

---

[14] Curfew consists of prohibiting flights between 00:00 and 06:00 am.

4.3 Scenarios at national, EU and global level

4.3.1 2016 France transport model forecast (MODEV)

Pochet et al. (2016)[15] provide long terms projections at 2030 and 2050 to forecast the evolution of passengers transport demand in France according to the envisaged development of transport projects at national level.

Demand projections have assumed an average annual growth of GDP equal to 1.9% between 2012 and 2030 and 1.7% between 2030 and 2050, respectively. The oil price have been assumed equal to €$_{2012}$ 93 in 2030 and €$_{2012}$ 117 in 2050, according to the "New policies" scenario of the International Energy Agency. Specific hypotheses have been assumed regarding the evolution of transport network and charging policies.

Transport demand of air passengers is categorised as long distance demand, which considers journeys of 100 km or longer, with origin or destination in France. Table 4-9 shows the projections reported in Pochet et al. (2016) at 2030 and 2050 for passengers air transport with respect to the volume of transport activity, modal share and average annual growth rates[16].

Table 4-9: Air transport demand projections of France national transport model (MODEV) (domestic[17])

Variable	2012	2030					2050					
		Central	High GDP	Low GDP	High oil	Low oil	Central	High GDP	Low GDP	High oil	Low oil	Low charges
Transport activity (billion pax·km)	14.0	16.6	18.0	15.9	16.3	17.1	20.8	23.9	18.3	20.3	21.8	20.3
Modal share (%)	4.4	4.2	4.2	4.2	4.1	4.3	4.3	4.4	4.2	4.1	4.4	4.1
Average annual growth rate (%)[18]		0.9	1.4	0.7	0.9	1.1	1.0	1.4	0.7	1.0	1.2	1.0

Source: Pochet et al. (2016)

Pochet et al. (2016) also provides specific air transport demand projections for the region of Pays de la Loire, where Nantes-Atlantique airport is located. Figure 4-11 shows that the evolution of the air transport activity, which is expected to be relatively high over the 2012-2030 period, when compared to the other regions of France. In particular, the volume of pax·km of the region is envisaged to increase from 0.8 to 1.0 billion, or 30% over the period, a total growth which is higher than the forecast at national level (i.e., 18%) (see also Table 4-10).

---

[15] Pochet R., Wagner N. and Cabanne I. (2016). Projections de la demande de transport sur le long terme, Théma Analyse, Ministère de l'Environnement, de l'Energie et de la Mer, Juliet 2016.

[16] At 2030 time horizon, low and high GDP scenarios consider a change of the annual growth rate of ±0.5% with respect to the central scenario. The high oil price scenario at 2030 assumes a price equal to €$_{2012}$ 150 per barrel. The low oil price scenario at 2030 assumes a price equal to €$_{2012}$ 54 per barrel. At 2050 time horizon, low and high GDP scenarios consider variations of average per capita income and unemployment rate with respect to the central value. The high oil price scenario at 2050 assumes a price equal to €$_{2012}$ 188 per barrel. The low oil price scenario at 2050 assumes a price equal to €$_{2012}$ 67 per barrel.

[17] Domestic passengers transport activity, which includes all domestic flights (also with Corse) and domestic flights to others connecting the rest of Europe.

[18] Average annual growth rates are calculated for the period 2012-2030 and 2012-2050, respectively.

Figure 4-11: Variation of passengers air transport demand in the regions of France
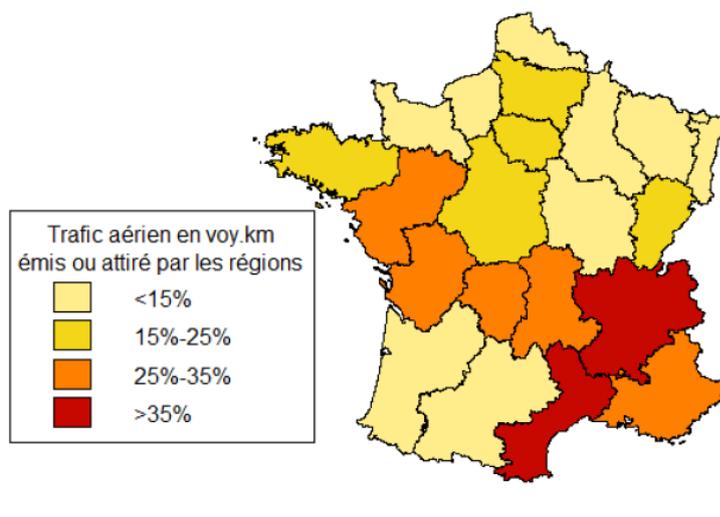
Source: Pochet et al. (2016)

