Aeroporto "Guglielmo Marconi" di Bologna

Document for Stakeholder Consultation and Engagement
Procedure Concerning the Application of the Balanced Approach

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1 Summary

This document contains the relevant information regarding the noise impact of operations and noise management (both current and prospective). It has been prepared by Aeroporto Marconi di Bologna S.p.A. (hereinafter also AdB), the Airport Operator of the Bologna "Guglielmo Marconi" Airport, with the qualified technical contribution of the analysis, consulting, and design firm To70 s.r.l. This is in implementation of Regulation (EU) No 598/2014 and further applicable EU and national provisions, as well as regulatory measures recently enacted by ENAC (Italian Civil Aviation Authority), having consulted the Ministry of Environment and Energy Security.

The Balanced Approach, defined within the framework of Regulation (EU) No 598/2014 (and in line with ICAO provisions), is a mandatory procedure for aircraft noise management at European Union airports recording over 50,000 (fifty thousand) movements.

Regarding the significant role of ENAC in this matter, it should be noted that by means of note no. 6513 of February 15, 2017, the Ministry of Infrastructure and Transport designated ENAC as the competent national authority for the process to be followed when adopting operating restrictions pursuant to Art. 3, par. 1, of the aforementioned Regulation (EU). This appointment was made considering both the functions exercised by ENAC under Art. 2 of Legislative Decree No. 250 of July 25, 1997, and the tasks already assigned to the Authority by the pre-existing regulatory framework concerning airport noise abatement.

The initiation of the Stakeholder consultation process, within the framework of the so-called BAR (Balanced Approach Regulation) procedure in accordance with the current provisions mentioned above, as well as the preliminary analysis of the specific context and of this Informative Report, stems from the exceedance of the noise limits established by the airport noise zoning in the vicinity of the Bologna airport.

In light of these findings, the Airport Operator has initiated a technical process to analyze and study all the elements specified by the relevant regulations. This is carried out with the reservation to formulate a definitive proposal upon completion of the Stakeholder Public Consultation process, with the objective of identifying and subsequently progressively implementing suitable noise mitigation measures for aeronautical activities, in compliance with the current national and European regulatory framework.

The proposal that will be developed by AdB following the acquisition of informational inputs from Stakeholders will define a set of measures and actions aimed at achieving the aforementioned objectives. It will adopt the principles of the Balanced Approach, which require a balance between the acoustic effectiveness of the measures and their economic, financial, and operational impacts on the airport system and the European network.

The assessment will be conducted considering the traffic volume forecasted for 2030 by the current Airport Development Plan (ADP). Therefore, 2030 is adopted from this point forward as the target year for achieving the set goals.

From a methodological standpoint, the identification of mitigation options—as already detailed in this Report—must consider a complex and multifaceted regulatory framework. To ensure the most appropriate and comprehensive approach, it must also include a broad benchmarking analysis aimed at identifying all available and realistically implementable solutions. This should be done using a balanced approach that

reconciles the needs of the Airport Operator with the perspectives and interests of all Stakeholders affected by the future adoption and implementation of the measures.

For each potentially adoptable measure, the noise reduction effectiveness and the overall repercussions on the broader airport system must be analyzed, defining a set of parameters to evaluate its cost-effectiveness profile.

Within this context, it is deemed essential at this stage, and as a general principle, to highlight the socio-economic significance of "Marconi" Airport. This importance extends beyond the Metropolitan City and the Emilia-Romagna Region to the entire national economy and the European Union, particularly concerning air transport operators, the vast user base served by the Airport, and, more broadly, businesses and all economic operators with various interests in the air connections and socio-economic activities that the Airport stimulates or supports.

Over the last twenty years, Bologna Airport has served over 180 million passengers and handled approximately 900,000 tonnes of cargo. It has contributed to increasing regional accessibility, supporting the right to personal mobility, and enhancing the local socio-economic system, while simultaneously fostering the export of regional excellence. In this perspective, the Airport plays a significant role across the three dimensions of sustainability: economic, social, and environmental.

Consistent with the sustainability and environmental protection policies historically promoted by Aeroporto Marconi di Bologna S.p.A., this Report systematically evaluates all mitigation measures that can be implemented at the Airport. It pursues a dual objective: on the one hand, to improve the acoustic environment and reduce the population exposed to aircraft noise; on the other hand, to safeguard the strategic role and socio-economic function of the Airport.

The implementation of the measures to be defined following the Stakeholder Consultation will take place over the 2026–2030 timeframe. The schedule will align with technical requirements and the completion of the necessary authorization and approval processes.

The implementation process will be accompanied by continuous monitoring aimed at verifying the effectiveness of the actions undertaken and the actual reduction of noise levels.

Furthermore, this Report is the result of a dialogue process initiated by the Airport Operator during the preliminary investigation phase. This process aimed to gather useful elements from directly involved and relevant Stakeholders for the proposal, which will be finalized by the Airport Operator within the timeframes and modalities specified by the reference regulations. All relevant observations based on technical elements will be evaluated by the Airport Operator.

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2 Introduction

The fundamental principles of **Regulation (EU) No 598/2014** (**Balanced Approach Regulation**, hereinafter "BAR") are illustrated below, clarifying their application criteria and their role in airport noise management. Concurrently, the main European and national legislative and regulatory references useful for defining the framework are recalled. These provisions form the basis both for establishing the methodological approach adopted and to be further followed, and for ensuring full consistency with the requirements and obligations provided for the correct and lawful development of a BAR proposal.

2.1 Balanced Approach principles

The International Civil Aviation Organization (ICAO) has outlined a structured and consistent approach for the management of noise impacts at airports, designed to guide decisions at the level of individual airports in a rational and comparable manner. This methodological pathway involves the coordinated analysis of the full range of available measures, without excluding or prioritizing any a priori, in order to identify the combination best suited to the specific context and capable of ensuring measurable results.

The overall objective is to manage noise pollution effectively and efficiently, adopting proportionate decisions aimed at maximizing cost-effectiveness.

Within this framework, Bologna Airport has oriented its policies and intervention tools towards the adoption of this approach, initiating a process that has enabled the systematic evaluation of applicable options and the definition of an implementation path consistent with the operational needs of the Airport, the characteristics of the surrounding territory, and the expectations of the affected communities.

The development of this document, as well as the measures identified for the analyzed reference scenarios, has been carried out by applying the criteria set forth by Regulation (EU) No 598/2014 on the "Balanced Approach". This methodological approach allows for the identification of the most effective measures to address the issue of noise pollution at airports, maximizing environmental benefits while minimizing any negative impacts.

The identification of the noise issue (noise criticality) constitutes the initial prerequisite of the methodological approach. In particular, in the event of an exceedance of noise limits, it becomes necessary to evaluate and, where appropriate, introduce further mitigation measures if the set of measures already in place proves insufficient to achieve the noise reduction objectives. This requirement must also be considered in light of the development prospects and the forecasted evolution of the Airport.

Starting from this definition, a systematic analysis of the mitigation measures available today is conducted, considering the scientific and technical state of the art, ultimately leading to the selection of the most appropriate measures that are consistent with the operational and territorial specificities of the Airport in question.

The measures evaluated for noise mitigation in this specific case are divided into the categories listed below:

Figure 1: Balanced Approach – ICAO

The four pillars identified by ICAO for the Balanced Approach can be described as follows:

1. **Reduction of noise at source:** Noise mitigation actions related to the reduction of noise at the source are based on the analysis of the current fleet, anticipated technological developments, and aircraft renewal plans. Such interventions include both the introduction of new-generation aircraft, characterized by a lower noise footprint, and the adoption of technological upgrades on aircraft already in service (engines, components, materials, and aerodynamic solutions), capable of progressively improving acoustic performance throughout their life cycle.

2. **Land-use planning and management:** Noise mitigation actions related to land-use planning and management aim to reduce the population exposed to noise through airport noise zoning and urban planning, measures concerning buildings and land-use designations (e.g., sound insulation, limitation of noise-sensitive developments), consultation with local authorities, and the control of non-conforming uses.

3. **Noise abatement operational procedures:** Operational noise mitigation measures consist of the optimization of take-off and landing phases through preferential runways and routes, as well as noise abatement procedures (take-off/approach), without reducing airport capacity. They may include adjustments to flight paths and operational profiles to reduce or redistribute noise in the surrounding areas.

4. **Operating restrictions:** Operating restrictions are extraordinary noise mitigation measures that regulate aircraft access and/or limit movements. They encompass: general limits (maximum number of movements or noise quotas), specific constraints by aircraft type (e.g., the phase-out of marginally compliant aircraft), and partial restrictions differentiated between daytime and nighttime periods. From the perspective of the Balanced Approach, such measures must be

viewed as a last resort (*extrema ratio*), to be considered and proposed only when all other measures are insufficient to achieve the noise reduction objectives. In any event, due to their exceptional nature, operating restriction measures must be notified by ENAC to the European Commission prior to their approval and entry into force.

The analysis was conducted following this methodical and structured approach, in order to ensure an assessment that is strictly faithful to the guidelines of the Balanced Approach.

2.2 Regulation framework

In drafting this document, reference was made to international regulations and, as a primary source, to European legislation, and consequently, to non-conflicting primary and secondary Italian legislation. The current regulatory framework establishes useful references, criteria, and procedures to monitor, limit, and mitigate the noise impact arising from airport operations.

2.2.1 International regulation

As anticipated in the previous section, the **International Civil Aviation Organization (ICAO)** defined the **Balanced Approach to Aircraft Noise Management** as its primary noise policy, adopted by the ICAO Assembly during its 33rd Session (2001) and reaffirmed in all subsequent Assembly sessions (reference: ICAO Resolution A41-20). Detailed guidelines on the application of the Balanced Approach are provided in ICAO Doc 9829, "Guidance on the Balanced Approach to Aircraft Noise Management".

The method allows for the identification of the most appropriate measures to address an airport's noise pollution issue and to achieve the maximum environmental benefit most **cost-effectively**.

The method unfolds through various phases:

- Identification of the **noise issue**;
- Analysis of the various available measures;
- Selection of the most appropriate measures.

The measures considered to mitigate noise are divided into the categories shown below:

1. Reduction of noise at source;
2. Land-use planning and management;
3. Noise abatement operational procedures;
4. Operating restrictions.

Without prejudice to the validity of **Directive 2002/49/EC** (END - Environmental Noise Directive), the main regulatory framework reference used for drafting this Report and for the process initiated by Bologna Airport in this matter is **Regulation (EU) No 598/2014** on the establishment of rules and procedures with

regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach.

This Regulation establishes rules concerning the procedure to be followed for the introduction of noise-related operating restrictions. Member States shall ensure that the Balanced Approach to aircraft noise management is adopted, in order to determine the measure or combination of measures that can offer and ensure the best **cost-effectiveness ratio**.

Within this Regulation, it is highlighted that, although operating restrictions may result in a benefit in terms of the acoustic environment in the areas surrounding the Airport, they can also lead to a reduction in airport capacity and, consequently, limit the socio-economic development of the territory. Quoting the Regulation and, specifically, **Recital 9**:

"At airports where a noise problem has been identified, additional noise abatement measures should be identified in accordance with the Balanced Approach methodology… Noise-related operating restrictions should be introduced only if other Balanced Approach measures are not sufficient to achieve the specific noise abatement objectives."

It is emphasized that **operating restrictions** are undoubtedly an effective tool for reducing airport noise but must be considered as a **measure of last resort** (*extrema ratio*). They are to be introduced exclusively following a cost-effectiveness assessment and only in the event that the other actions provided for under the Balanced Approach prove insufficient to achieve the noise abatement objectives.

2.2.2 Regulation ENAC 20/12/2024

The ENAC Regulation "Provisions for the implementation of the balanced approach at national airports in application of Regulation (EU) No 598/2014" (together with the Technical and Operational Guidelines detailing the "Methodology for the implementation of the balanced approach at national airports in application of Regulation (EU) No 598/2014") aims to provide a clear, consistent, and structured methodological framework. This framework is designed to support the effective application of the Balanced Approach and to ensure the preservation of the airport's acoustic environment over time.

Therefore, this ENAC Regulation constitutes a reference tool for establishing a comprehensive operational pathway, capable of guiding the Airport Operator's decisions in managing airport noise issues. Specifically, it defines the actions that airport managing bodies are required to adopt for noise containment once an exceedance of the noise limits established through the airport noise zoning has been verified.

In contexts where such exceedances are confirmed, and provided that no substantial changes have occurred in the conditions that led to the definition of the noise zoning, the Airport Operator is required to evaluate the effectiveness of the measures already in place. If the combination of existing measures does not allow for the achievement of the predefined noise abatement objectives—and without prejudice to compliance with the timing and procedures for preparing the noise containment and abatement plans referred to in Art. 2, paragraph 2, clause 3, point c) of the Ministerial Decree of November 29, 2000—it becomes necessary to identify and adopt supplementary noise mitigation measures.

These interventions must be defined taking into account not only the current criticalities but also the forecasted development of the Airport, in order to ensure a sustainable balance between air traffic growth, the protection of the local population, and compliance with the relevant regulatory framework.

The measures to be adopted follow the pillars of the Balanced Approach, while also integrating financial instruments, which are considered useful economic tools to incentivize more sustainable behavior by sector operators.

2.2.3 Italian regulation

At national level, the primary reference—for all its provisions that do not conflict with the aforementioned EU source—is the **Ministerial Decree (MD) of 29/11/2000**. This decree assigns the Airport Operator the responsibility to identify areas where noise levels exceed the noise zoning limits and preparing the necessary mitigation measures to restore compliance.

The approach of this methodology is specifically focused on the exceedance of noise zoning limits, with the objective of bringing the noise contours back within the approved boundaries. This plan is prepared in compliance with the provisions of Legislative Decree No. 42 of February 17, 2017, as the implementing measure of Framework Law No. 447 of 26/10/1995.

Article 10, paragraph 5 of Decree 447 of 26/10/1995, regarding the preparation of the noise mitigation and abatement plan, is cited below:

"*Notwithstanding the provisions of the preceding paragraphs, companies and managing bodies of public transport services or related infrastructures, including motorways, ((in the event of exceeding the limit values established by the implementing regulations referred to in Article 11,)) are obliged to prepare and submit noise mitigation and abatement plans to the municipality, in accordance with the directives issued by the Minister of the Environment by decree within one year of the entry into force of this law.*"

Therefore, as also established by Article 2, paragraph 4 of MD 29/11/2000, the Airport Operator is obliged to identify the areas where limits are exceeded and to submit a plan for noise mitigation and abatement measures, which includes:

- The identification of the mitigation measures and their implementation procedures;
- The indication of any other infrastructures contributing to noise immission in the areas where the limits are exceeded;
- The indication of the implementation timeframes and estimated costs for each measure;
- The degree of execution priority for each measure;
- The justification for any measures applied directly to noise-sensitive receptors.

Structural mitigation measures must be implemented according to the following hierarchy of priority:

a) Directly at the noise source; **b)** Along the noise propagation path; **c)** Directly at the noise-sensitive receptor.

Furthermore, reference is made to Article 5, paragraph 4 of MD 29/11/2000:

"The measures referred to in letter c) [ed. structural measures directly at the receptor] shall be adopted if, through the types of measures referred to in points a) and b) of paragraph 2, compliance with the immission limit values is technically unachievable, or if required by technical, economic, or environmental assessments."

