ANIMA
Aviation Noise Impact Management through Novel Approaches

Case Study – Cluj-Napoca Airport

Overview

This case study provides an overview of the previous, current and proposed practices of Cluj Airport, as a part of their Noise Management Strategies. In this case study, the actions and interventions accomplished by Cluj Airport are presented in a descriptive and detailed manner with the purpose of emphasising lesson learning and good practices.

All information used for the development of this case study was gathered from the airport and interviews with relevant stakeholders and online sources. Interviews included airport representatives, local community and city hall representatives, the local environmental agency, the local representative of the Romanian Air Navigation Service Provider (ANSP), the Civil Aviation Authority (CAA), TAROM airline and relevant National Ministries (Environment and Transport). The interview findings were correlated with all other available information and were included within the case study. Most of the interviews topics were formulated around the knowledge, understanding and application of ICAO Balanced Approach, together with further actions designed to reduce and mitigate noise and its effects.

The target audience for the findings of the case study includes airport operators, together with several other relevant stakeholders such as Air Navigation Service Providers, Civil Aviation Authorities, aircraft operators, environmental and governmental organisations and other interested parties.

Background information

The airport is located in Cluj-Napoca city, which is the largest urban centre of Transylvania (over 320,000 inhabitants) and placed geographically, economically, historically and culturally in the heart of this historic region with 7 million inhabitants. The airport is situated on the E576 road, about 10 km East of the Cluj-Napoca city centre and 12 km from the railway station. The size and the location of the airport makes it the main airport in Transylvania (North-Western Romania).

The destinations offered by the Cluj Avram Iancu International Airport vary, given the fact that there are up to 45 domestic and international destinations to 21 countries from Europe and the Middle East. The main airlines that operate are Tarom, Wizz Air, Lufthansa, Lot Polish Airlines, Blue Air, Turkish Airlines and Aegean Airlines.

Cluj County has approximately 700,000 inhabitants. From this point of view, Cluj-Napoca Airport can be compared to the airports of other European cities such as Geneva and Stuttgart, that annually register around 9 million passengers.

Cluj Avram Iancu International Airport is one of the modern regional airports in Europe, being the second largest airport in Romania in terms of passenger traffic and the first regional airport of this country. It is considered that the services provided by the airport are fundamental to many people from all areas on a radius of 170 km from Cluj-Napoca city, having estimated approximately 3 million possible passengers from this region alone.

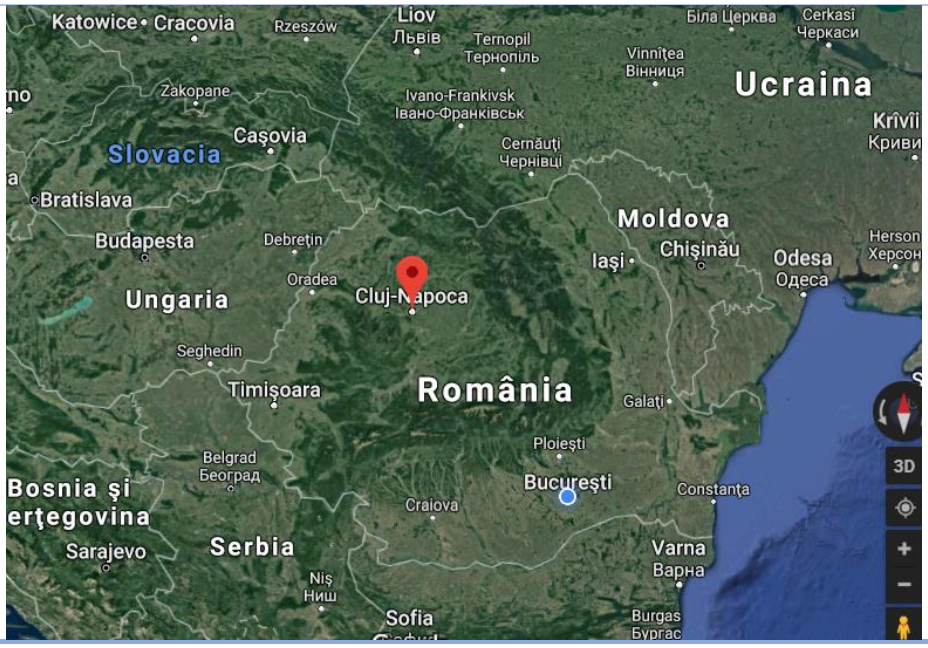

Figure 8.1 – Location of Cluj-Napoca Airport [1]

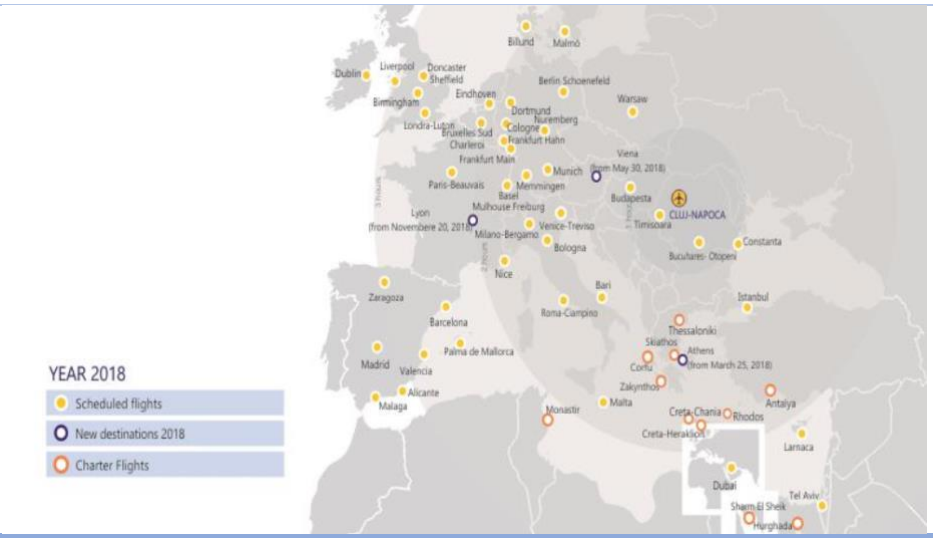

Figure 8.2 – Cluj-Napoca Airport flight connections [2]