Table 4-10: Variation of passengers' air transport demand of Pays de la Loire compared to France

Area	2012	2030	Variation 2012-2030
Pays de la Loire	0.8	1.0	+30%
France[19]	10.5	12.8	+18%

Source: Pochet et al. (2016)

4.3.2 2016 EU reference Scenario

Aggregate data are available from 2016 EU Reference Scenario (Capros et al., 2016)[20] for air passengers transport activity of France. Table 4-11 present the estimated projections and average annual variations for short, medium and long term horizon at both national and EU28 level.

Table 4-11: Air transport demand projections of France (2016 EU Reference scenario)

Transport activity (billion pax·km)	Year								Average annual growth rate	
	2015	2020	2025	2030	2035	2040	2045	2050	20-30	30-50
France	76	86	97	111	123	136	140	145	2.5	1.4
EU 28	**608**	**693**	**776**	**860**	**944**	**1031**	**1,104**	**1,177**	**2.2**	**1.6**

Source: Capros et al. (2016)

---

[19] Without double counting.

[20] Capros P. (E3M-Lab), De Vita A., Tasios N., Siskos P., Kannovou M., Petropoulos A., Evangelopoulou S., Zampara M., Papadopoulos D., Nakos C. et al. (PRIMES model), Paroussos L., Fragiadakis K., Tsani S., Karkatsoulis et al. (GEM-E3), Fragkos P., Kouvaritakis N. et al. (Prometheous model and PRIMES gas), Höglund-Isaksoson L., Winiwater W., Purohit P. and Gomez-Sanabria A. (IIASA-GANIS model), Frank S., Forsell N., Gusti M., Havlik P. and Obersteiner M. (IIASA-GLOBIOM/G4M models) and Witzke H. P., Kesting M. (Eurocare) (2016), EU Reference Scenario 2016 Energy transport and GHG emissions - Trends to 2050. Publication prepared for the European Commission, the Directorate-General for Energy, the Directorate-General for Climate Action and the Directorate-General for Mobility and Transport.

4.3.3 2018 Eurocontrol

According to Eurocontrol (2018)[21], overall air traffic growth will be faster in the medium term (2018-2030) than in the long term (2030-2040), stronger in Eastern Europe and stronger for flights leaving and arriving Europe than for intra-European flights.

For Nantes-Atlantique airport Eurocontrol provides specific estimations for IFR[22] movements according to 4 scenarios, which differ with respect to some input assumptions: economic growth, fuel prices, load factors, hub-and-spoke versus point-to-point etc. This leads to different volumes of aircraft movements and different underlying patterns of growth: long- versus short-haul, rates of up-gauging of aircraft[23], etc.

The 4 scenarios have been developed as follows.

- Global Growth (Technological Growth): strong economic growth in an increasingly globalised World, with technology used successfully to mitigate the effects of sustainability challenges such as the environment or resource availability.

- Regulation and Growth (Most-likely): moderate economic growth, with regulation reconciling environmental, social and economic demands to address the growing global sustainability concerns.

- Fragmenting World: a World of increasing tensions between regions, with more security threats, higher fuel prices, reduced trade and transport integration and knock-on effects of weaker economies.

- Happy Localism: this scenario investigates an alternative path for the future. With European economies being exposed to shocks, increasing pressure on costs, stricter environmental constraints, air travel in Europe adapts to new global environment but taking an inwards perspective. There is less globalisation, more trade inside EU (e.g., Turkey joining Europe). Also, less leisure travel to outside Europe, however certainly more inside EU. More point-to-point traffic within Europe. It does not mean that Europe does not grow or does not adapt to new technologies and innovation, but its main focus is "local".

Table 4-12: IFR movements Forecast at Nantes-Atlantique airport for different scenarios

| Scenario	2017	2040	Average annual growth rate
Global Growth	57,667	94,904	2.2%
Regulation and Growth	57,667	75,272	1.2%
Happy Localism	57,667	73,661	1.1%
Fragmenting World	57,667	56,313	-0.1%

Source: Eurocontrol (2018)

---

[21] Eurocontrol (2018). European Aviation In 2040 Challenges of Growth. Annex1. Flight Forecast to 2040.
[22] Instrument Flight Rules.
[23] Up-gauging is the aviation jargon for when airlines use larger aircraft that can accommodate more passengers.