3 Additional Reference Decrees

Within the reference regulatory framework, in addition to the Implementing Decree of Framework Law 447/95, the following decrees are also cited:

Ministerial Decree 31/10/1997 Particular reference is made to Article 2 concerning the criteria and methods for measuring airport noise. MD 31/10/1997 is uniquely significant within the Italian regulatory landscape for noise pollution because it defines a specific noise indicator: the **Airport Noise Evaluation Level** (*Livello di Valutazione del rumore Aeroportuale - LVA*). Its formulation and definition are linked to the operational modalities of airport infrastructure typical of Italy. For a more detailed description of this noise indicator, please refer to Appendix B of this document.

Prime Ministerial Decree (DPCM) 14/11/1997 With reference to Article 3, paragraph 2 of this decree, the following is cited:

"*For road, railway, maritime, and airport infrastructures, as well as other noise sources referred to in Article 11, paragraph 1 of Law No. 447 of October 26, 1995, the limits set out in Table C annexed to this decree do not apply within their respective statutory noise zones (fasce di pertinenza), as identified by the relevant implementing decrees. Outside these zones, said sources contribute to the achievement [of the limits].*"

It is therefore concluded that, outside the statutory noise zones defined by the relevant implementing decrees, the noise pollution contribution generated by the Airport is only one of the contributing factors to reaching the total noise value.

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4 Current status

To clearly depict the current status of Bologna Airport and present the results of the noise mapping for the reference year 2023—with a specific focus on areas where exceedances of the airport noise zoning limits are recorded—this chapter provides a description of the airport context and its operational procedures.

Furthermore, it reports the primary traffic data and the corresponding noise contours generated for the reference year of this document, as well as for the intermediate bridging years 2024 and 2025.

4.1 Land use around Bologna airport

Bologna Airport is located in an area bounded by the A14 "Adriatica" motorway to the south, the Reno River to the east, the local road network to the north, and the Bologna–Verona railway line to the west.

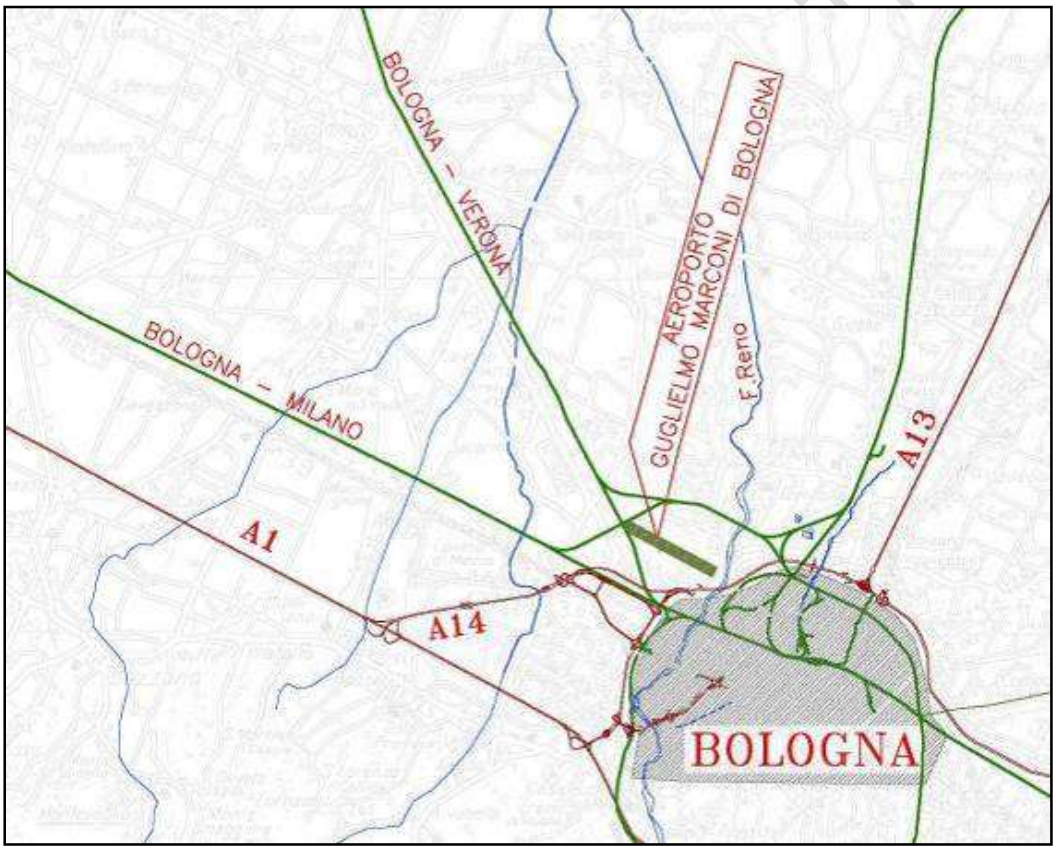

Figure 2: Bologna airport localisation

The environs of Bologna Airport encompass the municipalities of Bologna, Castel Maggiore, Calderara di Reno, and Anzola dell'Emilia; specifically, the airport footprint intersects the administrative boundaries of Bologna and Calderara di Reno.

Land use to the east of the airport is dominated by high-density urban development. In contrast, the western perimeter is adjacent to the **Bargellino industrial zone**, which subsequently transitions into a primarily agricultural landscape.

To the north of the airport grounds, at a lateral distance of approximately 400 meters from the runway, lies the residential settlement of Lippo di Calderara di Reno. Further along this same directional axis, the area features additional industrial developments.

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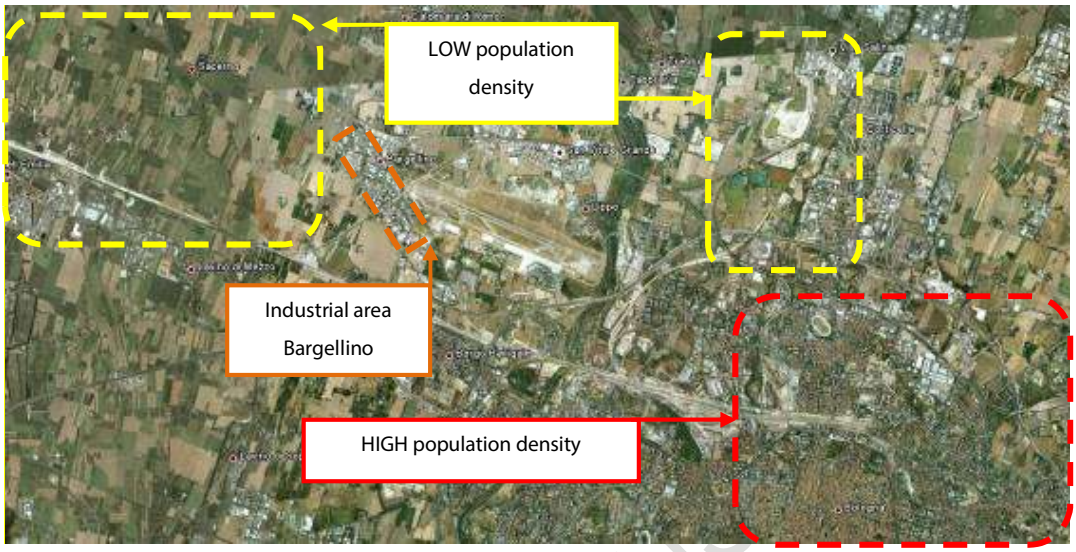

Figure 3: Localisation of residential areas around airport

4.2 Airport infrastructure

Bologna Airport (IATA: BLQ, ICAO: LIPE) features a single runway designated as RWY 12/30, with a true bearing orientation of 116.71°/296.71°. The runway is 2,803 meters long and 45 meters wide, with a flexible pavement structure (asphalt concrete) rated at a bearing capacity of PCN 7.

Under ENAC regulations for Airport Construction and Operations, the runway is classified as Code 4D. Runway threshold 12 is equipped with a 120 m x 180 m clearway and a 90 m x 90 m RESA (Runway End Safety Area). Runway threshold 30 is equipped with a 60 m x 180 m clearway and a 120 m x 90 m RESA.

The general layout of Bologna Airport is illustrated in the aerial imagery and the subsequent AIP chart below.

Figure 2: Air view of Bologna airport – Fonte: Google Earth

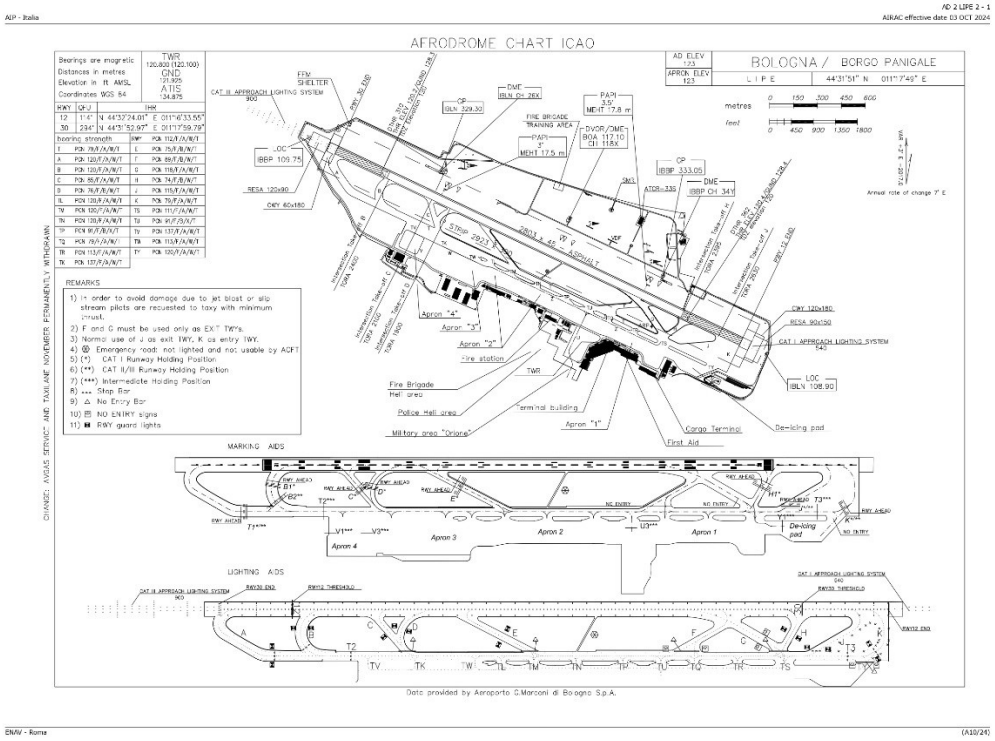

Figure 4: Aerodrome Chart ICAO Aeroporto Guglielmo Marconi di Bologna – fonte AIP ENAV

The passenger terminal consists of a single building located south of the runway. The facility is structured across three levels. The passenger processing area spans two distinct functional levels, dedicated respectively to arrivals and departures for both domestic and international flights.

4.3 Description of current noise reduction measures

This section provides a detailed overview of the strategies and mitigation measures adopted by Bologna Airport for noise pollution management. These interventions have been progressively implemented over time with the objective of:

1. Monitoring aircraft noise;
2. Accommodating progressive traffic growth with measures designed to mitigate the noise impact on the densely populated areas located in the eastern airport environs, within the municipality of Bologna.

- **1996**: Introduction of the first Noise Abatement Procedures (Initial Climb Procedures – ICPs for RWY 12) to minimize overflights (turn point at 2 NM VOR)
- **2001**: Installation of the Noise Monitoring System (NMS);
- **2003**: Implementation of acoustic zoning (establishment of airport noise limits and land-use planning conditions); designation of RWY 30 as the preferential runway for departures, and a nighttime ban on RWY 12 departures;
- **2004**: Runway extension (+350 m), resulting in an increased overflight altitude above Bologna;
- **2004**: Construction of an earthen noise barrier (berm) to shield the residential settlement of Lippo di Calderara di Reno;
- **2010**: Revision of RWY 12 ICPs (turn point reduced to 2 NM, corresponding to approximately 800 ft);
- **2011**: Installation of a CAT I ILS on RWY 30, subsequently reducing the number of departures from RWY 12;
- **2016**: Implementation of a nighttime runway use restriction for arrivals on RWY 30;
- **2023**: Introduction of an operating restriction limiting nighttime runway capacity (ENAC Order 05/2023;
- **2023**: Update to RWY 12 ICPs (turn point altitude lowered from 800 ft to 520 ft);
- **2024–2026**: Noise Action Plan (NAP).

The table below and the subsequent sections detail the primary mitigation measures implemented, structured according to the pillars of the Balanced Approach.

N.	Pillar	Misura di mitigazione ESISTENTI
1	**Reduction of the noise at source**	• Fleet renewal
2	**Land use planning**	• Airport acoustic zoning • Airport noise monitoring system • Acoustic barrier Calderara
3	**Operational procedures**	• ICP RWY 12
4	**Operative restrictions**	• Limitation use of APU • Limitation engine test • Banning aircraft stage 2 • Ordinanza ENAC 05/23

4.3.1 Pillar 1 – Fleet renewal

Over recent decades, aircraft fleet renewal has played a pivotal role in the modernization of air transport and the transition toward more sustainable aviation practices. The introduction of next-generation aircraft has reduced noise footprints, enhanced fuel efficiency, and mitigated the environmental impact of airport operations and flight routing.

Up until the 1980s and 1990s, fleets were dominated by aircraft designed primarily for capacity and range, featuring noisier and less efficient engines, such as the MD-80 and Boeing 727. The continuous growth in air traffic, coupled with increasing scrutiny from local communities, underscored the pressing need for technological upgrades. Consequently, many airlines initiated phase-out programs for older aircraft, replacing them with modern models. Alitalia and then ITA AIRWAYS, for instance, progressively replaced its MD-80s initially with Airbus A319/A320 and Embraer E170/175/190 aircraft, and subsequently with A320neo, A321neo, and A220 models.

Although Bologna Airport has not yet implemented substantial measures to incentivize fleet renewal, it intrinsically benefits from the natural fleet turnover of its operators. The airport's current traffic is indeed dominated by the most widespread models, with the Boeing 737-800 holding the top position, followed by more recent and fuel-efficient aircraft such as the Boeing 737 MAX 8, Airbus A320neo, and A321neo. In the long-haul segment, Emirates operates modern aircraft such as the Airbus A350-900.

The main carriers operating at Bologna Airport, including Ryanair and Wizz Air, are investing heavily in fleet modernization, with a strong strategic focus on the MAX and NEO aircraft families. Given their significant operational footprint at the airport, these next-generation aircraft are poised to become the primary backbone of future traffic, contributing substantially to the airport's environmental and operational evolution.

Natural fleet turnover has proven to be one of the most effective drivers in containing aviation noise, despite the overall increase in traffic volumes. In the coming years, a progressive increase in the share of latest-generation aircraft is anticipated, offering competitive advantages in terms of operational efficiency and environmental performance. Supported by ongoing airline order books and the planned phase-out of legacy models, these aircraft will further optimize the airport's fleet mix, yielding expected reductions in both noise emissions and air pollutants.

4.3.2 Pillar 2 – Airport acoustic zoning

Bologna Airport features an acoustic zoning plan, approved by the competent Airport Commission and established in compliance with the Ministerial Decree of October 31, 1997. This zoning was officially ratified in 2003, based on air traffic data from 2001.