LRCL AD 2.2 AERODROME GEOGRAPHICAL AND ADMINISTRATIVE DATA

1	*ARP co-ordinates and site at AD*	464721N 0234132E on RWY centre line, 1457M from THR07
2	*Direction and distance from city*	9 km East from Cluj Napoca.
3	*Elevation/Reference temperature*	1039 FT / 26.3°C
4	*Geoid undulation at AD ELEV PSN*	133 FT
5	*MAG VAR/ Annual rate of change*	5°E (2015) / 7.0'E
6	*AD Administration, address, telephone, telefax, e-mail, AFS, website*	Aeroportul Internațional Avram Iancu Cluj Str. Traian Vuia, nr. 149 , Cluj-Napoca, cod 400397 Tel: +40-(0)264-307500; +40-(0)264-416702; +40-(0)264-416708 Fax: +40-(0)264-416712; +40-(0)264-307505 Telex: 031288 AEROPCL R AFS: LRCLRAYD e-mail: office@airportcluj.ro SITA: CLJAPXH WEB: www.airportcluj.ro
7	*Types of traffic permitted (IFR/VFR)*	IFR/VFR
8	*Remarks*	Nil

Figure 8.3 – Cluj-Napoca Airport Geographical and administrative data [3]

From 1996 until 2017, Cluj Avram Iancu International Airport registered a high growth in the rate of passenger air traffic. This increase was a result of an effective and efficient

management and of the adoption of marketing strategies that generated the increase in air traffic and introduction of new airline operators within the Cluj area market (Tarom, Wizz Air, Lufthansa, Vueling, Lot Polish Airlines, Blue Air, Turkish Airlines, Aegean Airlines). Also, there are three airlines at Cluj Airport that operate international cargo transport – Silver Air, Swift Air and Cargo Air. The evolution of passenger air traffic in the period 1996-2017 can be observed in the charts below, together with the forecast until 2030 and with further airport characteristics.

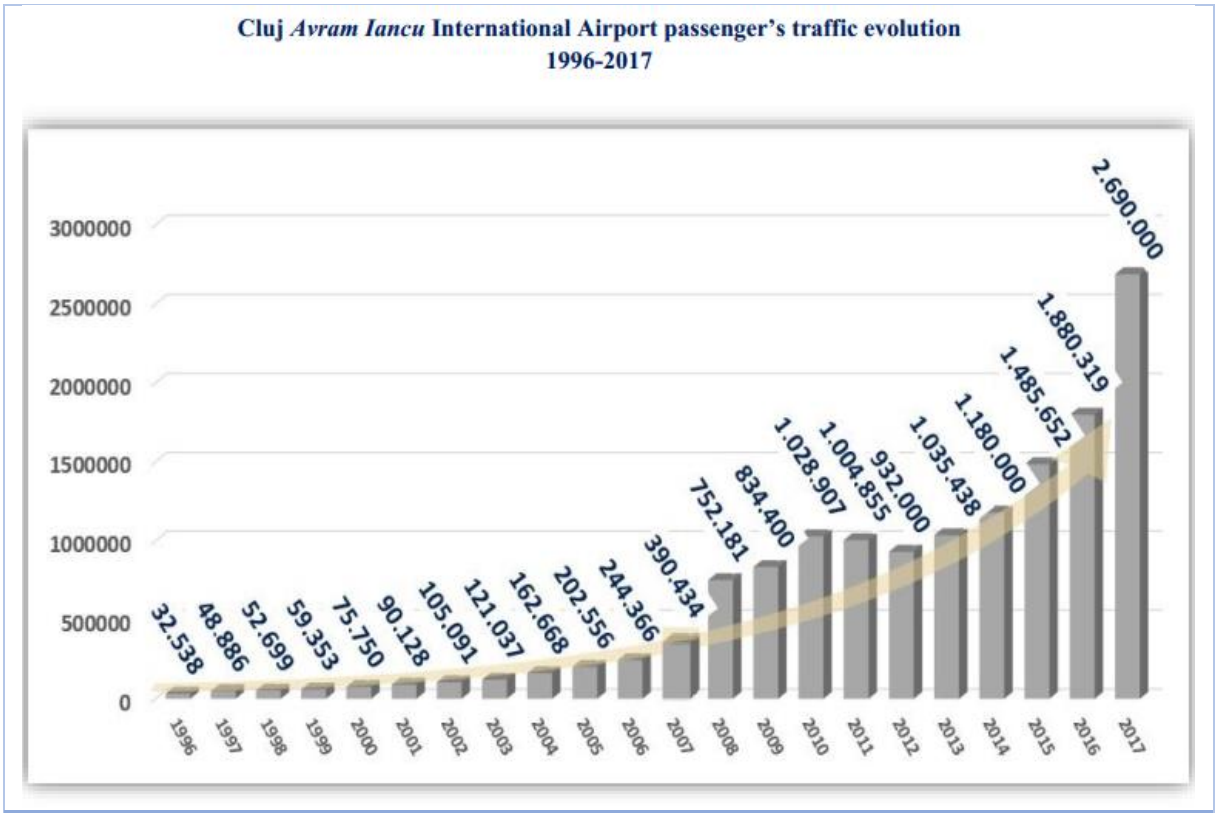

Figure 8.4 – Cluj-Napoca Airport Passengers traffic evolution 1996-2017 [2]