Figure 4-12: IFR movements Forecast at Nantes-Atlantique airport for different scenarios[24]
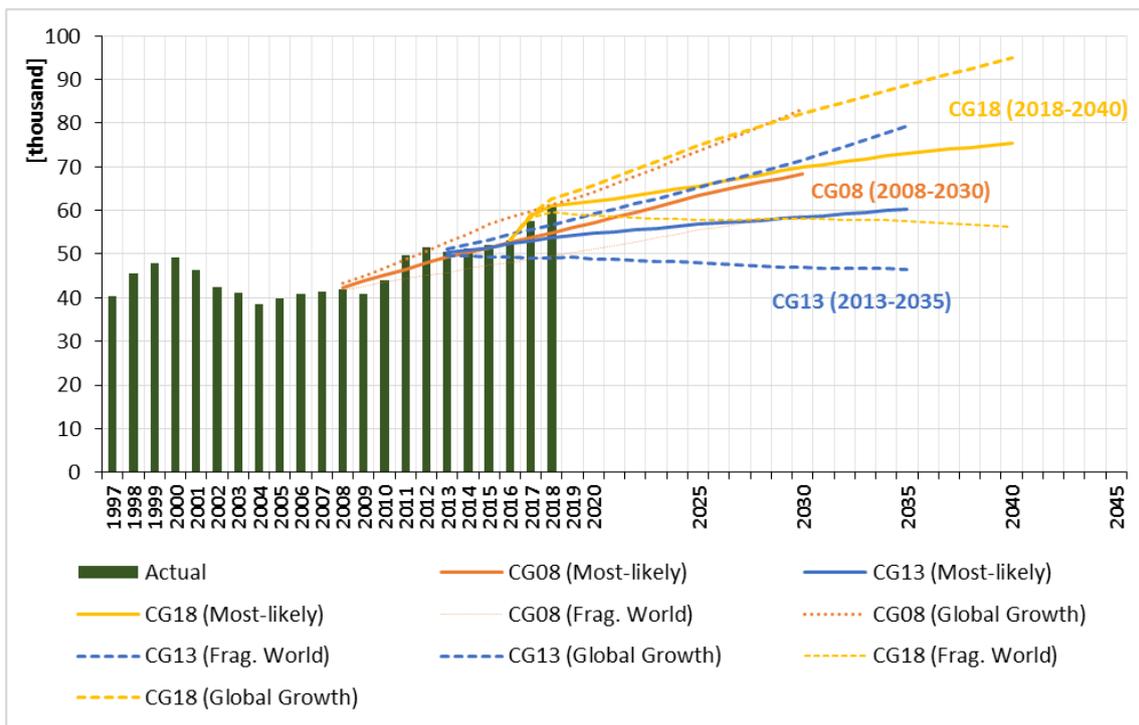
Source: TRT elaboration on Eurocontrol (2018)

4.3.4 2019 ITF Transport outlook

The 2019 ITF[25] Transport Outlook reports that global demand for air travel will continue to increase through 2050, according to the current demand pathway. The main drivers are the economic growth (in developing economies) and improving air connectivity. In particular, the further rise of low-cost carriers will make air travel less expensive than many trips previously using other modes.

However, the 2019 ITF Transport Outlook also recognises that the future growth of air passenger transport activity will depend on whether the air network is able to keep up with the demand. Given the uncertainty of how the air networks will evolve, there are differences between the projections of the current demand pathway and alternative scenarios. Table 4-13 summarises envisaged projections of the 2019 Outlook for the European Economic Area[26] plus Turkey, for domestic and international demand segments.

---

[24] The acronym GC followed by two digits in the legend of the figure indicates to the version of the study "Challenges of Growth" of EUROCONTROL, with respect to which the forecasts have been estimated (i.e., 2008, 2013 or 2018).

[25] The International Transport Forum (ITF) at the OECD is an intergovernmental organisation with 60 member countries. It acts as a think tank for transport policy and covers all transport modes. While administratively integrated with the OECD, it is politically autonomous.

[26] The European Economic Area (EEA) unites the EU Member States and Iceland, Liechtenstein and Norway. Switzerland is signatory of the EEA agreement that has not ratified.