Regarding statutory land-use planning regulations, it is noteworthy that upon integrating the acoustic zoning into its municipal spatial plans, the Municipality of Bologna opted to apply residential constraints to the designated Zone A. This decision was driven by the objective of capping residential density in the areas closest to the airport, thereby mitigating the risk of exposing residents to elevated noise levels while concurrently containing urban encroachment within the immediate airport environs.

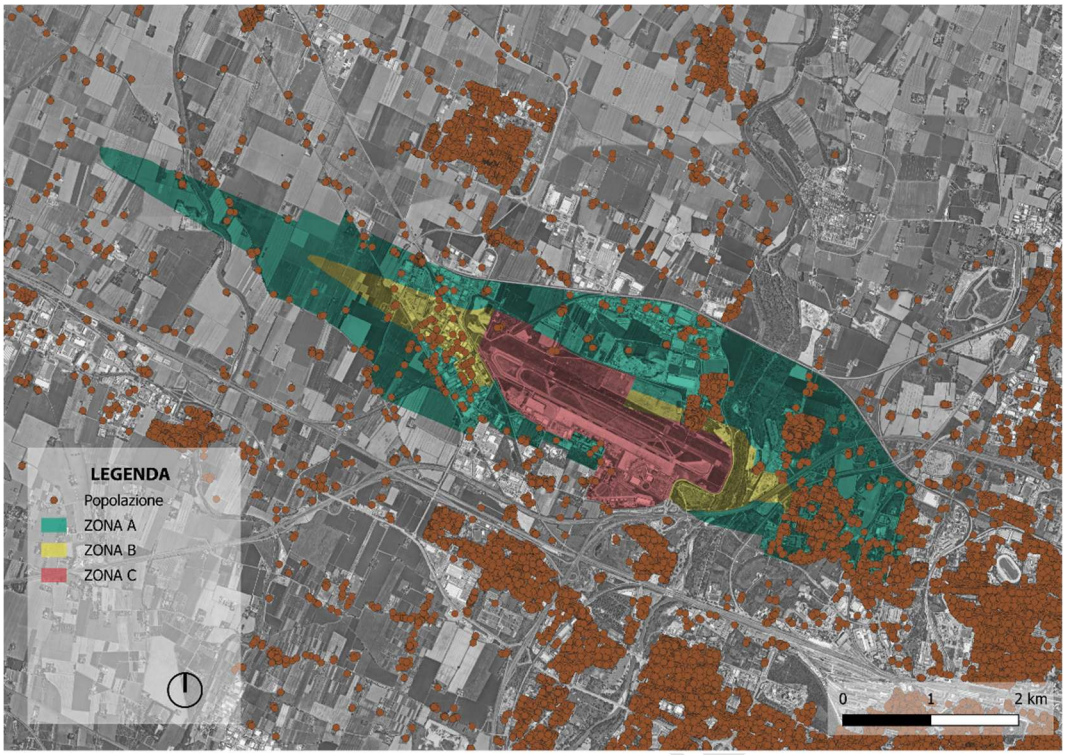

Figure 5: Airport Acoustic Zoning of Bologna Airport

Specifically, in accordance with Article 6 of the Ministerial Decree of October 31, 1997, the aviation noise limits corresponding to each noise buffer zone established by the acoustic zoning are defined as follows:

- **Zone A:** The LVA index must not exceed 65 dB(A);
- **Zone B:** The LVA index must not exceed 75 dB(A);
- **Zone C:** The LVA index may exceed 75 dB(A).

Outside the perimeters of Zones A, B, and C, the LVA index must not exceed a threshold of 60 dB(A).

The following table provides a detailed breakdown of the resident population located within the defined acoustic zones, categorized by the municipalities of Bologna, Calderara di Reno, and Anzola dell'Emilia[1].

Population exposed	Zona A	Zona B	Zona C
Total	**10.986**	**242**	**30**
Pop Bologna	9.359	25	24
Pop Calderara di Reno and Anzola dell'Emilia	1.627	217	6

Table 1: population exposed in the airport acoustic zoning

[1] Dati territoriali forniti dalle singole amministrazioni comunali ed elaborati tramite piattaforma GIS

4.3.3 Pillar 2 – Airport noise monitoring system

Bologna Airport is equipped with a Noise Monitoring System (NMS) consisting of seven mobile stations located within the airport environs, as illustrated in the following figure. The primary objective of this monitoring is to measure the airport noise impact regarding the potential exceedance of Class I limits in sensitive areas outside the airport acoustic zoning. This aims to assess the need for corrective air traffic management actions and/or noise mitigation interventions.

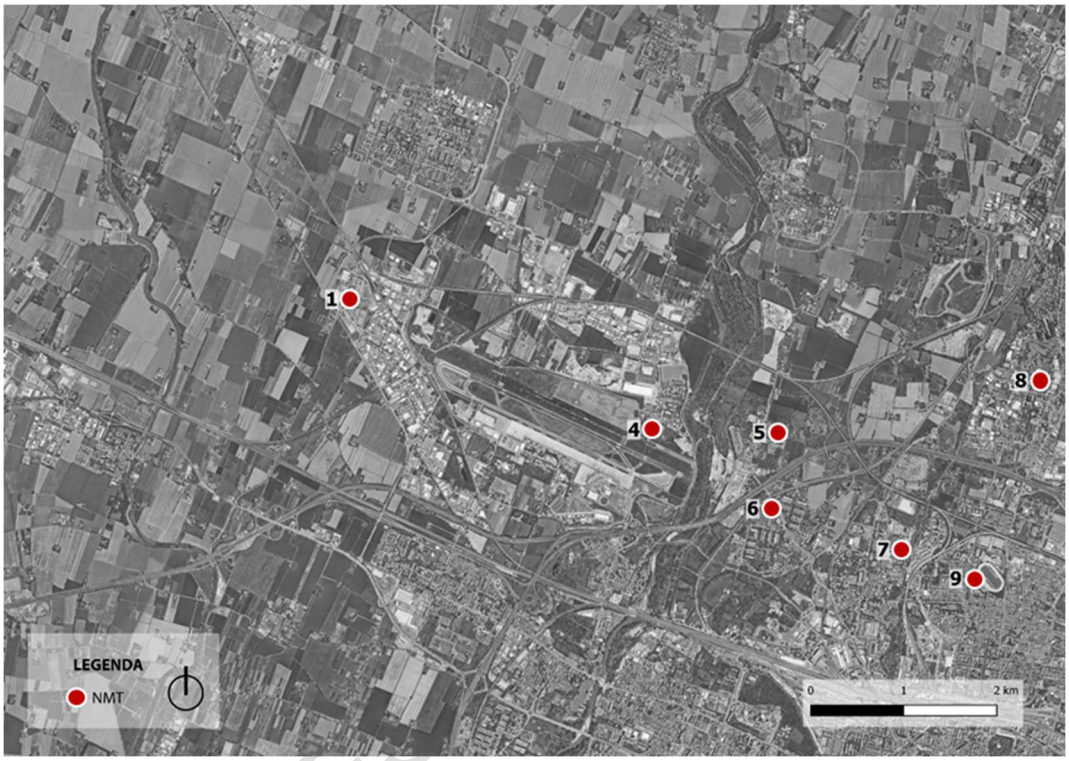

Figure 6: Noise Monitoring System at Bologna Airport

The system enables the automatic acquisition of ENAV radar tracks and correlates them with the acoustic data recorded by the Noise Monitoring Terminals (NMTs). The Airport Operator processes the noise data on a monthly basis, preparing technical reports that are submitted to local authorities, agencies, and the Navile District residents' committee. Similar data are also published on the Airport's website [1].

Furthermore, the Airport Operator analyzes and processes traffic data concerning nighttime overflights (departures and arrivals) over the Eastern sector (RWY 12 departures and RWY 30 arrivals) as part of an external communication and information program established in collaboration with local administrations. Specifically, the Public Viewer is a tool allowing citizens to monitor arriving and departing air traffic at Bologna Airport in real time, along with the noise levels recorded by the NMS terminals. By selecting a specific NMT, users can view the instantaneous noise level, intuitively represented by three intensity bands depicted as concentric circles around the measurement location. Nighttime overflight data are also made publicly available on the Airport Operator's website.

4.3.4 Pillar 2 - Lippo di Calderara Noise Barrier

The noise mitigation interventions implemented by Bologna Marconi Airport include the construction of a noise barrier within the airport perimeter to shield the residential settlement of Lippo di Calderara di Reno, located in Zone A of the airport acoustic zoning. The earthen noise barrier, built in 2004, consists of two sections measuring 214 m and 97 m, with a height varying between 4 m and 6.5 m. The following figure highlights the exact location of the noise barrier.

Figure 7: Noise barrier constructed by Bologna Marconi Airport to shield the Lippo residential settlement

Continuous monitoring of aircraft noise near the Lippo settlement (via the fixed NMT P4) has confirmed a significant noise attenuation achieved by the barrier. Over time, this has successfully kept aircraft noise levels contained at approximately 60-61 dB(A), consistent with the limits established for Zone A of the acoustic zoning.

4.3.5 Pillar 3 - Noise Abatement Operational Procedures

To manage the noise generated by flight operations, several noise abatement operational procedures are currently in effect, detailed as follows:

a) **RWY 12 Initial Climb Procedure:** For RWY 12 departures, an Initial Climb Procedure (ICP) has been established, requiring a northbound turn upon reaching an altitude of 520 feet shortly after takeoff. This procedure aims to confine overflight trajectories on the Bologna side within flight corridors featuring lower residential density. Notably, in 2023, the RWY 12 noise abatement procedure was updated to optimize the departure flight path, lowering the turn altitude from the previous 800 feet to the current 520 feet to further restrict overflights of densely populated areas;

b) **Daytime Preferential Runway:** During the daytime period (06:00 to 23:00 local time, as per the LVA index), departures preferentially utilize RWY 30, subject to authorized exemptions for meteorological or flight safety reasons, or unless otherwise requested by the pilot-in-command for weather and safety purposes. This procedure aims to minimize the number of daytime

overflights above residential areas located in the eastern airport environs, within the Municipality of Bologna;

These operational procedures are therefore designed to minimize overflights of the highly populated areas in the eastern sector of the Bologna municipality by shifting the majority of departure and arrival traffic toward the western sector, which is characterized by lower residential density.

4.3.6 Pillar 4 - Operating Restrictions

At Bologna Airport, the following operating restrictions are currently enforced, regulated by specific provisions of the ENAC Airport Directorate (Ordinance 11/2016, Ordinance 05/2023). These are aimed at curbing the number of overflight movements above the residential areas of the Municipality of Bologna:

a) Nighttime RWY 12 Departure Ban: During the nighttime period (23:00 - 06:00), there is a ban on utilizing RWY 12 for departures. Consequently, departures must mandatorily take place from RWY 30, barring specific exemptions for meteorological or safety reasons.

b) Nighttime RWY 30 Arrival Ban: During the nighttime period (23:00 - 06:00), there is a ban on utilizing RWY 30 for arrivals. Consequently, arrivals must mandatorily take place on RWY 12, barring authorized exemptions for meteorological or safety reasons.

The combination of these two operating restrictions, implemented to contain the noise impact on the city of Bologna, entails operating the runway in an **"opposite direction"** conFiguretion. This consequently reduces runway capacity to a maximum of 14 movements per hour. This measure is regulated by a specific ENAC provision (Ordinance 05/2023), which has thus far been introduced on a temporary basis and periodically extended..

5 Baseline Year 2023

This chapter provides a detailed analysis of the 2023 baseline year. The year 2023 was selected as the reference baseline because it represents the first year since the implementation of the airport acoustic zoning in which an exceedance of the statutory limits was recorded.

5.1 Airport Operations

The following sections present the percentage distribution of airport movements—specifically, arrivals and departures per runway threshold (RWY 12 and RWY 30) for each month of 2023—alongside the percentage distribution of the aircraft fleet mix operating at the airport.

RWY 12 Arrivals (A12)	RWY 30 Arrivals (A30)	RWY 12 departures (D12)	RWY 30 departures (D30)
37%	13%	27%	23%

Table 2: Percentage distribution Arrivals and Departures RWY 30 and RWY 12 – Year 2023

Mese	%A12/Atot	%A30/Atot	%D12/Dtot	%D30/Dtot
January	70.2%	29.8%	47.3%	52.7%
February	72.5%	27.5%	52.0%	48.0%
March	69.6%	30.4%	53.0%	47.0%
Aprile	75.6%	24.4%	59.0%	41.0%
May	70.7%	29.3%	58.3%	41.7%
June	79.4%	20.6%	55.7%	44.3%
July	82.3%	17.7%	59.8%	40.2%
August	82.2%	17.8%	61.5%	38.5%
September	76.4%	23.6%	55.0%	45.0%
October	79.6%	20.4%	56.3%	43.7%
November	69.0%	31.0%	45.1%	54.9%
December	54.7%	45.3%	32.8%	67.2%

Table 3: Percentage Distribution of Departures and Arrivals for Each Month of 2023

Regarding the airport's fleet mix, the most representative traffic models belong to the Airbus A320 and Boeing 737 families. Specifically, the combination of B738, A320, B38M, A321, A321neo, and A320neo aircraft accounts for approximately 66% of the total traffic operating at Bologna Airport. Within this group, **17% consists of latest-generation aircraft**, such as the A321neo, B737 MAX, and A320neo. This share is projected to grow as airlines continue to phase out older models and modernize their fleets.

Group	Description	%/Tot
B738	Boeing 737-800	33,2%
A320	Airbus A320	12,7%
B38M	Boeing 737 MAX 8	11,2%
A319	Airbus A319	4,3%
E195	Embraer 195	4,3%

A321	Airbus A321	3,4%
E190	Embraer 190	3,4%
A21N	Airbus A321 NEO	3,1%
BCS3	Airbus A220-300	2,9%
A20N	Airbus A320 NEO	2,7%
Altro	Altri modelli	18,8%

Table 4: Fleet Mix Percentage Distribution for 2023

In 2023, Bologna Airport recorded a total of **78,658 movements**, of which 73,718 were commercial aviation flights, handling an annual volume of 9**.9 million passengers**.

The following summary table illustrates the distribution of commercial aviation movements between daytime and nighttime periods, based on the 2023 annual schedule.

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Schedulato 2023	2023
Commercial aviation movements	73,718
% Daytime movements	91%
% Nighttime movements	9%

Table 5: 023 Schedule – Commercial Aviation Movements and Daytime/Nighttime Percentages

During the three peak weeks identified in accordance with the Ministerial Decree of October 31, 1997, a total of 5,350 movements were recorded. The breakdown is detailed in the table below:

Four-Month Assessment Period	Period	Movem
I° QUAD: 1°– 31 Jan; 1 October– 31 December	1/10/2023 – 07/10/2023	1.752
II° QUAD: 1° Feb – 31 May	10/05/2023 – 16/05/2023	1.750
III° QUAD: 1° June – 30 September	26/07/2023 – 01/08/2023	1.848

Table 6: 2023 Peak Weeks for Impact Assessment Using the LVA Metric

Using the LVA metric as a reference, which accounts for the three peak weeks across the three assessment periods listed above, the percentages of daytime and nighttime movements relative to the total recorded movements are shown below.