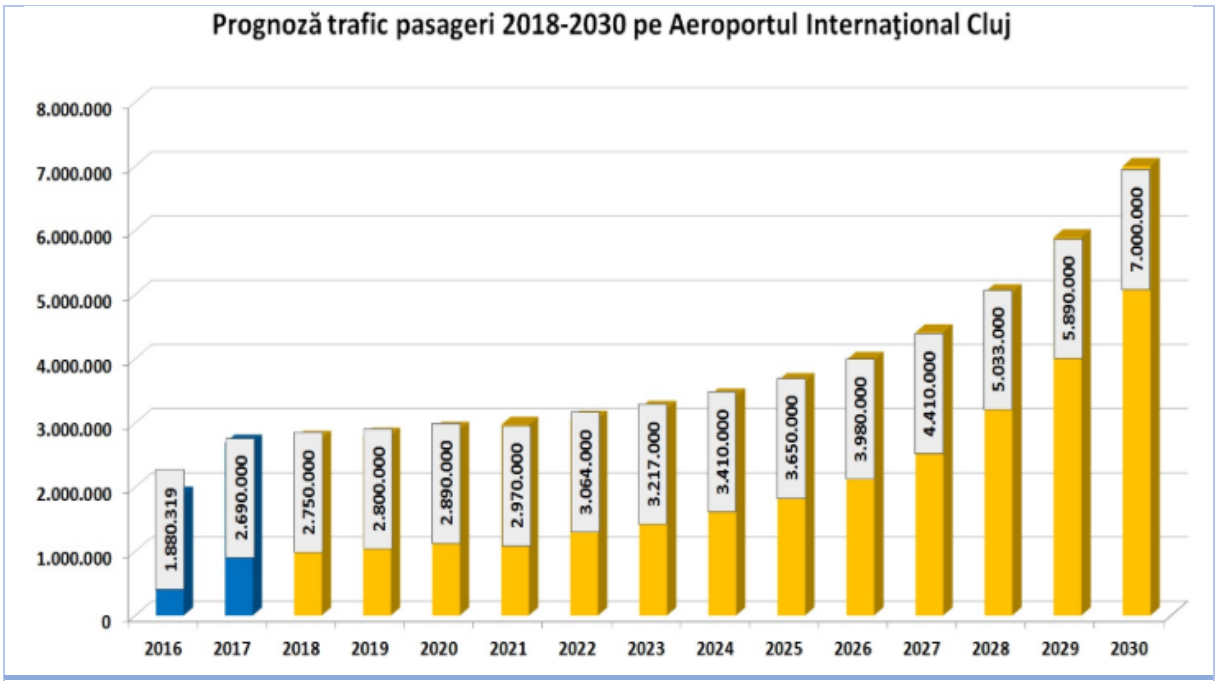

Figure 8.5 – Cluj-Napoca Airport Passenger traffic forecast 2018-2030 [2]

LRCL AD 2.12 RUNWAY PHYSICAL CHARACTERISTICS

Designations RWY	*TRUE BRG*	*Dimensions of RWY (M)*	*Strength (PCN) and surface of RWY and SWY*	*THR co-ordinates RWY end coordinates THR geoid undulation*	*THR elevation and highest elevation of TDZ of precision APP RWY*
1	2	3	4	5	6
07	071.83°	2040 x 45	114/R/B/W/T Concrete	464706.53N 0234026.61E 464724.70N 0234147.26E GUND 133FT	THR 1037 FT
25	251.84°	2040 x 45	114/R/B/W/T Concrete	464724.70N 0234147.26E 464704.10N 0234015.86E GUND 133FT	THR 1023 FT TDZ 1023 FT

Slope of RWY-SWY	*SWY dimensions (M)*	*CWY dimensions (M)*	*Strip dimensions (M)*	*OFZ*	*Remarks*
7	8	9	10	11	12
-0.1% (135 M) -0.4% (540 M) -0.24% (960 M) 0.00% (345 M)	Nil	60 x 180	2160 x 210	Nil	Nil
0.00 % (345 M) 0.24% (960 M) 0.4% (540 M) 0.1% (135 M)	Nil	60 x 180	2160 x 210	Nil	Nil

Figure 8.6 – Cluj-Napoca Airport Runway physical characteristics [3]

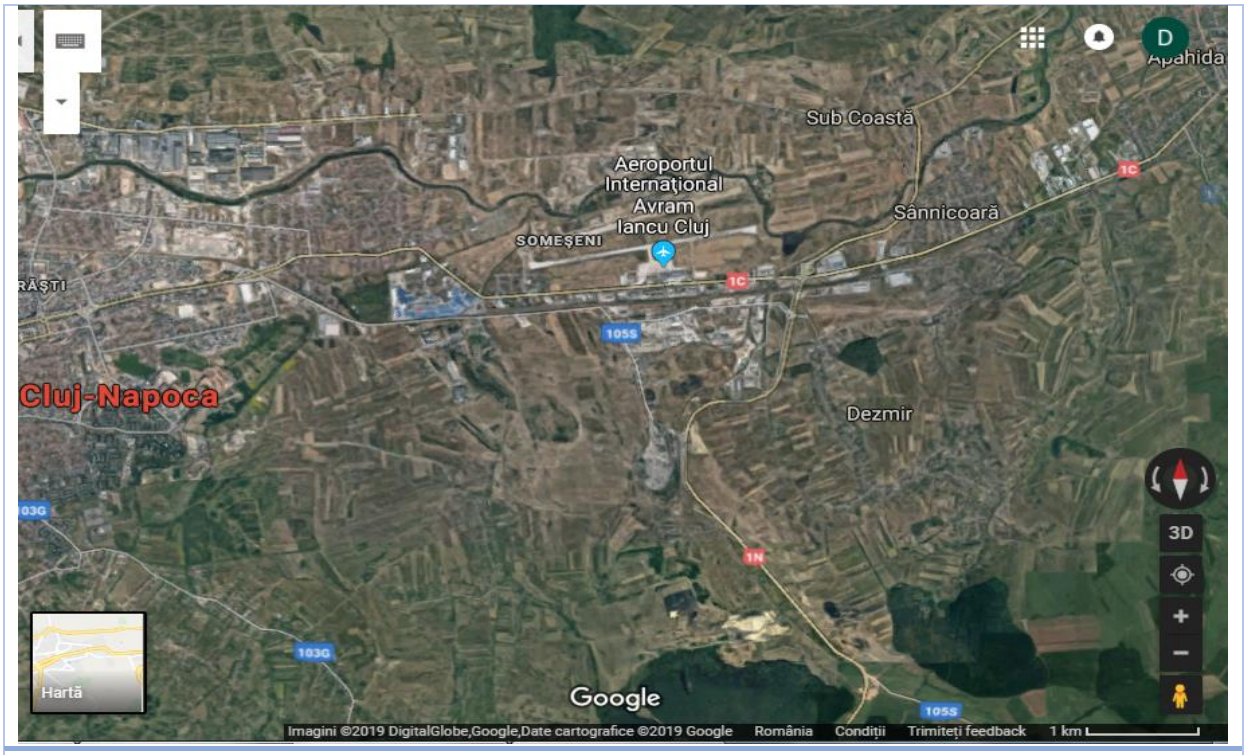

Figure 8.7 – Cluj-Napoca Airport and surroundings [1]