Table 4-13: Air transport demand projections of EEA plus Turkey (2019 Transport Outlook)

Transport activity (billion pax·km)	Year								Average annual growth rate	
	2015	2020	2025	2030	2035	2040	2045	2050	20-30	30-50
Domestic	134.5	146.1	153.9	157.9	160.6	162.6	170.0	168.5	0.8%	0.3%
International	1,350.0	1,576	1,754	1,858	2,001	2,038	2,181	2,374	1.7%	1.2%
Total	**1,484.5**	**1,722.1**	**1,907.9**	**2,015.9**	**2,161.6**	**2,200.6**	**2,351.0**	**2,542.5**	**1.6%**	**1.2%**

Source: OECD-ITF (2019) [27]

## 4.4 Average annual growth rates cross comparison

This section compares the average annual growth rates of 2019 DGAC model (see section 4.2.2) with the rates of the other projections illustrated throughout the previous section, and which have been developed spanning different time periods in the future and covering different geographical areas.

As far as the time periods are concerned, available data allows to compare the rates at medium (2030) and long term (2040/2050) horizons. With respect to the geographical scope, the rates forecasts have been developed (i) specifically for Nantes-Atlantique airport, (ii) at national level for France and (iii) at multi-national level (i.e., EU28 and EEA plus Turkey). It is worth noticing that all rates provide future projections in terms of passengers' activity, except for Eurocontrol (2018), which estimates future aircrafts movements at Nantes-Atlantique airport.

The data shows that the 2019 DGAC model average annual growth rates for France are higher compared to the other estimations, for both medium and long terms and different geographical scopes, if one considers the 2018-2030 and 2018-2040 periods. The rates of the periods 2025-2030 and 2030-2040 are smaller and comparable with the other projections. The difference depends on the relatively high average annual growth rate assumed for the 2018-2025 period, namely 4.4% and which could be explained as a "ramp-up" phase simulating the expansions of the low cost airlines network.

---

[27] Update June 2019. Data available on OECD-ITF website.

Figure 4-13: Cross comparison of average annual growth rate forecasts of medium and long term horizons
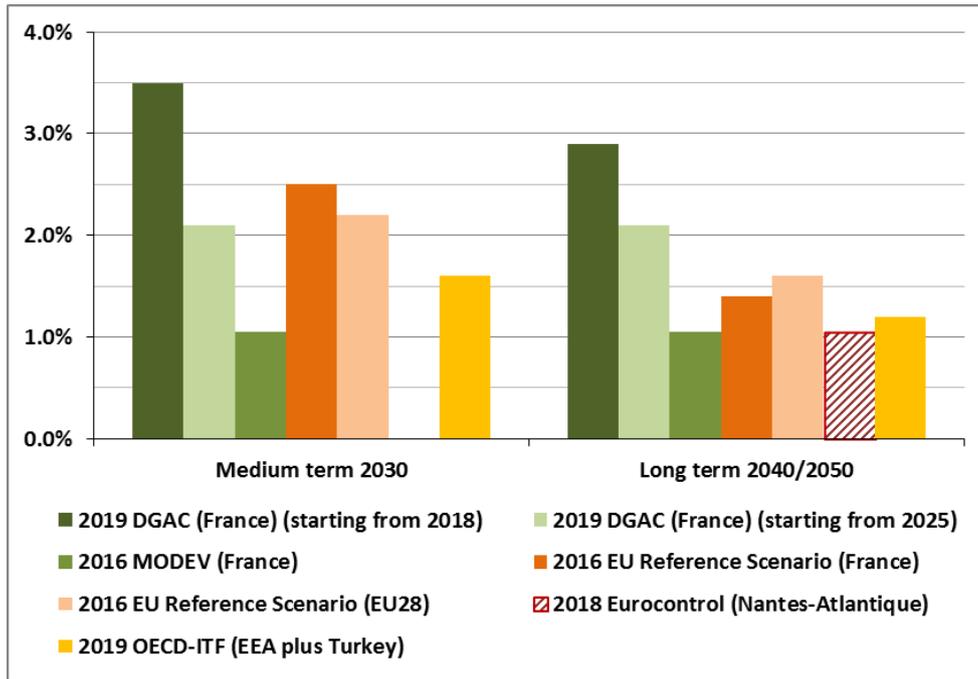
Source: TRT elaboration on various sources

5 Conclusions

This section presents the conclusion of the complementary study on the traffic hypotheses of Nantes-Atlantique airport. Section 5.1 summarises the factors that could influence the air traffic growth in the future, also providing a judgment on their likely impacts. Section 5.2 illustrates our conclusions on the air traffic forecasts at medium and long term time horizons.