Average Day 2023 (Ref. peak weeks)	2023
Commercial aviation movements	255
% Daytime movements	89%
% Nighttime movements	11%

Table 7: Average Day – Commercial Aviation Movements and Daytime/Nighttime Percentages

5.2 2023 Baseline Year Results

The image below illustrates the LVA noise contours, generated using the AEDT predictive model, for the baseline year of this proposal. Comparing these contours with the airport **acoustic zoning reveals exceedances within Zones A and B.**

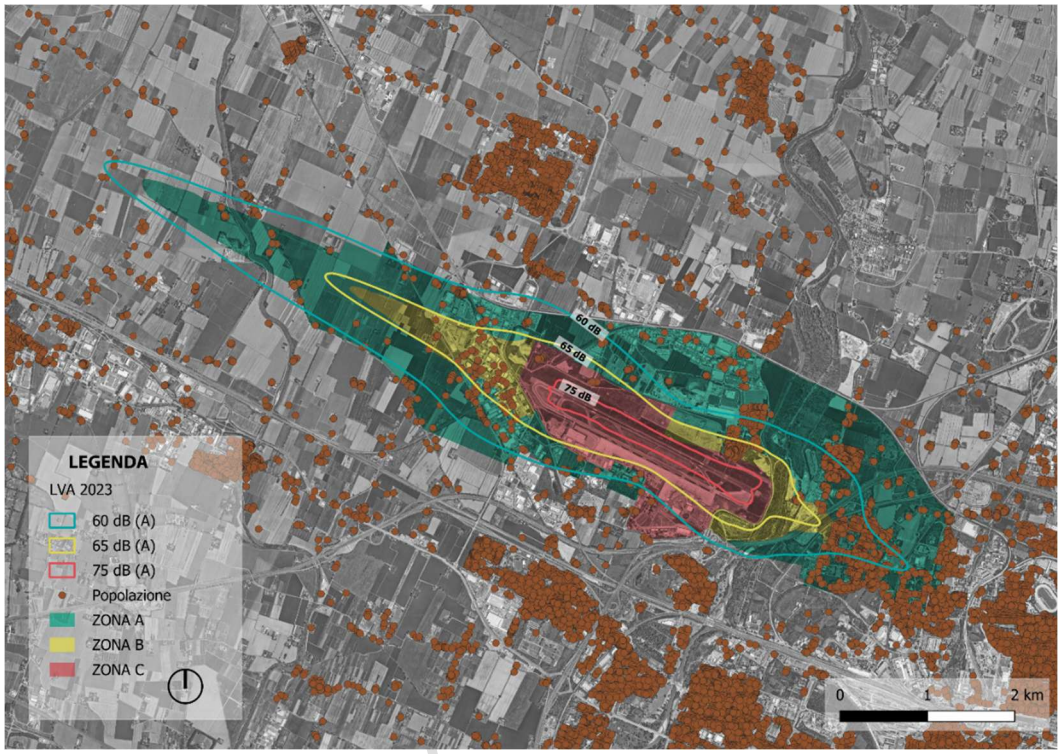

Figure 8: 023 LVA Noise Mapping

The initial phase of the project focused on identifying the noise issue at Bologna Airport and pinpointing the primary areas where the most significant breaches of the 2023 contour lines occurred.

The noise impact analysis confirmed that **the exceedances do not affect the densely populated areas of the Municipality of Bologna** in the eastern sector. Instead, **they are localized in the western sector, in areas characterized by low residential density**

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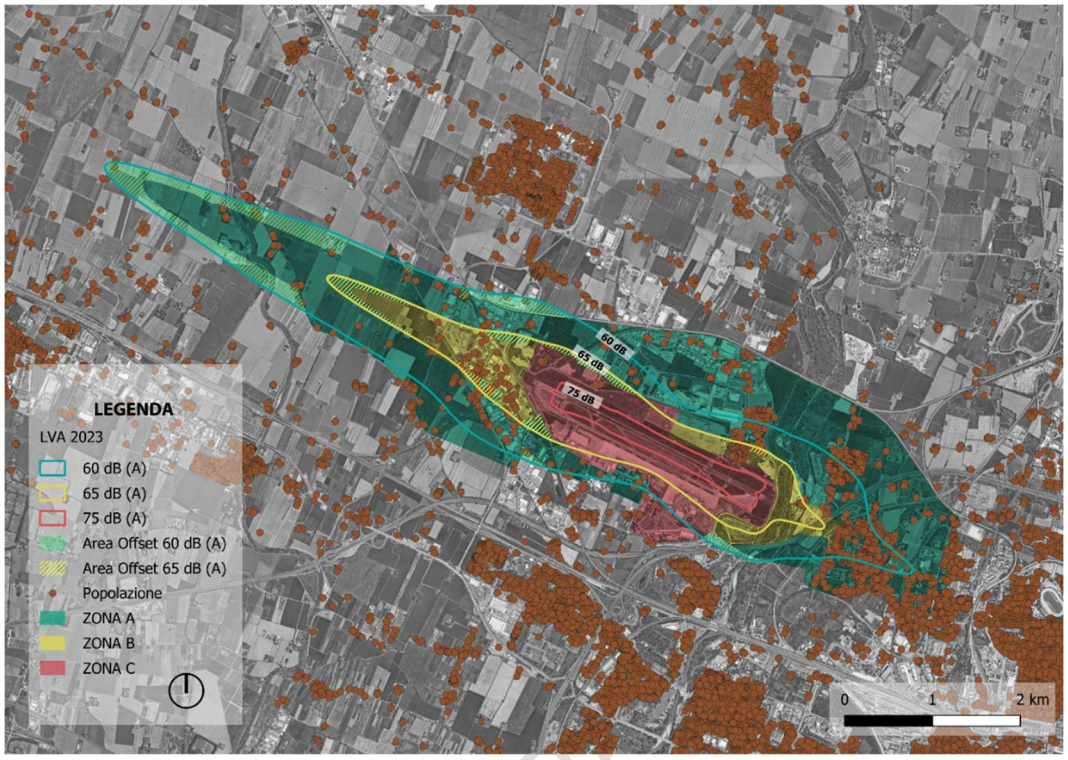


Figure 9: 2023 LVA Noise Mapping (Baseline Year) - Zoning Limit Exceedances

The following table details the exposed population, expressed as the number of residents, within each area encompassed by the **60, 65, and 75 dB(A)** noise contours.

Exposed population	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2023	4.941	307	-

Table 8: Total Exposed Population Within Noise Contours – 2023 Baseline Year

As previously noted, the exceedances primarily occur in rural and less densely populated zones located in the western airport environs. The actual exceedance area for each analyzed noise contour is provided below.

Exceedance Area	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2023	0,99 km^2	0,39 km^2	-

Table 9: Zoning Exceedance Area – 2023 Baseline Year

5.3 Years 2024–2025

As outlined in the previous chapter, 2023 was the first year the Airport recorded exceedances of the acoustic zoning limits, and it was therefore selected as the baseline year. This chapter presents data for the two interim years, 2024 and 2025, based on finalized data available at the time of drafting this proposal.

Parameter	Consuntivato		
	2023	2024	2025
Annual Movements	73.718	77.650	79.931
3 Peak Weeks Movements	5.355	5.775	5.796
Reference Day Movements	255	275	276

Table 10: Movements in the Years 2023, 2024, and 2025

5.3.1 Year 2024

This section details the noise contours for 2024, a year that, alongside 2025, serves as an interim period between the 2023 baseline and the planning and subsequent implementation of the mitigation measures outlined in this proposal.

As highlighted in the figure, zoning limits continue to be exceeded to the west in 2024. **These exceedances do not impact the densely populated eastern sectors of the Bologna municipality; rather, they are localized in the western sector within the Calderara municipality, in areas of low residential density.**

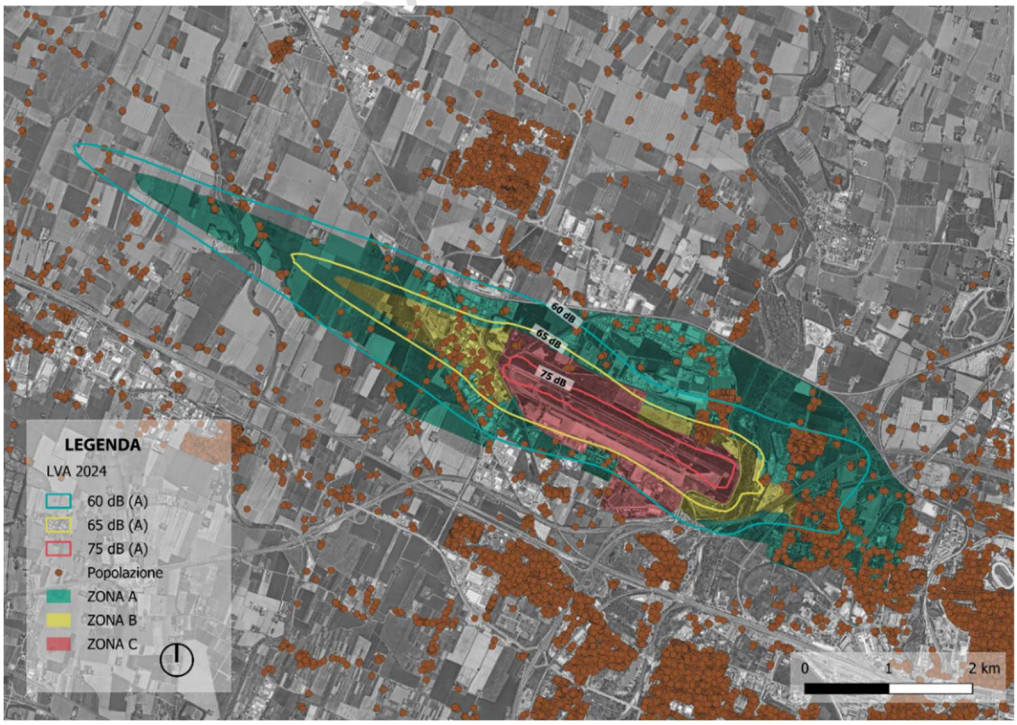


Figure 10: 2024 Noise Mapping (Interim Year)

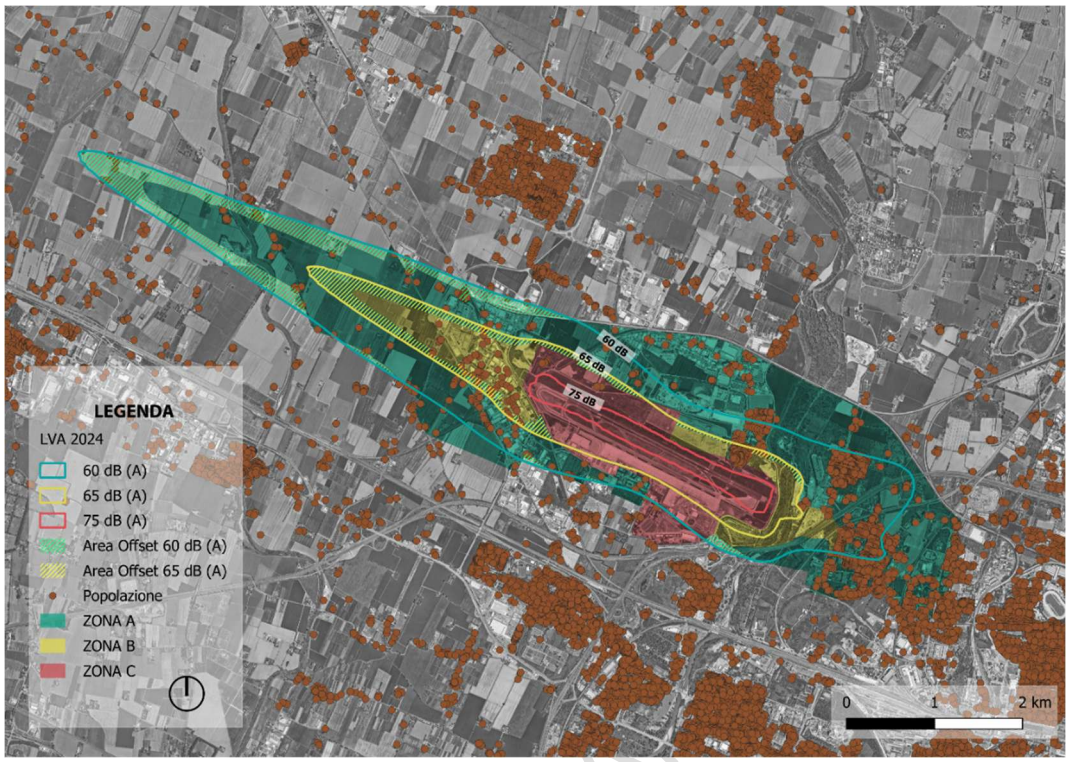


Figure 11: 2024 LVA Noise Mapping (Interim Year) - Zoning Limit Exceedances

The following table details the exposed population, expressed as the number of residents, within each area encompassed by the **60, 65, and 75 dB(A)** contour lines.

Exposed Population	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2024	5.444	334	-

Table 11Total Exposed Population Within Noise Contours – 2024 (Interim Year)

Exceedance Area	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2024	1,28 km^2	0,72 km^2	-

Table 12: Zoning Exceedance Area – 2024 Interim Year

5.3.2 Interim Year 2025

For the year 2025, the data similarly indicates that the acoustic zoning limits are exceeded in the western areas, consistent with the findings from 2023 and 2024.