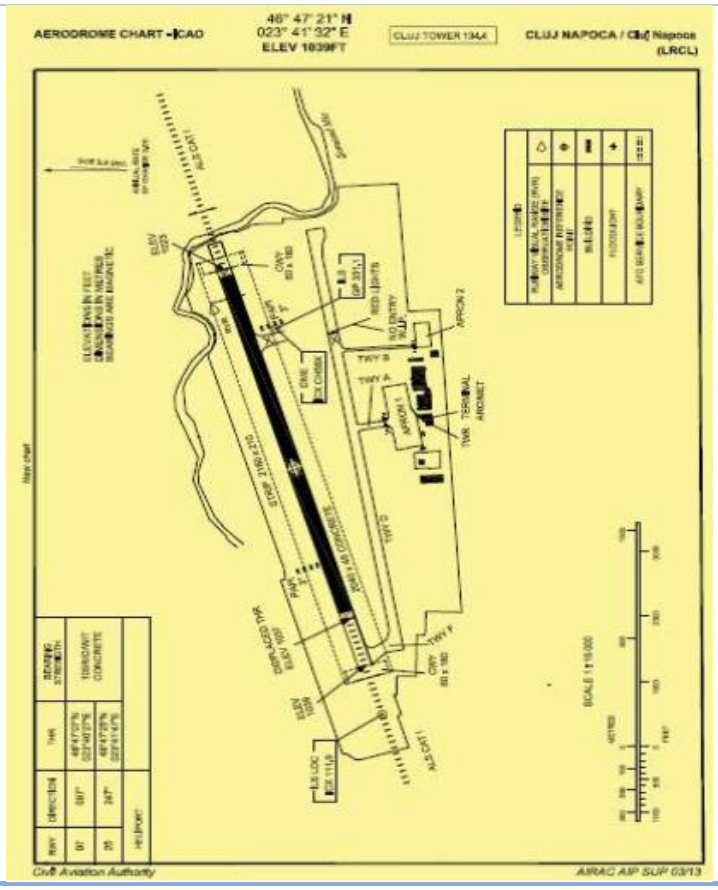

Figure 8.8 – Cluj-Napoca runway map [3]

<u>Investment projects with possible noise issues</u>

Two important projects are planned within the premises of Cluj Airport, which might influence the noise situation in the area in its proximity:

1. *<u>The extension of 07/25 runway</u>*

Figure 8.9 – Runway extension project [2]

A runway extension from 2040 m to 3420 m is considered to represent a necessary investment in order to cope with the expected future traffic development within the

highly dynamic economic area of Cluj. Unfortunately, such an extension requires a correction and relocation of some segments of the Somes River, across a distance of 7 km. This is a difficult task due to supplementary financial needs and potential environmental issues that require preventative measures. Even so, there is a strong determination from the Airport and Cluj-Napoca Local Authorities to move forward and it is expected that this project will be finalised within the next few years. As a consequence, an increase in aircraft noise is expected in the vicinity of airports, due to the expected increase in air traffic. However, there is an opportunity to control or reduce aircraft noise at the same time, provided that there is an effective use of such an extended runway, as it is considered by the airport representatives.

2. *Development of the intermodal transport infrastructure for passengers and cargo*

The intermodal transport infrastructure is an ambitious project, aiming at a smart development of the airport and the region and has the following characteristics: cargo capacity 50 000 tons/year; total surface 46 570 m^2; cargo hall surface 6 180 m^2. This investment would become effective in conjunction with the runway extension, which is expected to facilitate a higher air traffic increase.

Applicable Noise Regulations

The Environmental Noise Directive (END) [4] was transposed into the national legislative framework in 2005 (H.G. 321/2005) [5]. Further updated and modified versions were published through the years, together with the necessary framework for the implementation and evaluation of its provisions. As a main result, the development of the Strategic Noise Maps and Action Plans is mandatory for major airports. Romania has only one major airport, which is Bucharest Henri Coanda International Airport.

The compliance of Romanian Airports with END is further strengthened in 2007 (H.G. no. 674/2007 [6]), 2012 (H.G. no.1.260/2012 [7]) and 2016 (H.G. no. 944/2016 [8]) through modifications and completions done under the provisions of the Law no. 52/2003 [9], regarding the decisional transparency of the public administration. These provisions were extended, at the same time, to many other airports which were not major, but significant in terms of noise in the future, due to their expected increases in air traffic.

A new Noise Law [10] was initiated in 2018, transposing the updated version of the END together with the Annex of the EU Directive 996/2015 [11], establishing the common methods of noise evaluation at the EU level. The implementation of the Noise Law will repeal the previous transposition of the END, together with all its subsequent legislative acts.

Regarding ICAO Balanced Approach (BA) [12], recent legislative changes include the transposition of the Regulation (EU) no. 598/2014 of the European Parliament and Council of 16 April 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at the Union Airports within BA and repealing Directive 2002/30/EC (August, 2018) [13].

A detailed description of the Romanian legislative framework regarding aviation noise can be found in Annex (A). Responsible authorities for aviation noise are detailed in Annex (B).

Overview – approach to the BA

Summary of national regulations and how they are implemented by the airport; AIP Data on noise operations/restrictions/other land use planning data

The only noise abatement procedure of Cluj Airport available within the Aeronautical Information Publication (AIP) data refers to the use of Auxiliary Power Unit (APU) during ground operations (LRCL AD 2.21). Recently (December 2018), the use of NADP1 for RWY 25 became mandatory. Also, the use of either NADP1 or NADP2 for RWY 07 is recommended (LRCL AD 1.1-3).

Review of Noise Action Plans and previous BA interventions

Cluj Airport is not a 'major airport' as defined by the END. However, it is an airport near an urban area (agglomeration) having more than 250 000 inhabitants, which highlights its importance and binds it to be compliant to END. Until now, the airport has implemented the END requirements regarding the development of Strategic Noise Maps and Noise Action Plans.

The most recent Noise Action Plan was initiated in 2017, based on Strategic Noise Maps (2017) for the 2016 air traffic data. In addition, a forecast for the time period of 2017-2022 was also developed. A noise mitigation study was made by using the preferential runway for departures and arrivals, at the initiative of the airport.

An important observation is that the new Noise Action Plan (2017) takes into consideration the noise data coming from the use of the new RWY 07/25, which was opened at the end of 2013 and replaced the old RWY 08/26, which later became a ground operations facility. The development of the new 07/25 RWY was proposed as a noise reduction solution within the previous Noise Action Plans for reducing the noise burden for some communities around the airport (Apahida and Sannicoara). Therefore, the change in direction from the old RWY 08/26 to the new RWY 07/25 aimed to reduce the amount of noise from overflying these communities.

The noise reduction and mitigation interventions that were proposed within Noise Action Plans were considered for both short-term and long-term intervals of time.

Noise at source

Most aircraft that operate on Cluj Airport have to be compliant with the R7 class standards (ACI Aircraft Noise Rating Index, Amendment 7, Chapter 4, 2010). In addition, all aircraft that operate on this airport have to be compliant with ICAO standards on noise (Annex 16, Vol I, Chapter 2 aircraft) or FAA FAR Part 36 (Chapter 2 aircraft). Otherwise, they are not considered eligible to operate on this airport.