5.1 Factors influencing air traffic growth

5.1.1 Operating airlines and networks

Currently, six low cost (out of eleven) airlines operate at Nantes-Atlantique airport. The **penetration of low cost airlines** in the air transport market of the region has significantly supported the development of the airport traffic over the past years. According to data, the average annual growth rate of this transport segment has been found increasing at a relatively constant pace and in 2018 59% of the passengers has been reported travelling with low cost airlines.

With respect to the **destinations connected with Nantes-Atlantique airport**, both passengers' volume and flight movements to domestic and international airports have been increasing until 2018. The average annual growth rate of the **international segment has been found higher compared to the domestic one, driven by the development of low cost airlines networks to destinations abroad**. The domestic segment basically relies on standard airlines' operating connections to Paris airports, which allow to connect to other international and long-haul flights, and to other major cities airports in France.

In general, low cost airlines are highly flexible in planning and operating connections and usually open and close air links depending on contingencies and context-specific situations. This factor could also be linked to contractual arrangements (i) with airport managers for slots allocation and terminal facilities utilisation (i.e., dedicated check-in areas and gates) and (ii) with handling operators, for example, to manage passengers' luggage.

The flexibility of the low cost airlines business model is a factor that could negatively influence future developments of those airports where one low cost airline has strongly dominant position. As noted above, this is not the case of Nantes-Atlantique airport, where a number of low cost airlines operate and, for some destinations, they are in competition. For this reason, it seems likely that an airline could operate a flight to a destination, in case this would be left free by another low cost operator.

The current mix of airlines and destination offered by Nantes-Atlantique airport can be realistically assumed to guarantee further traffic development.

5.1.2 Relationship between airlines networks, travellers profile and socio-economic context of the region

The network of connections, especially for the international segment, is reflected by **the profile of the travellers** identified in a recent survey carried out. In general, the majority of respondents **(i.e. around three out of four trips)** have been found **travelling for holidays or leisure purposes and during the summer**. This behaviour is also apparent looking at the summer peaks of air traffic and in this respect it is worth noting that (i) the intensity of these summer peaks has been strengthening over time and (ii) no winter peaks have emerged, which suggests that the flights operated to overseas holiday destinations are negligible or absent.

Travellers for **business purposes is another important demand segment of Nantes-Atlantique airport, covering around one out of four trips**. The connections operated suggest that business travellers could travel either to domestic or international destinations, for instance major cities or capitals of neighbouring countries. The development of the connections to the latter type of destinations also suggests that

business travellers would be more inclined to travel with low cost airlines. **With these characteristics, air traffic development is clearly directly correlated to the economic development of the Loire-Atlantique region.**

On top of the economic development of the region, additional traffic could be linked to land use developments (such as establishment of research and innovation centres, industrial or business districts, specialised hospitals, etc.), or **marketing and promotional campaigns** targeting users interested in specific activities (i.e., eco-tourism, cultural and sport events, fairs, etc.) that might generate or attract, to a minor extent, **new demand to travel**.

It is also worth noting that projections of demography, population aging and impact of migration flows should also be considered in the analysis. They **could either positively, or negatively, change users preferences and behaviour** towards the attitude to travel in the future.

5.1.3 Competition with other French airports

Rennes Bretagne is the closest airport, being at around 120 km from Nantes. It is categorised as *aéroport métropolitaine* (according to the French air national transport strategy[28]) and has been developing its activities over the past years. Notably, the volume of passengers doubled over the 2000-2018 period, from 420 to 850 thousand, and currently, 8 airlines operate providing 16 connections, of which 9 domestic and 7 international.

The observed passengers' volume is markedly smaller compared to Nantes-Atlantique airport and the information gathered from concerned stakeholders on its future development indicates that over the next decade a volume of 2 million passengers could be reached. **However, the Rennes Bretagne airport infrastructures growth is limited due to physical constraints surrounding the runway**, which is located between the river Vilaine on the west side and the D177 highway on the east side.