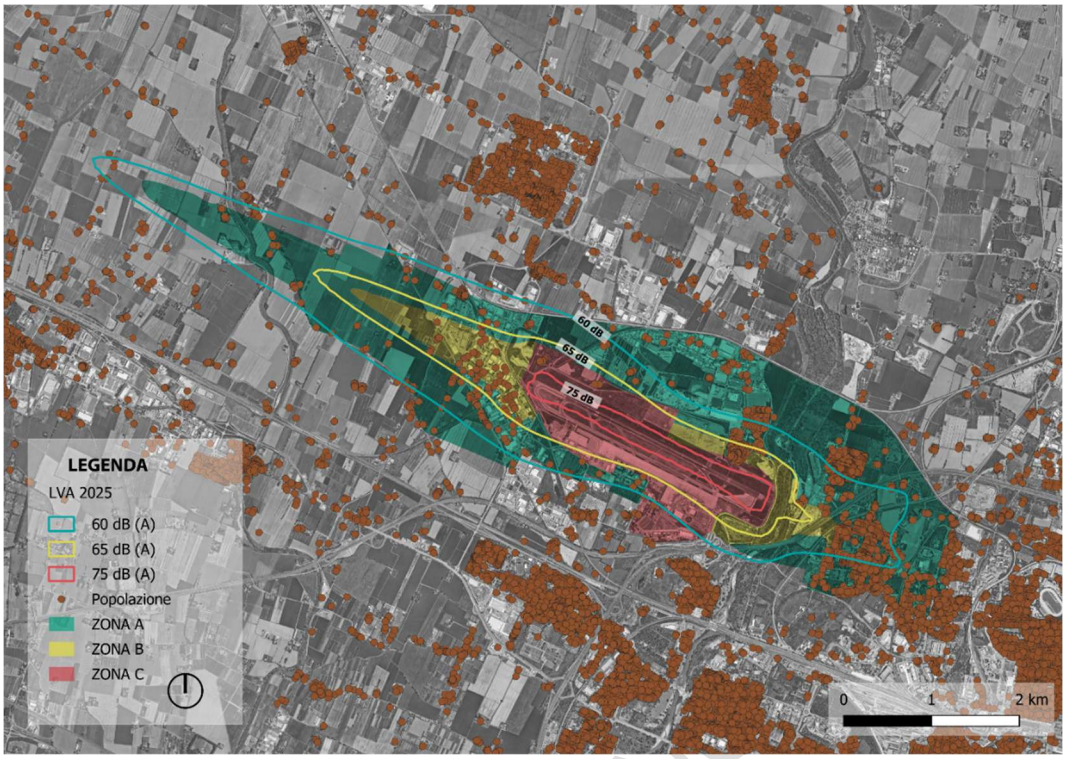


Figure 12: 2025 Noise Mapping (Interim Year)

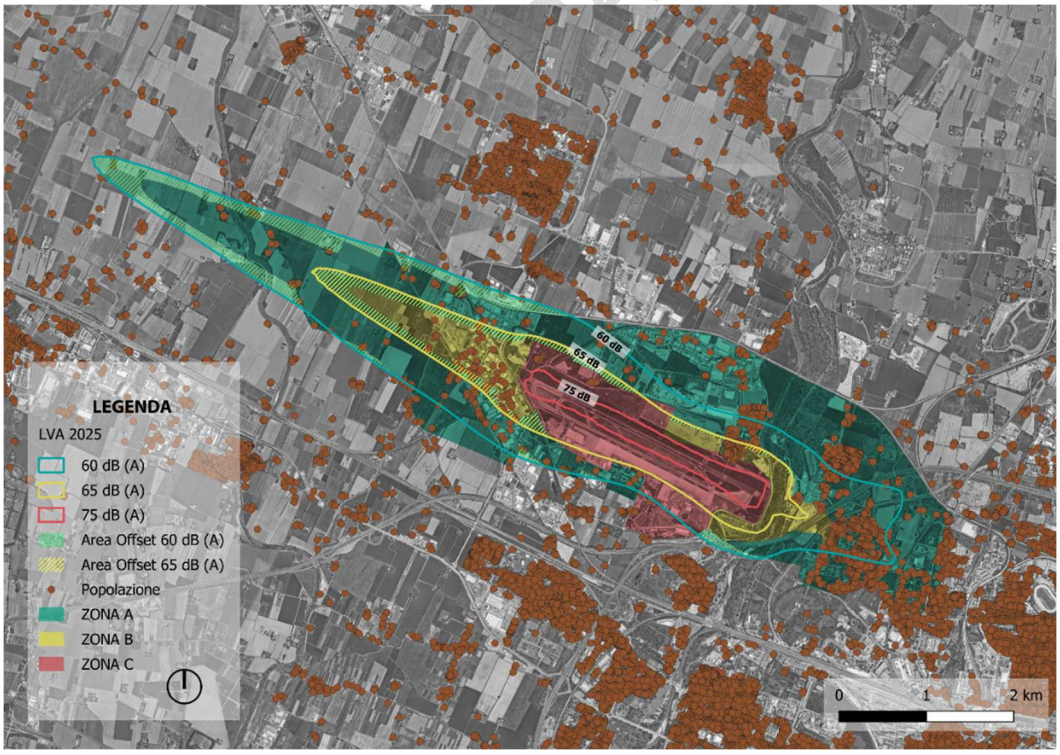


Figure 13: 2025 LVA Noise Mapping (Interim Year) - Zoning Limit Exceedances

The following table details the exposed population, expressed as the number of residents, within each area encompassed by the **60, 65, and 75 dB(A)** contour lines.

Exposed Population	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2025	5.039	289	-

Table 13: Total Exposed Population Within Noise Contours – 2025 (Interim Year)

Exceedance Area	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2025	1,14 km^2	0,68 km^2	-

Table 14: Zoning Exceedance Area – 2025 Interim Year

5.4 Summary and Comparison of 2023, 2024, and 2025 LVA Results

The principal factors contributing to the exceedances recorded in 2023, 2024, and 2025 are detailed below. Furthermore, this section presents a comparison between the areas where noise contour exceedances were recorded against the airport acoustic zoning, along with the total exposed population within these contours.

The trajectory of mitigation measures introduced in recent years to reduce the noise footprint over high-density areas has yielded a **significant improvement in the perceived noise climate** over the city of Bologna. **The combined measures have successfully contained population exposure**.

Within this context, the exceedances of the airport acoustic zoning are now highly localized and tend to be concentrated in territorial pockets characterized by low or very low residential density. Specifically, **the identified exceedance areas fall within sparsely urbanized settings** (see Figure 15), whereas in the higher-density zones (see Figure 16), the implemented measures have proven effective, contributing to keeping noise levels within statutory limits. In other words, the combined effect of the ENAC Ordinance and the various actions deployed by Bologna Airport has fostered a progressive reduction in the impact on residential areas, ensuring better protection for the most populated neighborhoods and their residents.

The charts in Figure 17 and Figure 18 demonstrate that, despite the growth in traffic (measured by annual movements), the impacted population has remained largely stable.

Figure 14: Example of LVA Exceedance Area 2023, 2024, and 2025

Figure 15: Example of Area Not Affected by LVA Exceedances 2023, 2024, and 2025

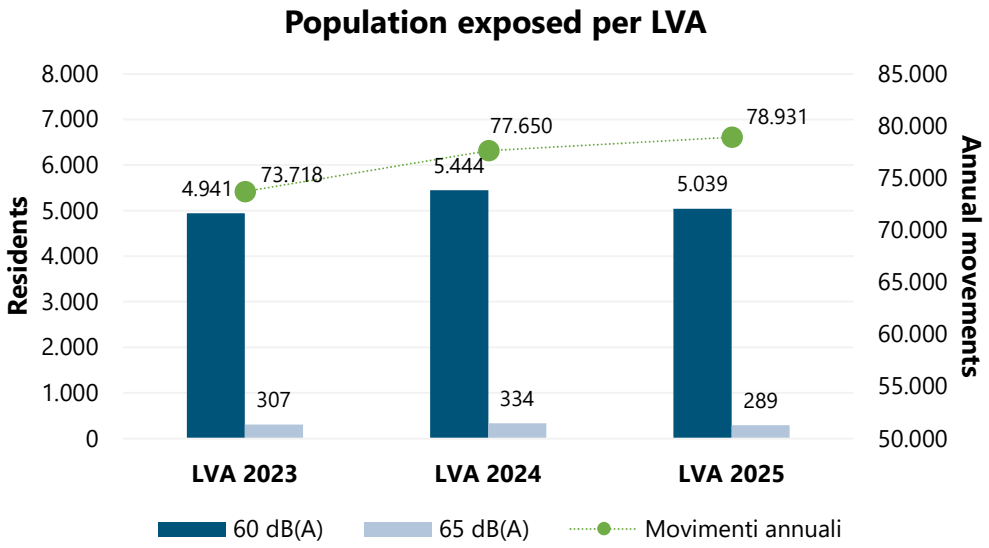


Figure 16: Comparison of Exposed Population for LVA 2023, 2024, and 2025 vs. Traffic Growth During the Same Years

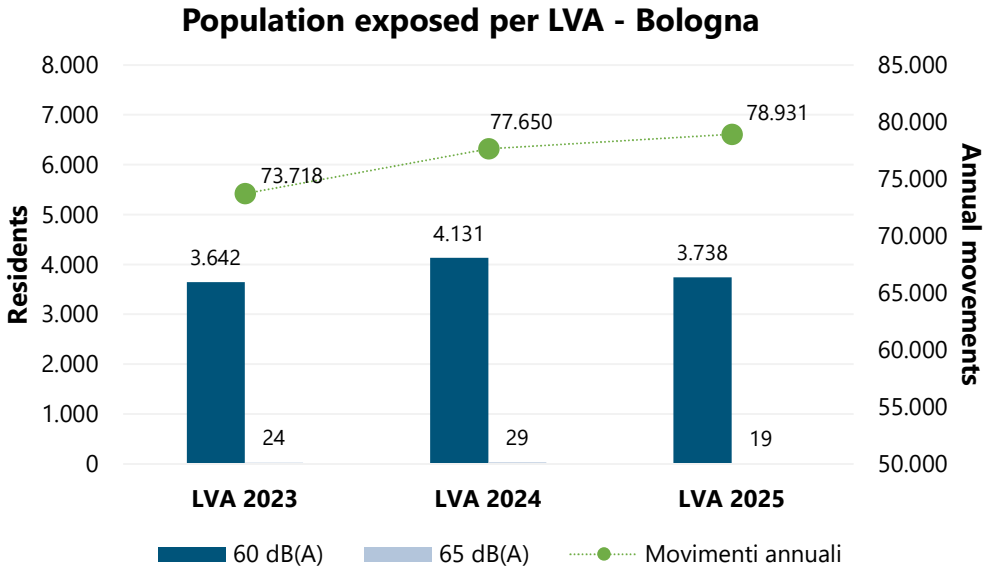


Figure 17: Comparison of Exposed Population for LVA 2023, 2024, and 2025 in the Municipality of Bologna vs. Traffic Growth During the Same Years

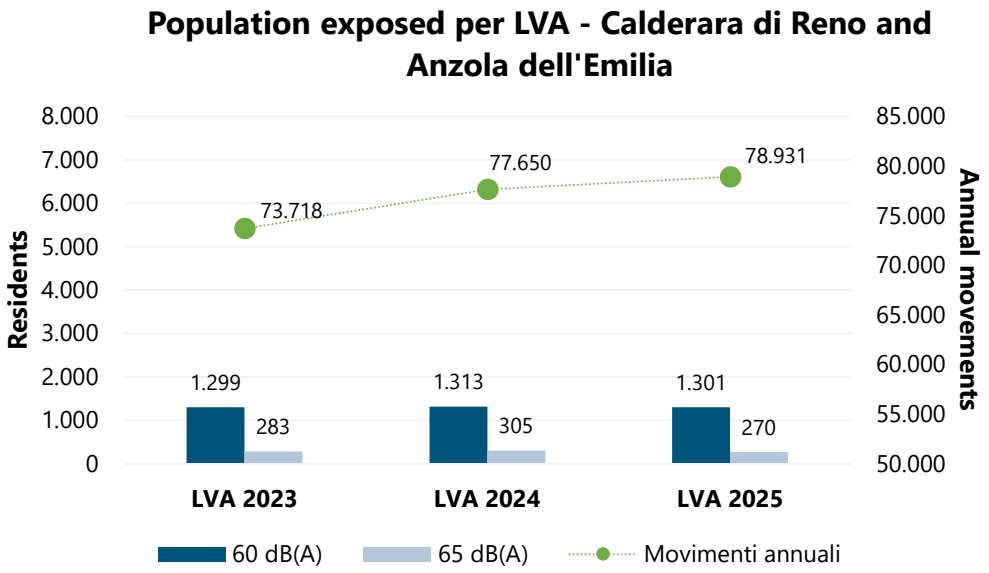


Figure 18: Comparison of Exposed Population for LVA 2023, 2024, and 2025 in the Municipalities of Calderara di Reno and Anzola dell'Emilia vs. Traffic Growth During the Same Years

5.5 Identification of the Causes of the Noise Issue

The factors that have led to the exceedance of the airport acoustic zoning limits, exclusively within the territory of Calderara di Reno, can be attributed to the following:

1. **The progressive growth of air traffic, consistent with the Masterplan forecasts;**
2. **The gradual implementation of noise mitigation measures aimed at reducing the impact on the densely populated areas of the Municipality of Bologna.**

The combination of these elements has influenced the overall noise levels associated with airport operations, primarily affecting the spatial distribution of the noise contours:

Progressive Air Traffic Growth

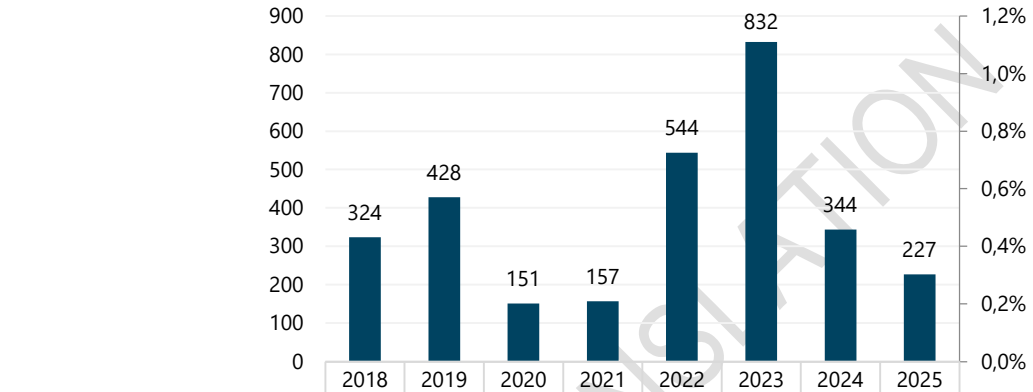
Regarding historical traffic trends—detailed in the subsequent technical chapter—aside from the downturn observed during the COVID-19 pandemic, there has been an almost constant growth in both movements and passenger traffic over the last 20 years.

Progressive Implementation of Noise Containment Measures on the Bologna Side

As previously outlined, concurrently with the progressive growth in traffic, measures to contain overflights and noise over the densely populated areas of the Bologna municipality (the eastern sector of the airport environs) were implemented. This was achieved by shifting an increasing share of traffic to the western sector, which is characterized by low or very low residential density. Specifically, regarding the nighttime

traffic component, in addition to the operating restrictions already in force, ENAC Ordinance No. 05/2023 reduced nighttime overflights over the city of Bologna to near zero. This ordinance has successfully mitigated nighttime noise and disturbance in the highly populated areas of the Bologna municipality.

In fact, as illustrated in the graph below, nighttime overflights in 2025 accounted for only 0.3% of total movements and occurred exclusively under operational conditions where overflying the Bologna municipality was strictly necessary for aviation safety reasons.



	2018	2019	2020	2021	2022	2023	2024	2025
SORVOLI NOTTE	324	428	151	157	544	832	344	227
% Sorvoli notturni vs MVT TOT	0,5%	0,6%	0,5%	0,4%	0,8%	1,1%	0,4%	0,3%

Figure 19: Historical Trend of Nighttime Overflights over the City of Bologna

These measures resulted in a new distribution of flights between the two routing corridors, creating a fundamentally different conFiguretion from the one anticipated when the airport acoustic zoning was originally defined, leading to a modified shape of the noise contours. The overall effect is the continuous compliance with the airport acoustic zoning over the areas of the Bologna municipality, coupled with an exceedance—starting in 2023—of the acoustic limits in the western sector of the airport environs (Municipality of Calderara), despite its low or very low residential density.

To ensure a consistent comparison with the historical noise contours, a comparative analysis is presented below, both graphically and by quantifying the exposed population, comparing the 2003 contours (the year the zoning was approved, based on 2001 traffic data) with those of 2025.

Only the 60 dB(A) contour line is shown here, as it is considered particularly significant for illustrating the evolution of the spatial distribution of the noise impact.