Since 11 802 aircraft out of the total of 24 633 aircraft (48%) operating on this airport (2017) were from the A320 family, it can be observed that the noise at source requirements from EASA [A.064.3 from 30.01.2018] are met, as it states that all A320 aircraft produced by AIRBUS meet the standards outlined by ICAO (Annex 16, Vol. I, 3rd Edition, Amendment 7, Chapter 4). Additionally, it is important to mention that 2 998 Boeing 737-800 aircraft (12% from the total number) operated on the airport (2017), aircraft that are also compliant with ICAO standards on noise (Annex 16, Vol. I, 3rd Edition, Amendment 7, Chapter 4), according to EASA [IM.A. 120 of 09.04.2013][14].

Land use planning management, communication and community engagement

Cluj Airport is considered an active promoter of land use planning implementation at both local and national levels. One example is that, in support of completing the legal framework in a coherent and harmonised manner, the airport aims to promote, at the level of the Ministry of Transport and the Government, the development of a draft proposal regarding the development and approval processes of legislative acts for the regulation of constructions in different areas. From their point of view, this effort should

come in support of reducing the number of people exposed to noise and prevent any additional increase.

Strategic Noise Maps developed for Cluj Airport after the construction of the new runway were also shared with the local authorities (city councils and local councils of neighbouring communities – particularly the City Hall of Cluj-Napoca). The aim of this action was to raise awareness about the noise situation and provide information about the contours from conflict areas, while emphasising the importance of enabling the use of such data within the approval process for the construction of residential areas in the proximity of the airport. The rationale behind this action was the assumption that the provision of data related to L_{den} and L_{night} can become a useful tool for an effective regulation of construction initiatives in this area, especially for residential buildings in the vicinity of the airport. Therefore, such an approach provides the possibility to become extended to a long-term strategy on noise and to facilitate a better understanding of the need to implement a continuous aircraft noise monitoring system, such that real-time values can be captured. The most important outcome so far is the inclusion of aeronautical servitudes within the General Plan of Urbanism of the Cluj-Napoca city. The airport plans to continue with this approach in the future.

In the future, the airport aims to promote at the level of local authorities, a proposal for noise zoning in the vicinity of airports, in connection to L_{den} and L_{night} contours resulted from Strategic Noise Maps. This measure aims to exploit the advantages of early planning to ensure a strategic development of the area, in direct synergy with the airport development. The main intention of such initiatives is to support or reduce the noise exposure of residents in the vicinity of the airport.

In addition, as a measure to control and reduce the noise exposure in the vicinity of the airport, it is proposed to carry out noise simulations and forecasts either on an annual basis (correlated to aircraft movement forecasts), or in special cases (correlated to significant differences between the planned and real time of flight). Implementing this measure is considered to support the airport and other relevant stakeholders (e.g. Air Navigation Service Provider, airlines) to better determine an optimal distribution of aircraft movements within the available flight paths.

One further identified need in terms of future measures is the continuous update of Strategic Noise Maps. This is considered to be effective in connection to ensuring that they are available to the interested parties and the public. Such a measure is driven by the need to increase awareness about the noise levels in the area to most interested parties, before starting any investment in constructions or before purchasing a house in the area.

One important driver for Cluj Airport to get engaged in such initiatives was the outcome of the Strategic Noise Maps from 2016 air traffic and of the simulations with noise level predictions for 2017-2022, developed within the 2017 Noise Action Plan. The most important outcomes were the L_{den} and L_{night} values in comparison with the maximum allowed exceeded values for the L_{den} and L_{night} in residential areas within the vicinity of the airport, which showed that the noise exposure is expected to increase in the absence of effective measures.

Operations

Currently, the 2017 Noise Action Plan proposes the use of preferential runways during departures and arrivals. According to a detailed simulation study performed during 2013 and repeated in 2017, it resulted that it is recommended to reduce the number of aircraft movements overflying the city of Cluj-Napoca. That implies the fact that the use of the RWY 07 for departures (from the Cluj-Napoca city towards the airport) and RWY 25 for arrivals (from the airport towards the Cluj-Napoca city) should be used more

frequently (without hindering safety and depending on how much this solution is technically feasible), both during the day and during the night time. Between 2015-2017, the use of RWY07 for departures was approximately 30%, while RWY25 for arrivals was of approximately 90%. This proposal is made in order to prevent any increase of the noise burden in the area (in strong connection to the expected air traffic growth) for the period of time 2017-2022.

Other future goals include the reduction of the number of flights during the night through a more efficient flight planning system, that aims to avoid, as much as possible, scheduling flights in the time interval 23:00h-07:00h. This measure is formulated based on the target to maintain a number of maximum 4,500 aircraft movements per year during the night-time. In addition, another goal is to promote the use of RWY25 for arrivals for night-time flights, in order to avoid overflying the Cluj-Napoca city during the night as much as possible. From a technical point of view, this proposal is feasible especially due to the availability on the RWY25 of the necessary ground equipment for arrivals, which assists aircraft during low visibility conditions. This measure is to be concluded in a joint protocol with the Romanian Air Navigation Service Provider – ROMATSA.

As a long-term measure, it is intended to support the optimisation of SID/ STAR procedures, in partnership with ROMATSA (Romanian Air Navigation Service Provider), in order to investigate, discuss and establish scenarios for different flight paths that are beneficial in terms of noise exposure reduction, especially the ones that reduce the amount of aircraft overflying Cluj-Napoca city.

Operational restrictions

There are no specific noise operational restrictions detailed within the Noise Action Plan, apart from the 'noise at source' restrictions imposed for aircraft types allowed to operate on the airport. Even so, there are some recommendations from the Noise Action Plan that are important to be mentioned:

- It is recommended to maintain the minimum possible number of flights at night by rescheduling them outside the time interval 23:00h-07:00h;

- As a long-term measure, it is recommended to use those flight directions that have more available ground guidance equipment, which is considered better in terms of safety and also beneficial for reducing the number of aircraft overflying the city of Cluj-Napoca. In this sense, this measure focuses on the concentration of flights above areas that are less inhabited.

Public Consultations

Public Consultations have been performed according to the provisions from the Law no. 52/2003 [9], regarding the decisional transparency in the public administration.