Figure 5-1: Low cost airlines share at French regional airports
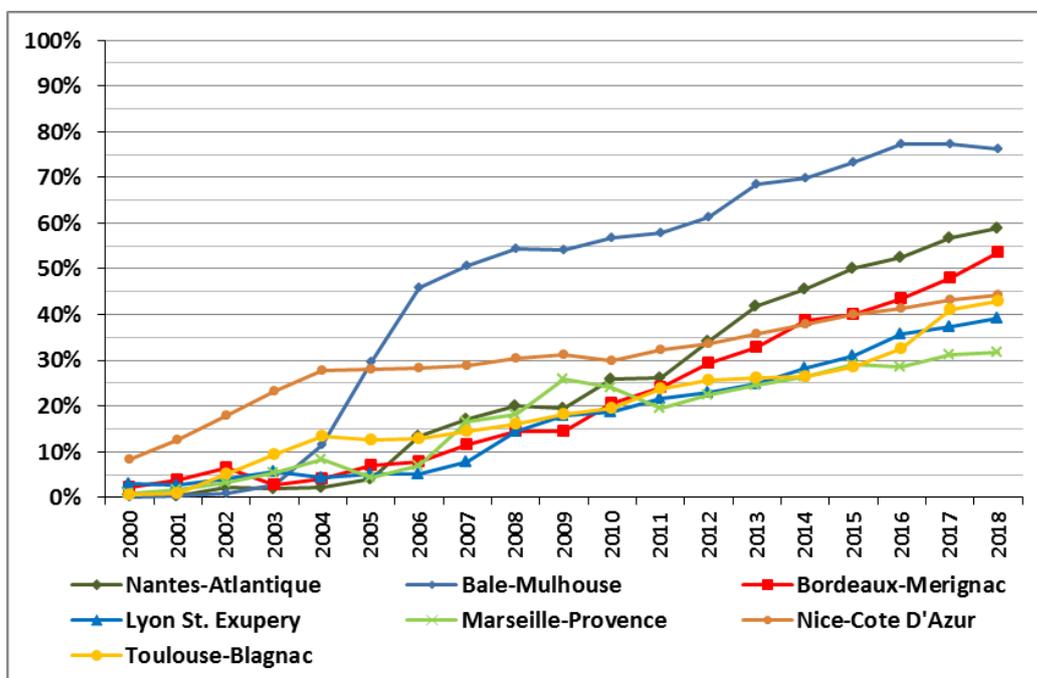
Source: TRT elaboration on DGAC data

---

[28] Ministère de la Transition Écologique et Solidaire, Stratégie Nationale Du Transport Aérien 2025.

The French air national transport strategy identifies **seven regional airports**. According to data, their passengers' volume has been found increasing, from 35 to 65 million over the 2000-2018 period[29]. Although at different paces, the observed growth is relatively constant through time and for some cases the effect of the economic crisis is visible between 2008 and 2009.

To different extents, low cost airlines are playing a role in driving the observed trend, being their share increased from almost negligible to 48% on average in 2018 (see Figure 5-1). Bale-Mulhouse, Nantes-Atlantique and Bordeaux-Merignac, in descending order, are the airports found above this average. But, while the share of low cost airlines at Bale-Mulhouse airport seems stabilised after 2016, for Nantes-Atlantique and Bordeaux-Merignac the observed growth is constant.

The distance between Nantes-Atlantique and Bordeaux-Merignac (the closest of these seven airports) does not seem allowing for overlaps or strong interactions of the catchment areas and cannibalisation of demand, which is rather driven by context-specific socio-economic conditions.

Overall, the level of competition with other French airports is found low, because of the smaller size of the closest airport (Rennes) and negligible interaction with comparable French regional airports.

5.1.4 Competition with high speed rail and long distance bus services

TGV is generally the preferred options for a direct travel from Nantes to Paris, which can be reached in around 2 hours and 15 minutes, depending on the train operated. Travel by air mode on the same route implies (i) extra time to get to departure airport and from the arrival airport to the final destination and (ii) change(s) of transport mode(s) to travel to/from urban areas (i.e., local trains or urban public transport).

Figure 5-2 shows the projects of TGV railway lines assumed by the transport model of France (MODEV) to develop demand projections over medium (2030) and long term (2050) horizons. **The extensions of the TGV railway network, which might divert some air demand in the future, are envisaged at 2030** (*LGV Bretagne-Pays de la Loire*) **and 2050** (*Ligne nouvelle Ouest Bretagne Pays de la Loire*).