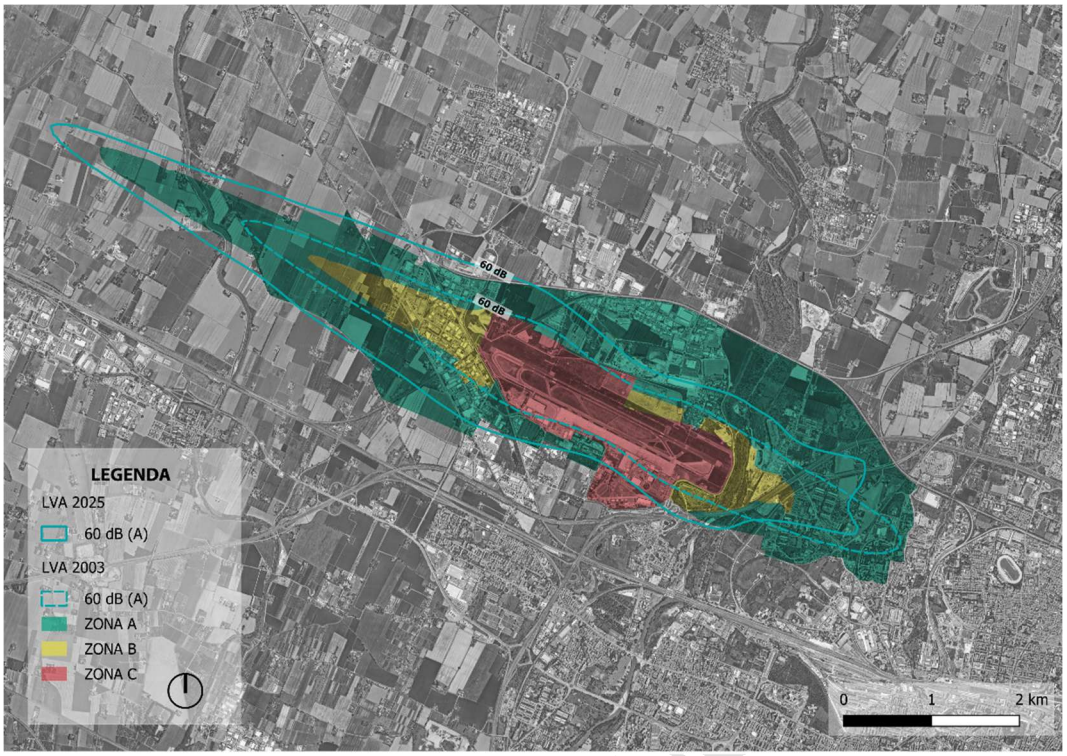


Figure 20: Comparison of the 60 dB(A) Noise Contour: 2025 LVA vs. 2003 LVA

Exposed Population	60 dB(A)	65 dB(A)
LVA 2003 **Pax: 3,56 milioni** **Mov: 56,7k**	**5.296**	**88**
Of which Bologna	4.629	66
Of which Calderara	667	22
LVA 2025 **Pax: 11,1 milioni** **Mov: 84,6k**	**5.039**	**289**
Of which Bologna	3.738	19
Of which Calderara	1.301	270
Var Bologna 2025vs2003	**-891**	**-47**
Var Calderara 2025vs2003	634	248

Table 15: Comparison of the Population Exposed to Airport Noise During the Three Peak Weeks: 2025 vs. 2003 (60 dB(A) and 65 dB(A) Contours)

A joint analysis of the noise contours and the summary table of the exposed population highlights that the increase in air traffic and the number of movements recorded during the period generally led to an

expansion of the contours themselves, as a natural consequence of heightened operational intensity. **However, the progressive introduction of noise containment and mitigation measures aimed at reducing disturbance over the populated areas of the Bologna municipality, coupled with the improved acoustic performance of modern aircraft, has over time not only offset the recorded traffic growth but actively reduced the population exposed to airport noise**. This has enabled an overall reduction in the resident population within the airport environs—defined under the Ministerial Decree of October 31, 1997, as the territory affected by LVA values exceeding 60 dB(A). Specifically, there was a significant decrease in the resident population of the Municipality of Bologna (the primary factor) and a concurrent increase (smaller than the primary factor) in the population of the Municipality of Calderara di Reno.

Therefore, even faced with a more than threefold increase in passenger numbers—which has generated positive and lasting effects on local economic growth and expanded connectivity for Central Italy—the Airport has successfully managed, thanks to the implemented actions, to reduce the total number of people exposed to aviation noise.

6 Traffic Forecasts

This chapter presents the traffic data for Bologna Airport, comprising both historical series and the traffic forecasts utilized in the simulations detailed in this document. Given that airport noise is inextricably linked to the number of aircraft movements (i.e., the sum of takeoffs and landings), any reference to annual passenger volumes has been intentionally omitted. This decision aims to preclude erroneous interpretations that are inconsistent with the objectives of the Balanced Approach proposal, which strictly focuses on the environmental impacts derived from air traffic.

6.1 Historical Data

The following figure illustrates the historical traffic data concerning commercial aviation movements at Bologna Airport from 2010 through 2025. It can be observed that between 2010 and 2016, the number of movements remained largely stable, hovering around 60,000 annual movements. Starting in 2018, significant growth was recorded, peaking at 72,883 movements in 2019. In 2020, however, a sharp decline occurred due to the impacts of the COVID-19 pandemic. Subsequently, the Airport experienced a gradual traffic recovery, culminating in 78,931 commercial aviation movements in 2025.

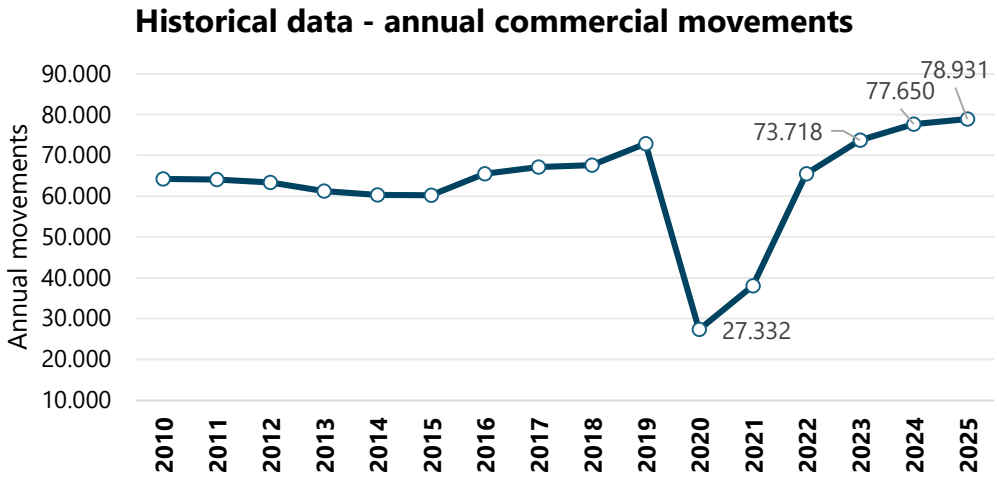


Figure 21: Historical Series – Commercial Aviation Movements – Source: Assaeroporti

6.2 Traffic Forecasts

The annual traffic volumes factored into the airport noise simulations align with the forecasts set forth in the **current Airport MasterPlan 2016–2030**. Furthermore, to ensure a conservative approach to the simulations, the maximum growth scenario (best-case scenario) was adopted as the reference baseline.

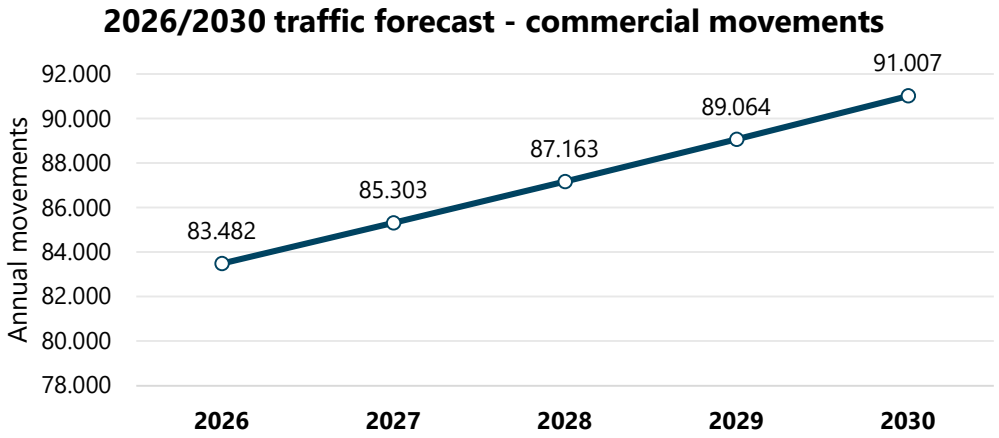


Figure 22: Traffic Forecasts: 2026–2030 Movements – Maximum Growth Scenario – Source: airport Masterplan 2016–2030

6.3 Future Baseline and Predictive Model Preparation

To finalize the analyses and quantify the effects of traffic growth, noise contour simulations were developed using the AEDT predictive modeling software.

The subsequent sections outline the assumptions underpinning the various scenarios into which noise mitigation actions were introduced. To ensure that the predictive models of the airport noise contours accurately reflect the future state, and to facilitate the comparison of different solutions in terms of both individual and cumulative effects, the baseline assumptions for the noise modeling framework were anchored to both the 2023 baseline year (as a validated model) and the future projections of the Masterplan 2016–2030 (as the active long-term planning instrument)..

The simulations representing future scenarios rely on fundamental assumptions regarding the input data used in the predictive model to quantify anticipated airport noise within the 2026–2030 timeframe. The primary assumptions encompass:

- Traffic forecasts;
- Reference Day;
- Fleet mix.

6.3.1 Traffic Forecasts

Passenger and cargo traffic forecasts within the Airport Development Plan 2016–2030 were predicated on three distinct evolutionary scenarios. These accounted for variables such as historical airport traffic growth rates, national GDP forecasts, and European aviation sector forecasts.

To adopt the most conservative modeling approach possible, the maximum growth scenario was selected. An excerpt of the commercial aviation movements anticipated in the active ADP 2016–2030 is provided below. As previously reiterated, since airport noise correlates with aircraft movements (takeoffs plus

landings), any reference to estimated future annual passenger numbers has been deliberately excluded from this document to prevent misinterpretations conflicting with the proposal's objectives.

PREVISIONI TRAFFICO MOVIMENTI 2016-2030						
ANNO	MIN		BASE		MAX	
2016	-	-	8,7%	65.461	-	-
2017	0,5%	65.814	0,5%	65.814	0,5%	65.814
2018	2,3%	67.322	2,3%	67.322	2,3%	67.322
2019	3,2%	69.443	3,2%	69.443	3,2%	69.443
2020	2,6%	71.248	2,6%	71.248	2,6%	71.248
2021	0,8%	71.814	1,8%	72.546	3,5%	73.155
2022	0,8%	72.384	1,8%	73.868	3,5%	75.113
2023	0,8%	72.959	1,8%	75.214	3,5%	77.123
2024	0,8%	73.538	1,8%	76.585	3,5%	79.187
2025	0,8%	74.122	1,3%	77.602	3,5%	81.306

PREVISIONI TRAFFICO MOVIMENTI 2016-2030						
2026	0,8%	74.710	1,3%	78.633	3,5%	83.482
2027	0,8%	75.304	1,3%	79.677	3,0%	85.303
2028	0,8%	75.901	1,3%	80.736	3,0%	87.163
2029	0,3%	76.128	1,3%	81.808	3,0%	89.064
2030	0,3%	76.354	1,3%	82.895	3,0%	91.007

Table 16: from Airport Development Plan 2016–2030 – Forecast for Aircraft Movements (Air Traffic Movements - ATM) across Minimum, Base, and Maximum Growth Scenarios for the 2030 Horizon

Regarding the contribution of the General Aviation (GA) component within the future scenario modeling, it was assumed that the number of movements would remain constant at the 2023 recorded levels (approximately 5,000 movements). This assumption is justified by the high volatility of this traffic segment, which is inherently difficult to plan or forecast due to its operational nature.

6.3.2 Reference Day

The scenarios projecting future years rely on the flight schedule (i.e., flown operations) of the average day, formulated in accordance with the LVA metric for the year 2023. Building upon this foundation, the average day for each subsequent year was processed to align with both the maximum growth traffic projections of the ADP 2016–2030 and the fleet renewal forecasts provided by the primary airlines operating at the Airport.

Key data regarding annual movements, the three peak weeks, and reference day movements for the 2023–2030 period are presented below.

Paramenter	Recorded (Forecast)			Forecast		
	2023	2024	2025	2026	2027	2030
Annual Movements	73.718 (77.123)	77.650 (79.187)	78.931 (81.306)	83.482	85.303	91.007
3 Peak Weeks Movements	5.355	5.775	5.806	6.006	6.132	6.531
Reference Day Movements	255	275	276	286	292	311

Table 17: Movements Across the Reference Years

6.3.3 Fleet mix

Concerning fleet renewal, the progressive introduction of next-generation aircraft (characterized by increasingly reduced noise emissions) exerts a positive impact on the airport noise climate and has thus been factored into the comprehensive predictive analysis.

Fleet renewal assumptions are grounded in industry documentation, including **market analyses** by the two major commercial aircraft manufacturers (Boeing and Airbus); specific studies by IATA, ICAO, and other international aviation authorities; and the business plans of the carriers themselves. Consolidating this data enabled the development of a robust fleet mix hypothesis for the reference years of this proposal, accurately aligned with current market trends.

Considering the type of traffic operating at Bologna Airport, the profile of its carriers, and traffic forecasts, the following aircraft families warrant detailed analysis:

- **Boeing 737**, specifically the 700, 800, and 900 variants, and its technological evolution, the Boeing 737 MAX series (MAX 7, MAX 8, MAX 9, and MAX 10)[2];
- **Airbus A320**, specifically the A320 and A321 variants, and their technological evolutions, the A320neo and A321neo.

The following figures illustrate the progressive renewal of the fleet operating at Bologna Airport for these two aircraft families.

[2] The 737 MAX 7 and 737 MAX 10 models have not yet entered commercial service as of the publication date of this document, and they currently lack specific modeling representations within the AEDT software. Given that the primary differences between these variants relate to seating capacity, these two aircraft models were mapped as the 737 MAX 8 for the purposes of the simulation.