In order to support transparency within the decision-making process, it was ensured that suggestions, recommendations and proposals regarding the content of the Noise Action Plan could be sent to an e-mail address, by specifying the articles that are referred to. In this sense, the Noise Action Plan was made available on the website of the airport and the announcement for the official public consultation has been published on their website and also in local newspapers.

All proposals and observations discussed during the public consultation were included in the official minutes and further analysed in order to establish which issues were raised and how can they be included in the Noise Action Plan.

The minutes of the public consultation, the recorded recommendations, an updated version and a final version of the Noise Action Plan, as well as other relevant documents were published and made available online on the website of the airport and at the airport premises on hard copies.

Identification of any trends and overarching processes and internal systems that underpin implementation of the Balanced Approach

Information regarding the **costs** associated with the measure of reducing to a minimum the number of aircraft overflying the city Cluj-Napoca are unavailable. However, it is considered that such a modification (i.e., changing the directions for take-off and landing) are expected to result in increased costs for airlines. If this is the case, it is assumed the risk that such an increase in airline costs might lead to a reduction in the number of flight connections available on Cluj Airport (either by waiving certain destinations or by reducing the frequency of flights).

Cluj Airport is also actively involved in the **SPICE -** Synchronised PBN (Performance Based Navigation) Implementation – Cohesion Europe - **European Project** [2]. The main partners from Romania within this project are the Romanian Airport Association (RAA), the Romanian Civil Aviation Authority (RCAA) and the Romanian Air Navigation Service Provider (ROMATSA). The importance of the presence of Cluj Airport within this project is emphasised by its leadership of the Romanian Airport Association. Also, each airport that is a member of RAA (Cluj Airport included), was funded directly from this project.

The European Project SPICE is part of the implementation phase (2014-2024) of SESAR programme that seeks the increase of Air Traffic Management (ATM) efficiency and of Air Navigation Services (ANS) through decreasing the fragmentation level of the European airspace. Predicted advantages through the application of SES (Single European Sky) estimate a triple increase in airspace capacity, a 50% reduction in ATM costs, a 10% safety increase and a 10% impact reduction of aviation on the environment.

SPICE supports the implementation of a navigation system based on PBN performance, exploiting Area Navigation Systems advantages of modern aircraft in order to support an efficient design of the airspace and the systematisation of air traffic routes, in pursuit of optimising the available airspace.

The implementation period of the project is from 2016 to 2020 and it is coordinated by EUROCONTROL. Partners range from air carriers (Aegean, Blue Air, Regional Air Service, SATA, Tap Portugal), to air traffic service providers (DCAC, HCAA, LPS SR, NAV Portugal and ROMATSA).

At the Romanian level, the project implies a series of activities related to the design, approval and operation of RNAV SID/ STAR systems and procedures (RNP APCH LNAV, LNAV/ VNAV, LP and minimum LPV) through the use of the GNSS signal (EGNOS). The tasks of the project include data collection through the development of obstacle studies for all participating airports, as well as the design, encoding and authorisation of the equipment for PBN implementation. The implementation of the project activities will assist the progress of controlling operations inside the Romanian airspace through PBN, thus facilitating safer and more efficient trajectories, altogether with reducing the rate of missed approaches and redirection cases.

Complaints regarding airport noise are less than 20 per year and are addressed to the airport, the ANSP (ROMATSA – local office), the Environmental Agency or the Municipal Local Police (city of Cluj-Napoca). It should be mentioned that there is no clear, regulated procedure for managing noise complaints.

Flight Procedures (e.g. SID/STARs)

RNAV SID and STAR procedures within NAPOC TMA are based on DME-DME sensors and designed in accordance with RNAV-1 (P-RNAV) criteria. RNAV-1 (P-RNAV) approval is required to conduct these procedures without additional restrictions. RNAV-1 (P-RNAV) approved aircraft operators fill-in accordingly the flight plan. There is expected direct routing/shortcut by ATC whenever possible (especially during off-peak hours). The turn to final approach is usually performed by radar vectors to expedite traffic handling and for separation reasons.

Tactical points for non-standard shorter approach are established: IXORI for CL RWY07, VIBUD for CL RWY25. These points may be used only after request/ approval of air crews. Vertical planning information – air crews should plan for possible descent clearance in accordance with vertical restrictions specified on STAR charts. Actual descent clearance will be as directed by ATC.

In the case when a required climb gradient cannot be followed, air crews are advised to request non-standard departure before start-up.

2.3.2 Obstacles

The exact location for the main obstacles is presented within LRCL AD2.10 from the AIP [3].

LRCL AD 2.10 AERODROME OBSTACLES

In approach / TKOF areas			*In circling area and at AD*		*Remarks*
1			2		3
RWY/Area affected	*Obstacle type Elevation Markings/LGT*	*Coordinates*	*Obstacle type Elevation Markings/LGT*	*Coordinates*	
a	b	c	a	b	
07/APCH	Tree	464656.45N	Building	464837.78N	
25/TKOF	325M/1066FT	0233953.11E	510M/1673FT	0233841.49E	
	Building	464654.70N	Geodetic point	464837.48N	
	325.4M/1066FT	0233951.82E	513M/1683FT	0233834.80E	
	Building	464659.13N	Geodetic point	464833.12N	
	331.2M/1086.6FT	0233940.93E	478.2M/1569FT	0234018.69E	
	Building	464620.64N	Hill	464855.44N	
	384.2m/1260FT	0233747.85E	440.8M/1446FT	0234242.93E	
	Antenna	464613.50N	Hill	464940.91N	
	386.5m/1268FT	0233726.10E	476.7M/1564FT	0234151.53E	
	Antenna	464610.62N	Hill	464617.44N	
	382M/1253FT	0233705.69E	451.2M/1480FT	0234336.52E	
	Antenna	464607.70N	Hill	464510.31N	
	391M/1283FT	0233656.40E	458.9M/1505FT	0233907.80E	
	Church	464619.06N	Hill	464539.68N	
	401.6M/1319FT	0233547.06E	438M.2/1438FT	0234206.29E	
	Church	464612.44N	Hill	464538.90N	
	428.7M/1407FT	0233522.68E	446.6M/1465FT	0234258.75E	
	Antenna	464547.23N	Hill	464637.12N	
	406.7M/1335FT	0233458.72E	536M/1759FT	0232910.91E	
	Antenna	464520.20N	Hill	464912.61N	
	480.2M/1575FT	0233436.56E	550M/1806FT	0233704.15E	
	Hill	464517.55N	Forest	464443.27N	
	442M/1449FT	0233430.29E	456.8M/1499FT	0234318.02E	
	Building	464526.70N			
	521.2M/1710FT	0233545.91E			
	Building	464442.01N			
	526.7M/1728FT	0233528.13E			
	Crane	464444.39N			
	552.3M/1812FT	0233527.37E			
	Antenna	464710.67N			
	351.5M/1153FT	0233926.74E			
	Church	464706.62N			
	359.5M/1179FT	0233927.32E			
	Antenna	464711.88N			
	349.9M/1148FT	0233932.42E			
	Building	464657.54N			
	322.6M/1058FT	0234012.09E			
	Building	464657.36N			
	323.6M/1062FT	0234011.12E			
	Building	464657.51N			
	325.5M/1068FT	0234007.97E			
	Church	464705.42N			
	346.6M/1137FT	0233923.30E			
	Building	464657.61N			
	324.7M/1065FT	0234010.33E			
25/APCH	Asphalt plant	464737.33N			
07/TKOF	335.9M/1102FT	0234317.85E			
	Hill	464906.13N			
	460M/1509FT	0234709.41E			
	Hill	464805.48N			
	465M/1526FT	0234645.58E			