Figure 5-2: Planned extensions of TGV railway network at 2030 and 2050
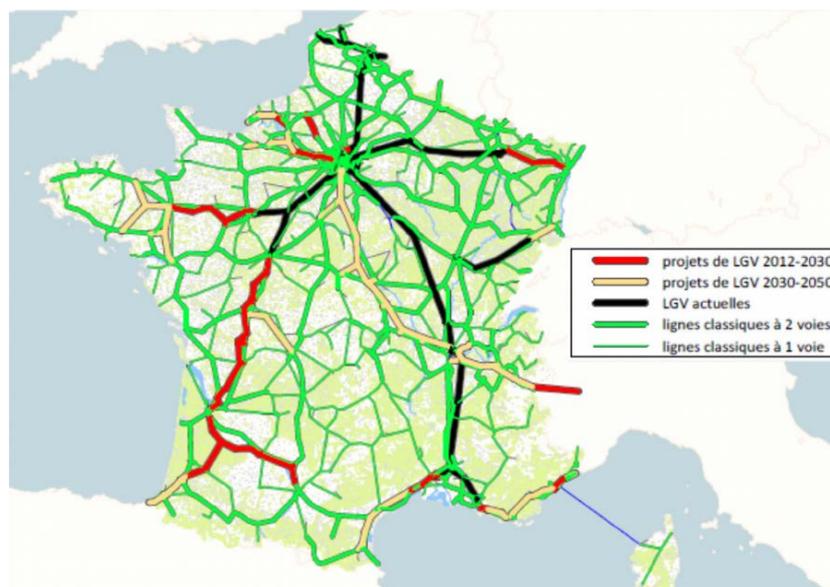
Source: Pochet et al. (2016)

---

[29] 32% of the total passengers in France in 2018.

As regards **long-distance bus services**, it is worth reminding that in 2015, the French government **opened the sector to competition**[30]. The main purpose of the reform was to provide a low cost alternative to rail transport and thus create new demand for users who would not have chosen rail transport.

Blayac and Bougette (2017)[31] did **not found straightforward implications with air transport** because of the following reasons. First, airlines amount for a relative **low volume of domestic passengers** compared to other transport modes (i.e., 9.3% of the total domestic traffic). Second, **low cost airlines are less developed for domestic connections in comparison to** international ones (see also sections 3 and 4). Therefore, **air transport was found not as a close substitute to long-distance bus services** in France. Similar results have been found for Italy, according to Beria et al. (2018)[32] and Beria and Bertolin (2019)[33,34].

For both high speed rail and long distance bus services, the competition factor with Nantes airport is low or negligible. In the light of the airlines network characteristics, they cannot be considered substitutes negatively influencing future developments.

5.1.5 Policies for internalisation of external costs

CO_2 emissions of aviation are partially covered by the EU Emission Trading Scheme (ETS) since 2012, as all CO_2 emissions allowances of intra-EEA flights have to be submitted. Fuel taxes on commercial aviation are not extensively applied at EU28 level[35]. The UK operates a passenger tax that raised £ 3.4 billion in 2017-2018. That levy, while not specifically an eco-tax, starts at € 14.5 per passenger, while Germany's levy begins at € 8.0 per passenger and Sweden's at € 5.6 per passenger.

The French Government has recently announced that an environmental tax will be levied on airlines flying out of the country. The new tax will be progressive and levied on flight tickets, starting from roughly € 1.50 for economy flights up to € 18.0 for business-class flights outside of Europe. According to Government's estimations, the tax could yield some € 180 million from 2020 and the money raised by the new tax would be earmarked to improve transport links in France[36].

Although the announced level of the environmental tax is relatively low, it should be considered as a factor that might negatively influence future developments. This is especially true for the large share of the low cost airlines at Nantes-Atlantique airport whose passengers are more sensible to variations of price. At the same time, it has to be taken into consideration that future improvements of engines efficiency might partially compensate possible increases in fuel taxation.

5.1.6 The political scenario and the macro-economic contexts

These factors can be hardly predicted, however some could be considered to assume shocks when assessing future projections. For instance, the Brexit could impact on the operations of UK-registered airlines and political tensions in the area of the Persian Gulf might induce an increase the oil price, in turn

---

[30] This reform was part of a set of measures proposed by the former Minister of the Economy, Industry, and Digital Affairs, Emmanuel Macron, aimed at fostering "growth, activity and equal economic opportunity".

[31] Blayac, T. and Bougette, P. (2017). Should I go by bus? The liberalization of the long-distance bus industry in France. Transport Policy, 56, 50–62.

[32] Beria P., Nistri D. and Laurino A. (2018). Intercity coach liberalisation in Italy: Fares determinants in an evolving market, Research in Transportation Economics 69 (2018) 260-269.

[33] Beria P. and Bertolin A. (2019). Evolving long-distance passenger services. Market concentration, fares and specialisation patterns in Italy.

[34] The analysis considered only rail, coach and carpooling services, deemed not fully separate markets and interacting in terms of supply, prices and groups of customers.

[35] See also DTA (2018) Les enjeux de la taxation du transport aérien en France, 22 novembre 2018.