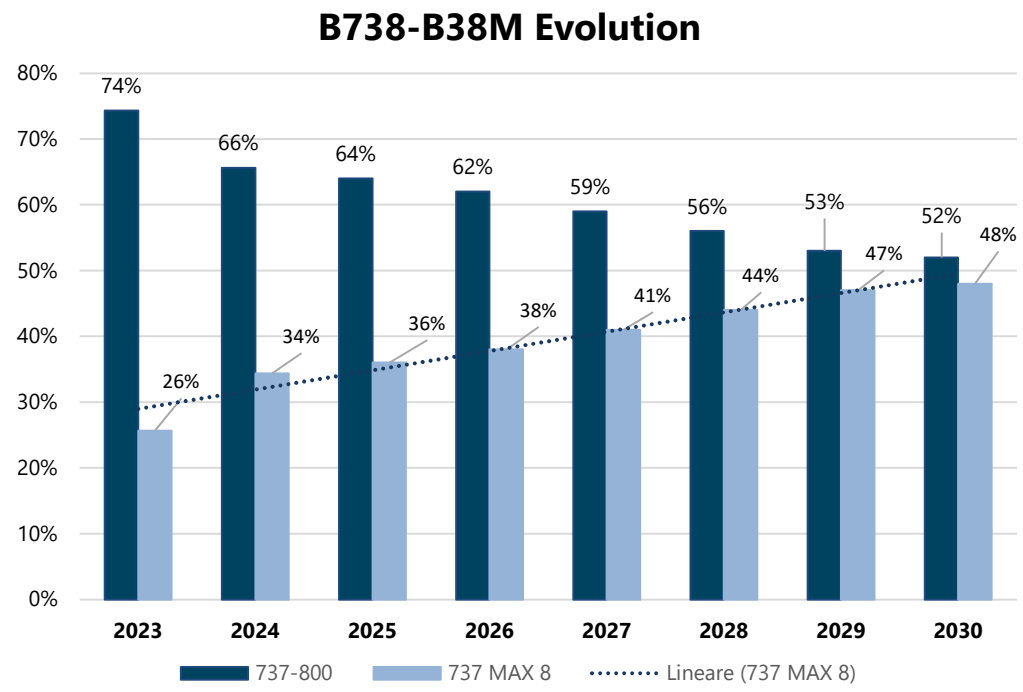


Figure 23: Fleet Renewal: Boeing 737-800 to Boeing 737 MAX 8

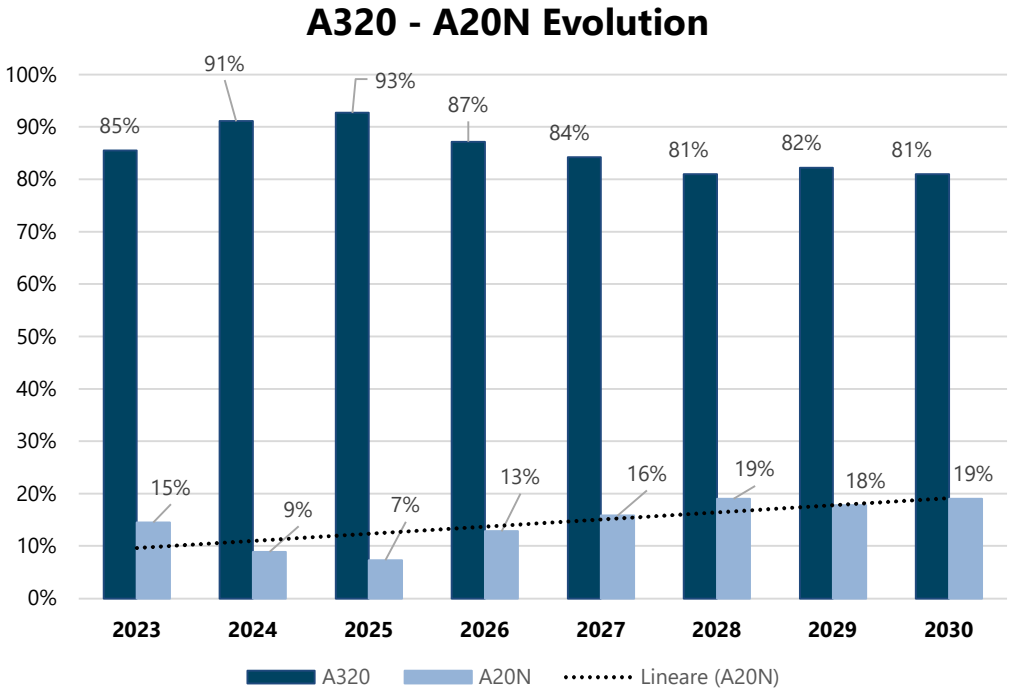


Figure 24: Fleet Renewal: Airbus A320 to A320neo

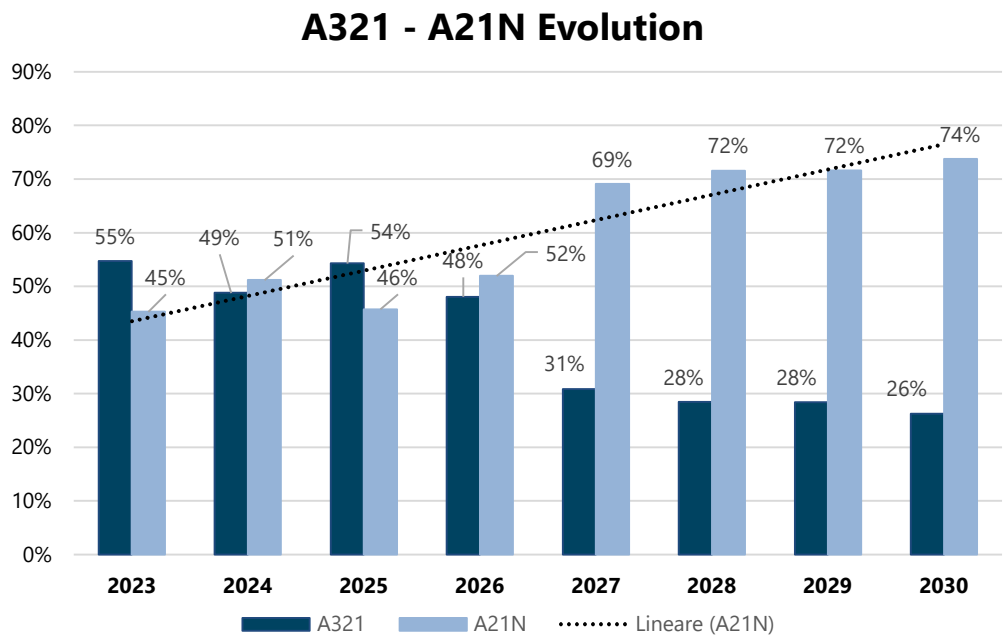


Figure 25: Fleet Renewal: Airbus A321 to A321neo

It is specified that for other aircraft categories, renewal factors were applied based primarily on market analysis forecasts for the carriers operating at the airport.

It must be underscored that, given the absence of definitive and reliable data, and to ensure a conservative predictive model for the future state, no fleet renewal or aircraft replacement was assumed for cargo traffic.

The commitment of airlines to phase out legacy models in favor of new, higher-performance aircraft is considered a contributing factor—alongside the mitigation measures identified by the Airport—in pulling the noise contours back within the acoustic zoning limits, even though this is not a direct action mandated by the Airport Operator.

7 Definition of the Noise Problem and Noise Objectives

Given the considerations and analytical data presented in the preceding chapters, this section is dedicated to the precise definition of the noise problem within the framework of the Balanced Approach. Specifically, it outlines the primary factors contributing to the critical situation identified at Bologna Airport, referencing both the results of the acoustic assessments and the spatial distribution of these impacts across the territory.

Based on this framework, the associated noise objectives are subsequently identified and formalized, functioning as measurable targets that are consistent with the operational and territorial context. These objectives serve as the benchmark for designing subsequent mitigation actions and for verifying the effectiveness of the measures that will be proposed in the later stages of this Proposal.

7.1 The Noise Problem

In accordance with national regulations, **the noise problem is therefore identified as the persistence of exceedances of the acoustic zoning limits**.

However, it must be clarified that **these exceedances** have not thus far affected the higher-density residential areas of the Municipality of Bologna, predominantly located in the eastern sector. Rather, they **are localized in the western sector within the Calderara municipality, in areas characterized by very low residential density**.

7.2 The Noise Objective

Bologna Marconi Airport has conducted an in-depth analysis of the suite of mitigation measures potentially applicable at the airport, in strict accordance with the principles of the Balanced Approach. The research and **selection of the measures—to be put forward following the Stakeholder Consultation—have been oriented toward noise abatement objectives achieved through actions that are overall sustainable for the Airport and all stakeholders, firmly rooted in the cost-effectiveness principle**. Specifically, a dual objective is being pursued: on one hand, to improve the noise climate and reduce the population exposed to aviation noise; on the other, to safeguard the strategic role and socio-economic function of the Airport.

Within this framework, alongside the overarching objective of bringing noise levels back within the limits defined by the acoustic zoning—within timeframes compatible with the implementation of the mitigation measures identified following the public consultation—an **operational objective** is defined. This aims to select and evaluate the most effective interventions to reduce the resident population in the impacted areas, thereby mitigating the annoyance associated with airport noise. This objective seeks to maximize the efficacy of the proposed actions, tailoring them to the specificities of the local context and the actual distribution of the potentially affected population, thus targeting the measures toward areas where the most significant benefits can be achieved.

At the same time, the adopted approach intends to preserve and enhance the strategic role of Bologna Airport, taking into account its socio-economic relevance to the region and the need to protect the right to air mobility for the airport's users.

8 Description of Mitigation Actions

This chapter presents the anticipated impacts of the mitigation actions that Bologna Airport considers potentially available to develop a proposal aimed at achieving noise mitigation objectives. This proposal adheres to the Balanced Approach and proposes measures grounded in the cost-effectiveness principle. For each mitigation action, alongside a precise description of its technical aspects, the potential effects of the individual measure on the noise climate within the airport environs are outlined.

8.1 Reduction of Noise at Source

Fleet renewal resulting in lower "noise" emissions at the source is not a direct action implemented by the Airport Operator; rather, it represents the autonomous fleet mix development operating at Bologna Airport. Nevertheless, the airlines' commitment to progressively phasing out legacy models in favor of next-generation aircraft—which are more fuel-efficient and feature enhanced acoustic performance—is a significant driver. Coupled with other mitigation measures implemented by the Airport, this will substantially contribute to reducing the overall noise footprint.

In this context, Bologna Airport initiated an acoustic profiling activity, using 2025 as the reference year, to map the noisiest aircraft operating at the airport. This acoustic analysis classified aircraft in accordance with ICAO regulations (Annex 16, Volume I) to identify those with less favorable noise performance.

Acoustic margins represent the difference between the statutory ICAO noise limits—determined by parameters such as *Maximum Take-Off Weight* (MTOW) and the number of engines—and the actual certified noise levels of each aircraft. In other words, they indicate how much quieter an aircraft is compared to the applicable regulatory requirements.

The primary metric for this analysis is the cumulative margin, calculated as the sum of the margins across the three ICAO certification points: *flyover*, *sideline*, and *approach*. This indicator determines an aircraft's classification into a specific noise chapter, as follows:

- **Chapter 3:** Cumulative margin < 10 EPNdB;
- **Chapter 4:** 10 ≤ Cumulative margin < 17 EPNdB;
- **Chapter 14:** Cumulative margin ≥ 17 EPNdB.

The cumulative margin thus provides a comprehensive measure of the aircraft's acoustic performance, integrating the various operational conditions under which noise is evaluated during the certification process.

The following table highlights the primary findings of the preliminary analyses, detailing the percentage of movements operated by aircraft belonging to each acoustic chapter, both in terms of the annual total and the nighttime period.

Noise Chapter	% of Total Movements 2025	% of Total Nighttime Movements 2025
Chapter 3	0,3%	0,1%
Chapter 4	63,3%	66,6%
Chapter 14	35,4%	32,2%
n.a	1,0%	1,0%

Table 18: Noise Chapter Allocation – Percentage of movements operated by aircraft belonging to each acoustic chapter

As evidenced, the majority of recorded movements fall under Chapter 4, while Chapter 14 aircraft—representing the best-performing category in terms of acoustics—account for a share between 32% and 35% of total movements.

8.2 Land-Use Planning and Management

The measures falling under the second pillar of the Balanced Approach concern spatial planning and land-use governance in areas affected by airport noise. Specifically, these actions address the compatibility between airport operations, the presence of sensitive receptors, and the established land uses in the exposed areas.

In this respect, the regulatory framework is already defined by the acoustic zoning approved by the Airport Commission. This zoning regulates the surrounding territory through specific planning constraints and the establishment of aviation-related noise limits. The Airport Operator is required to ensure compliance with these mandated conditions.

Furthermore, comprehensive surveys have already been conducted to identify the building stock located within the airport environs up to the 60 dB(A) LVA contour. These receptors were classified according to their nature, distinguishing between residential uses and sensitive facilities such as schools and hospitals. This foundational data serves as the technical baseline for potentially designing passive acoustic mitigation interventions on buildings that, even after the implementation of the Balanced Approach measures, might still remain in conditions exceeding the statutory limits.

Following the Balanced Approach procedure, if a need arises for specific, targeted acoustic retrofitting (sound insulation) for affected receptors located outside the airport acoustic zoning, the Airport Operator will evaluate these in conjunction with the other mitigation measures identified during the BAR (Balanced Approach Regulation) process.

8.3 Noise Abatement Operational Procedures

The operational noise abatement measures considered and simulated in the reference scenarios are listed below and detailed in the subsequent sections.

8.3.1 Noise Abatement Departure Procedures

The Noise Abatement Departure Procedure (NADP) includes a set of operational techniques adopted during the aircraft takeoff phase to minimize the noise impact on the areas surrounding airports.

Through the analysis of current noise data at Bologna Airport, the Airport Operator has included in this proposal the introduction of the NADP 1 operational procedure. This involves a thrust reduction at 1,500 feet and the initiation of acceleration at 3,000 feet.

It is important to note that the noise reductions achieved using NADP flight profiles depend heavily on the aircraft type, engine type, required thrust, and the altitude at which thrust reduction is initiated. For this reason, the noise abatement effect can differ significantly from one aircraft type to another, and even among the same aircraft types equipped with different engines. From a modeling perspective, the NADP procedure was applied to the aircraft categories that collectively account for 90% of the airport's traffic.

8.3.2 RWY 30 Early Turns

The introduction of early turn trajectories shifts the turn point compared to the standard routes currently in use, initiating the heading change maneuver in the phases immediately following takeoff.

Bologna Airport, in collaboration with ENAV and To70, conducted an analysis to evaluate the overall noise impact associated with the introduction of early turns for RWY 30 departures (Bargellino side). The study was developed based on a representative average day traffic sample and was conducted using the LVA metric.

The main objective was to compare the noise contours generated by the various simulated conFiguretions, analyzing both the population exposed to noise and the areas where the airport acoustic zoning limits are exceeded, in addition to the municipalities affected by aircraft overflights.

The analysis identified the potentially most effective solution in terms of overall benefits and compared its results with the current baseline scenario. Specifically, the study verified the potential presence of significant variations in noise exposure levels, the extent of the areas exceeding statutory limits, and the estimated potentially exposed population. Furthermore, the effectiveness of the proposed trajectories in reducing or avoiding direct overflights of densely populated residential centers was evaluated, with the aim of minimizing the overall noise footprint on the most territorially and environmentally sensitive areas.

The analysis reveals that the trajectories ensuring the most significant overall benefits are those from the altitude-based profile simulations, **where both left and right turns are initiated at 520 ft in accordance with NADP1 procedures**.