Figure 8.10 - Cluj Airport obstacles [3]

However, it is important to mention that the airport is surrounded by the Somes River and by agricultural land in the Northern part. The rest of the area around the airport has residential areas towards the West, South and East. The most important inhabited area around the airport (highest population number) is the city of Cluj-Napoca, located towards the Western side of the airport.

Further relevant airport information

Bird-strike is not a risk around the airport due to the relatively dense populated areas around the airport and due to the available natural conditions. However, flight trajectories after departure and before arrival take this issue into consideration by avoiding some areas within the vicinity of Cluj-Napoca city, where bird-strike might become a risk.

There is also a small airfield (Sport Aviation/ Flying School) located South-East from the airport. Its close location has to be taken into consideration during flight planning.

Use of preferential runways for noise mitigation

Introduction

The intervention consists of the use of preferential runways for departure and landing in order to avoid overflying Cluj-Napoca city as much as possible.

This intervention was proposed during the first Noise Action Plan from 2014 [15] and again after a subsequent Noise Action Plan from 2017 [14], based on the traffic information from 2014. At that time, the new runway RWY 07/25 was opened to the public and it became the only available one for operational use, as the older RWY 08/26 was repurposed only for ground operations.

The initial specific requirements set out for the intervention were to use RWY 07 (from Cluj towards the Airport) for departures and RWY 25 (from Airport to Cluj) for arrivals as much as possible (limited only by safety reasons and considering the economic impact). This was the scenario for the new runway 07/25.

Detailed Process

Identification of environmental needs

Cluj Airport is the second largest Romanian Airport and has a high annual air traffic growth rate in comparison to other European airports and also to other Romanian airports. One of the reasons is the rapid economic development of the Cluj region, especially after Romania joined the European Union. Another important reason is also the demand for fast transportation options for both passengers and cargo. Given that these factors were identified in an early stage by various stakeholders (Regional and local authorities, airport management), many investment plans for the development of the airport were implemented: building a new terminal (2007), extending the runway (2013), increasing the number of parking spaces and developing an intermodal station for cargo operations. One of the most important changes is the development of the new RWY 07/25.

These aspects were recognised early by the regional, local authorities and airport management and resulted in some important investment plans of the airport development – the building a new terminal (2007), a new longer runway RWY 07/25 (first part opened in 2013) instead of the older RWY 08/26, new parking slots and an intermodal station for cargo operations. The new RWY 07/25 is particularly important for facilitating a further development and expansion of the airport.

The final planned length of the runway is approximately 3500 m and its construction was planned in two stages. The first stage of 2100 m became operational since 2013. The second stage, which is the extension to approximately 3500 m, is still waiting for environmental approvals and financial support. The second stage is more difficult to be achieved since it requires a correction of the Somes river over a distance of 7 km, thus requiring more complex environmental approvals and financial implications. One important characteristic of the new RWY 07/25 is that the flight directions are changed (from 08/26 to 07/25), in comparison to the old runway. This decision was also the only practical solution that allowed the construction of a longer runway, since the old RWY 08/26 could not be extended due to the increase in residential areas within Sannicoara community, in particular in the area that is very close to the end of the runway. Therefore, the orientation of the new RWY 07/25, apart from allowing the possibility to have a runway extension of approximately 3500 m, it also avoids a direct overflight of these new residential buildings. However, the most important challenge is the need to provide a correction for the Somes river.

Figure 8.11 - Location of Cluj Airport with the two runways (top-RWY 07/25; bottom-RWY 08/26) [1]

With respect to noise, the new RWY 07/25 has the advantage that it can avoid the direct overflight of Sannicoara village and Apahida commune. This characteristic was taken into consideration during the impact studies, performed before the construction of the runway. Nevertheless, when the RWY 25 is used for departures (airport towards Cluj-Napoca city) and RWY 07 is used for arrivals (Cluj-Napoca city towards the airport), the noise burden is still a pressing problem because this implies overflying the Cluj-Napoca city in a greater amount. It is important to also highlight the fact that this city represents the community with the highest number of inhabitants near the airport and that the use of the runway directions with increased flights over the city is therefore an important issue, especially during the night-time.

In addition, it is important to take account of the fact that Cluj Airport registered 13,335 aircraft movements in 2014 and estimated approximately 23,000 for 2017. In addition, the forecast for 2017 is expected to double in 2022, resulting in a high probability that Cluj Airport becomes a major airport before 2030. In this sense, the airport is strategically planning in anticipation of significant air traffic growth in the upcoming years, thus airport noise is investigated as an important issue. As a main result, the awareness of various stakeholders (regional and local authorities, communities and Cluj Airport itself) has increased with respect to the importance of introducing noise control and reduction interventions, especially after the development of Strategic Noise Maps and Noise Action Plans (mandatory by law [5]).

Selection of the intervention "Selected options in response to environmental needs"

The first Noise Action Plan issued after the construction of the new RWY 07/25, was based on noise studies performed by considering 2014 and 2015 air traffic data and 2016 forecasts.

The experts that performed these studies proposed as an optimal solution to limit the number of flights over the Cluj-Napoca city and to impose a restriction regarding a maximum number of aircraft movements allowed during the night-time.

Since 2014-2015, the distribution of departures and arrivals on RWY 07/25 became notably different. Available comparative traffic data emphasised this difference, together with the importance of correlating the take-off and landing directions with the number of exposed people to aircraft noise. Therefore, it was recommended that, whenever possible, aircraft movements on Cluj Airport should be made such that both take-off and landing directions avoid as much as possible overflying Cluj-Napoca city.