[36] See https://www.gouvernement.fr/ecologie-nouvelles-reglementations-pour-les-transports-aerien-et-routier

of the fuel cost, and slow down the economy at a global level. **The political and the macro-economic contexts should be considered as factors that could negatively affect future developments.**

## 5.2 Our conclusion on air traffic forecast

5.2.1 The air traffic forecast on the short term

All in all the **2019 air traffic forecast seems not overestimating the future development of Nantes-Atlantique airport for short and medium time horizon (2030), during which a ramp-up period followed by a linear growth seems realistic**. The average annual growth rate assumed is also found relatively in line with other projections developed for the air transport sector at medium term horizon (2030).

There are two factors that might sustain the ramp-up period in the next future:

• First, the continuous growth of the airport: there are **159 new connections for the 2018-2020 period**, of which 148 of low cost airlines (20 with domestic destinations, 106 with airports of the EU and 22 with non-EU airports of North Africa and Middle East). They will be operated to (i) destinations in southern Europe (i., Greece, Italy, Spain amongst the others) to address the demand of travels for medium/long-stay holidays and (ii) European cities or capitals for business travel or short-stay visits for leisure.

• Second, the fact that **Nantes-Atlantique airport has become the base of a major low cost airline in April 2019** and 25 new connections are being opened. Interestingly, the airport is found third after Bordeaux-Merignac and Marseille-Provence, when compared with respect to the number of new connections (see Figure 5-3).

Figure 5-3: Envisaged new low cost connections at French regional airports (period 2018-2020)
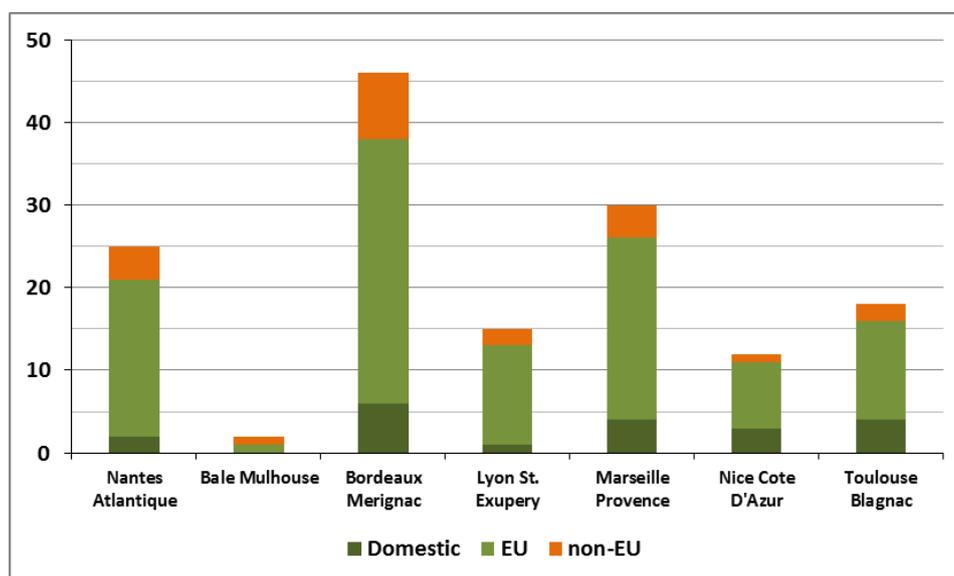
Source: TRT elaboration on www.quellecompagnie.com

As inferred analysing observed data and forecasts, the **expansion of the network of connections is basically designed to adhere to travellers profile** and an important demand segment at Nantes-Atlantique airport is that of **holidays or leisure journeys**.

5.2.2 The air traffic forecast on the long term

On a long term time horizon (2030-2050), the envisaged growth seems less likely to happen, because the offer of connections to new international destinations could reach a **lower asymptotic equilibrium due to market saturation**. To some extent, the growth could be sustained more by the demand to travel of the business segment, but there are not further element to support this hypothesis. It is also worth reminding

that the **long term average annual growth rate of the 2019 DGAC model is found higher with respect to other projections of the air transport sector at long term horizon (see Figure 4-13).**

On the long term horizon the **technological progress** may be a factor influencing future developments in terms of movements. Modifications of internal aircrafts characteristics could allow for more room for customisation, especially for **optimisation of internal space and seats capacity.** If this will happen, it **could likely support the envisaged increase of passengers' volume at higher pace compared to aircrafts movements**.

End of the document