The traffic orientation and distribution from 2014 was considered both a good practice and a solution that is technically achievable in the future and in the context of a high expected growth rate of operations. Nevertheless, it is mentioned in the Noise Action Plan that, from an economic point of view, the modification of take-off and landing directions will increase the costs of operation for airlines. This fact can determine airlines to reduce the number of flights and connections to Cluj Airport.

Many other positive factors were taken into consideration when estimating the efficiency of the proposed future intervention. One main factor was accounting for new aircraft generations, that are expected to be quieter. Another important factor was the impact of the future increased number of flights, which are planned to be distributed towards the Apahida village.

Implementation processes

The implementation of the proposed scenario for the use of preferential runways was not entirely completed before 2017. However, in 2017, this study was commissioned by the airport representatives, as a contribution to the 2017 Noise Action Plan. The implementation process is expected to continue even after the publication of the 2017 Noise Action Plan, as the understanding of both the airport and the communities regarding the importance of noise has increased. This assumption is drawn from interviews with relevant stakeholders, during the development of this study and from different local newspaper articles.

Different types of challenges have contributed to the delay of the implementation, from economical to technical issues (e.g. the availability of VOR and GNSS ground equipment only for the direction towards Cluj-Napoca city and an ILS for the other direction of flight). One important contributing factor was the unknown cost associated with this intervention. In spite of this uncertainty, it was assumed that such a modification could lead to increased airline costs, the same assumption being valid also for the case of reducing the number of flights operated during the night-time.

The evaluation criteria for the intervention implementation were set in terms of the number of people affected by noise (during the day and night), especially in terms of people affected by noise above the maximum allowed limit or above the future target values.

Post-implementation evaluation. Evaluation of results. Post-implementation changes. Mitigation actions.

Within the noise study performed in 2017 for the new 2017 Noise Action Plan, experts emphasised that the use of the runway oriented towards the city from the airport

(RWY25) for **take-off** in 2016 has grown significantly (74.6%) in comparison to 2014 (34.9%).

In terms of **landing** operations, the airport has registered a decrease to 7.5% in 2016 in the number of arrivals on the runway from the city towards the airport (RWY07), which is significant when compared to 13% in 2014.

From the correlation between the analysis of noise maps and the air traffic predictions for 2017-2022, it is assumed that an increase in the number of people exposed to noise during the night-time is expected, with values above the limit value of 60 dB.

The distribution of air traffic proposed within this intervention (similar to the traffic distribution from 2014), has revealed a significant reduction in the number of people exposed (over 10 times) to L_{night} greater than the target of 50 dB. In addition, a decrease of 60% in the number of people exposed to L_{night} above the maximum limit of 60 dB was concluded. It is assumed that, in the case of L_{den}, this distribution will not raise the number of people exposed to values exceeding the maximum allowed value of 70 dB, as well as the long-term target of 65 dB.

The continuity of this intervention was outlined in terms of proposed number of movements for day, evening and night-time intervals, for the period of time 2017-2022 (Table 8.1 and Table 8.2).

Table 8.1 - Day and evening movements proposed for the new intervention [14]

Direction/ Type of operation		Year 2014 [%]	The scenario from the Action Plan [%]
RWY 07	ARR*	13	13
	DEP	65,1	70
RWY 25	ARR	87	87
	DEP*	34,9	30

Table 8. 2 - Night movements proposed for the new intervention [14]

Direction/ Type of operation		Year 2014 [%]	The scenario from the Action Plan [%]
RWY 07	ARR*	13	5
	DEP	65,1	90
RWY 25	ARR	87	95
	DEP*	34,9	10

The new proposed movement distribution for 2017-2022 with the adopted intervention is even more important since the traffic forecast shows that the number of aircraft movements is expected to double in 2022, in relation to the situation existing in the year 2016. This data reinforced the decision to speed up the implementation of the proposed intervention in conjunction with the aim of having a limited number of flights during the night.

Within the 2017 Noise Action Plan it is also recommended that the proposed intervention should be evaluated through noise simulations and continuously monitored whenever the real air traffic varies in a significant manner from the forecast.

Use of metrics/trials/modelling/monitoring/interdependencies. Methods and tools. Interdependencies. Other relevant information.

The results of the proposed intervention were evaluated through the number of people exposed to a certain noise level, through the use of noise mapping tools.

Data used for the development of Strategic Noise Maps included: airport coordinates (AIP); runway dimensions and physical characteristics (AIP); airport plan (AIP); air traffic data (airport); data regarding the flight paths and flight profiles (AIP); data regarding the number of residents, number of residencies and statistical distribution of population; data about the level curves; the map with cities; building types and heights.

Data used within the study from the Noise Action Plan, regarding the modelling of flight paths and flight profiles included (AIP): the Aerodrome Obstacle Chart, Precision Approach Terrain Chart, Standard Departure Charts and Instrument Approach Charts.

All data described above were further processed through the use of BaseOPS (v7.363) software pack (calculus and prediction) for noise mapping. In addition, NoiseMap – Washmer Consulting (v 4.969) was the software pack used for editing and visualising airport GIS data. Traffic data was provided by the airport and demographic data by local authorities.

Conclusions

Cluj International Airport is the second largest airport in Romania and is handling a fast-growing air traffic due to strong economic demands.

Noise was not a concern in the past years, but the development of Strategic Noise Maps and Noise Action Plans (starting from 2012), has raised awareness and developed a better understanding of the need to account for noise exposure in support of a sustainable development of both the airport and communities.

The intervention of using preferential runways for take-off and landing was considered an effective solution for noise control and mitigation, by taking into account the air traffic forecast for the next 5 years.

Many other contributing factors are expected to facilitate noise control and reduction in the area surrounding the airport, such as the second extension of the runway, the use of modern and quieter aircraft, as well as the implementation of NADP1 procedures since 2019.

Recommendations and lessons to learn

The intervention for using preferential runways for departures and arrivals was proposed during the first Noise Action Plan (NAP) in 2014 and its implementation was supported by all stakeholders, thus highlighting the importance of a common understanding of the noise issue.

Several contributing factors influenced the effectiveness of the implementation of the intervention prior to the 2017 Noise Action Plan. In this sense, a subsequent study accounted for these factors and reinforced the implementation process.

Understanding the responsibilities of stakeholders and developing long-term monitoring strategies are considered to be still challenging due to the fact that the financial and economic impact are not properly determined yet.

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