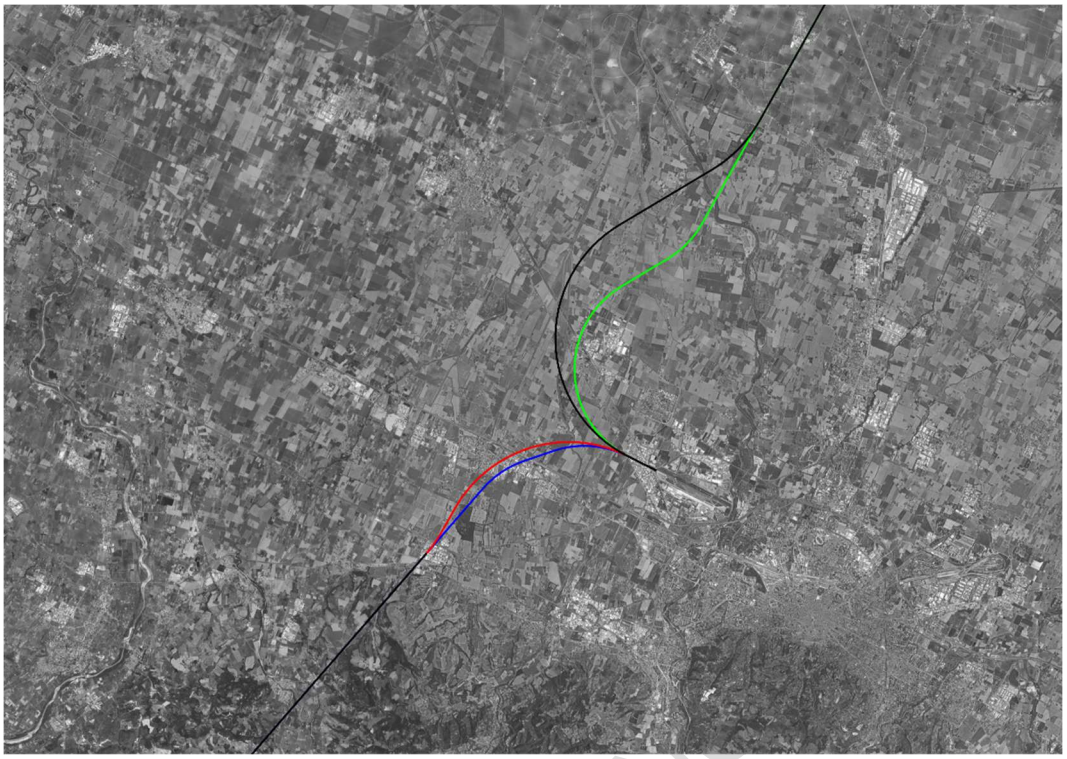


Figure 26: Early turns for turn initiation at an altitude of 520 ft AMSL

The figure illustrates the trajectories for Category C (blue and green) and Category D (red and black) aircraft. The nominal trajectories associated with this configuration also successfully avoid overflying the residential centers of Anzola dell'Emilia and Calderara di Reno, contributing to the reduction of the noise impact in higher-density residential areas.

8.4 Operating Restrictions

Following the Public Stakeholder Consultation and based on the observations and available data provided by stakeholders, if it is determined that the combination of suitably selected and introduced measures relating to Pillars 1–3 (outlined above) does not enable the achievement of adequate objectives in terms of noise management and exposed population reduction, the Airport Operator may evaluate integrating these interventions with potential operating restrictions. These would be appropriately calibrated according to specific and residual needs, utilizing a balanced approach and supported by comprehensive cost-benefit analyses.

Below are illustrative examples of operating restrictions, to be appropriately evaluated and calibrated, across the different reference scenarios. These measures represent the baseline assumptions for the analyses and enable a consistent comparison among the various configurations examined. In the subsequent sections, each restriction is detailed, outlining the implementation methods and the anticipated effects on the simulation results for the given case. The Airport Operator reserves the right to

appropriately define and calibrate the *"if"* and *"how much"* (an e quantum) regarding the introduction of one or more of these measures.

8.4.1 Runway Use ConFiguretion to Reduce Nighttime Traffic over High-Density Residential Areas (Bologna)

As extensively detailed in previous sections, since 2003, Bologna Airport has implemented noise abatement measures and operating restrictions designed to minimize overflights of the populated areas of the Bologna municipality and limit community disturbance. The latest provision introduced (ENAC Ordinance No. 05/2023) further tightened the ban on utilizing RWY 30 for nighttime arrivals and introduced a 50% reduction in nighttime runway capacity (down to 14 movements/hour) to enable operations in an "opposite direction" configuration. As previously noted, ENAC Ordinance 05/2023 was initially introduced with a 6-month validity period and has thus far been periodically extended upon each expiration. This measure falls under the operating restrictions pillar, as it dictates a capacity reduction during the nighttime period, specifically impacting the number of permitted movements and, crucially, departures from RWY 30.

An excerpt of Article 1 of Ordinance No. 05/2023, concerning the operating restrictions introduced in 2023, is provided below.

"*Article 1 of Ordinance 11/2016 is suspended until October 31, 2023, and the following runway use criteria shall apply in its place. At Bologna Airport, the use of runways is regulated as follows:*

- *From 06:00 to 23:00 LT, departures shall preferentially take place on RWY 30, subject to ATC requirements or unless otherwise requested by the pilot-in-command for weather or safety reasons;*
- *From 23:00 to 06:00 LT, departures must mandatorily take place on RWY 30, unless otherwise requested by the pilot-in-command for weather or safety reasons;*
- *From 23:00 to 06:00 LT, arrivals must mandatorily take place on RWY 12, unless otherwise requested by the pilot-in-command for weather or safety reasons."*

During the night, barring specific weather or safety conditions, all departures and arrivals must occur toward Bargellino (RWY 30 departures) and from Bargellino (RWY 12 arrivals), respectively, even if this entails potential delays in departure and arrival operations. During daytime hours, runway use is regulated to ensure flight safety and minimize delays resulting from airspace congestion.

It is specified that, in accordance with national regulations, noise abatement procedures and operating restrictions do not apply to state aircraft, military flights, humanitarian flights, hospital flights (HEMS), search and rescue operations, or those specifically authorized by the Italian Civil Aviation Authority (ENAC).

Weather or safety reasons provided for by the ENAC Ordinances correspond to the conditions described below.

- **LVP (Low Visibility Procedure):** Operational procedures implemented in low visibility conditions to allow aircraft to safely land and take off. When LVPs are in effect, takeoffs and landings are strictly restricted to RWY 12.

- **Wind:** Aircraft must take off and land with a headwind to ensure adequate aerodynamic lift and flight safety. Air traffic is therefore managed based on recorded wind direction and speed.
- **Adverse Weather:** Adverse meteorological conditions occurring at various altitudes—both at ground level and aloft—that may necessitate the selection of a specific routing corridor.
- Infrastructural **Limitations:** Conditions outlined in the prevailing Ordinance 11/2016 where maintenance activities on the maneuvering areas (runways, aprons, taxiways) are underway, temporarily limiting operations or preventing the use of specific takeoff/landing directions. Other infrastructural limitations pertain to specific aircraft characteristics (size and weight) that require operating on a designated runway heading.
- **ATC Requirements:** Conditions where the landing and takeoff direction is constrained by the need to ensure adequate physical separation and the orderly flow of air traffic. This condition is provided for by the ENAC Ordinances exclusively during the daytime period;
- **Ex ENAC Ord. 11/2016:** Refers to nighttime takeoff and landing overflights of the Bologna residential area which, due to airspace occupancy conditions, must be operated while keeping delays within 20 minutes. Article 1 of Ordinance 11/2016 is suspended until October 31, 2023, replaced by Article 1 of ENAC Ordinance 05/2023.
- **Pilot Request for Weather or Safety:** Requests made by the flight crew due to weather requirements (e.g., varying weather conditions over the two different ground areas involved and/or the need to avoid adverse weather/thunderstorms/turbulence/wind shear zones), aircraft operational performance parameters (which impact the safety of takeoff/landing operations, e.g., aircraft weight/available runway length/wind components/runway slope/runway contamination), or the available radio navigation aids/instrument procedures.

Specifically, it was recorded that 41% of nighttime overflights in 2023 occurred due to causes related to:

- Wind;
- Adverse weather;
- Pilot requests for weather/wind.

The remaining 59% of nighttime overflights were caused by LVP operations, infrastructural limitations, and the absence of the Ordinance during the corresponding reference month.

To highlight the noise impact benefits of this ordinance, the LVA noise contours were compared against a scenario where overflights toward the city of Bologna are permitted. To simulate this scenario, it should be noted that in the 2023 LVA schedule, 59% of nighttime overflights were primarily attributed to the peak week in May (before the ordinance came into effect in June). Therefore, in accordance with the calculation parameters of the LVA index, the number of nighttime overflights over Bologna was tripled, and the equivalent quantity was deducted from the remaining takeoffs and landings on the Bargellino side to balance the total number of nighttime movements.

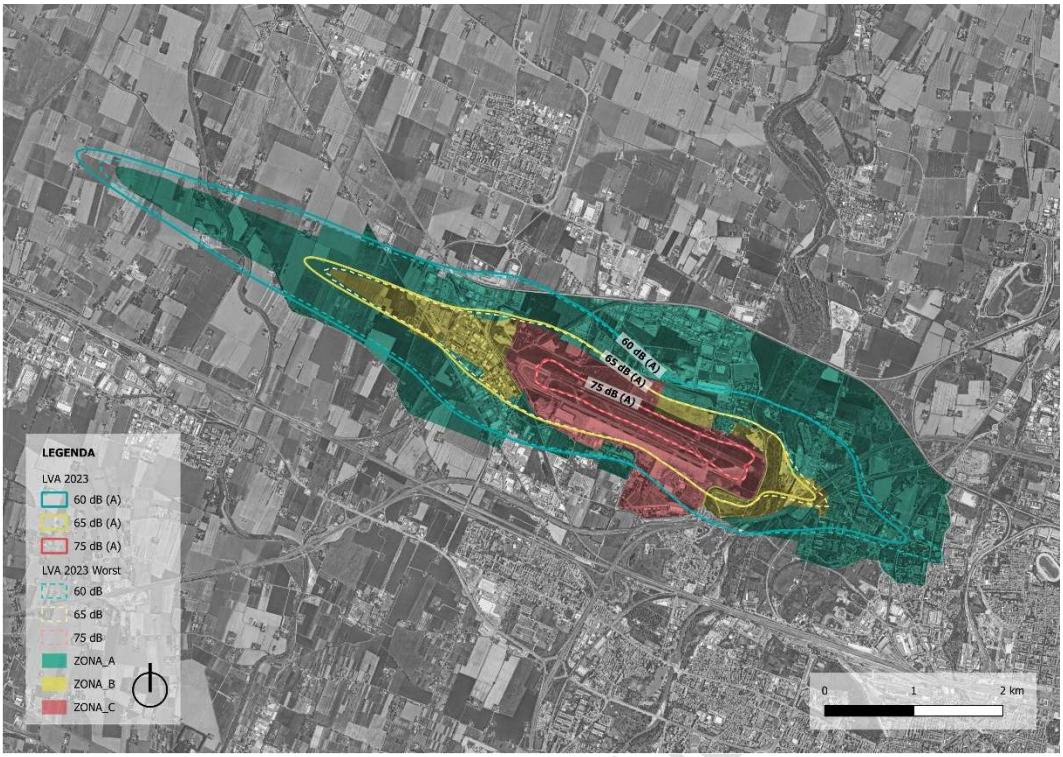


Figure 27: Comparison between the actual 2023 LVA and the simulated LVA without the implementation of ENAC Ordinance No. 05/2023

Exposed Population	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2023 – baseline year	4.941	307	-
LVA 2023 – without ENAC Ordinance	6.411	302	-

Table 19: Exposed population for LVA 2023 and the LVA 2023 worst-case scenario without the implementation of the ENAC Ordinance

Exceedance Area	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2023 – baseline year	0,99 km^2	0,39 km^2	-
LVA 2023 – without ENAC Ordinance	0,64km^2	0,24 km^2	-

Table 20: Exceedance Area for LVA 2023 and the LVA 2023 worst-case scenario without the implementation of the ENAC Ordinance

Observations of the population data above reveal that, in the absence of ENAC Ordinance 05/2023, a larger population would be exposed to airport noise.

The transitional implementation of this restriction has appreciably mitigated the noise impact of aviation operations on the Bologna territory and has succeeded in reducing the population exposed to airport noise.

Indeed, it is clearly observable that the absence of the ENAC Ordinance in 2023 would have resulted in a significant expansion of the noise contours in the areas adjacent to the residential center of Bologna. Specifically:

- The 60 dB(A) contour (highlighted in green in the image) would have led to a slight exceedance of the acoustic zoning in the sector of the Bologna municipality, consequently increasing disturbance for the resident population. Concurrently, a contraction of the noise contours and the affected surface area would have been observed on the Bargellino side;
- The 65 dB(A) contour (indicated in yellow in the image) would have caused a lateral exceedance of the acoustic zoning within the urban area of Bologna. Parallelly, a reduction in the extent of the noise contours and the corresponding impacted area would have been recorded on the Bargellino side.

Considering these potential negative effects, the Airport Operator (ADB), in agreement with ENAC-DA and all the authorities represented in the Airport Commission pursuant to Article 5 of the Ministerial Decree of October 31, 1997, agreed on the necessity to extend the validity of the Ordinance. The objective was to preserve the benefits derived from the measure itself. This decision inevitably resulted in an expansion of the noise contours on the Bargellino side, up to the point of exceeding the acoustic limits in an area characterized by low residential density.

8.4.2 Noise Night Budget – Quota of Nighttime Movements to be Preserved

To contain the Airport's noise footprint while simultaneously managing the anticipated growth in movements, the potential introduction of a "**noise night budget**" (i.e., a cap on the number of nighttime movements) may also be evaluated.

It is specified that the noise night budget does not act as an absolute movement cap. Rather, it defines a baseline target level to be maintained, which may be periodically reviewed over the years in response to changes in other parameters, primarily the composition of the aircraft fleet.

Regarding the statutory LVA metric, it is crucial to highlight those flights operating during the nighttime period (23:00–05:59) impact the quantification of perceived ground noise to a significantly greater extent than daytime flights (06:00–22:59): for the exact same operation, the nighttime contribution is factored in ten times heavier.

In light of this penalization, the potential contribution and benefit of this measure could be evaluated within the final proposal. This would require a prior, detailed analysis aimed at determining and quantifying the number of nighttime flights that might need to be rescheduled to the daytime period to reduce the overall contribution of nighttime operations. To achieve this objective and identify a coherent configuration for the future schedule—in terms of the split between daytime and nighttime flights, the type of aircraft deployed, and associated operations—an **iterative approach and a sensitivity analysis** within the AEDT predictive model will need to be adopted. This will involve progressively updating the assumptions until an equilibrium compatible with the acoustic constraints is reached.

A tal proposito, sono stati considerati due scenari alternativi, di seguito elencati e descritti nel dettaglio:

- **Scenario 1:** Maintenance of the ordinance on nighttime overflights.

  Depending on the progress achieved in implementing Pillars 1–3 of the Balanced Approach, as well as any acoustic retrofitting interventions (sound insulation) provided for dwellings still

affected by residual exceedances, the potential future introduction of a cap on the number of nighttime movements may be evaluated.

- **Scenario 2:** Absence of the ENAC ordinance on nighttime overflights and reallocation of a percentage of the remaining nighttime movements to the daytime period.

  This scenario would result in an **increase in the population exposed** to noise over the city of Bologna, placing it in potential **conflict with the principles of the Balanced Approach**.

9 Cost-Benefit Analysis of Noise Night Budget Scenarios

In line with the principles of the Balanced Approach, the cost-benefit analysis will guide the selection of measures toward solutions that ensure the optimal balance between environmental benefits and economic sustainability.

It should also be noted that the measures proposed in the form of operational procedures do not, by their nature, present a directly quantifiable economic-financial cost. Consequently, they are not considered determining factors for the economic-financial assessment within the cost-benefit analysis of the presented scenarios, although they remain highly relevant for the analysis of the acoustic effects.

9.1 Effect on capacity

The developed traffic scenarios take into account:

1. The limitations on nighttime traffic resulting from operating restrictions;
2. The anticipated evolution of infrastructural capacity, driven by ongoing and planned infrastructural works, resulting in the progressive release of additional capacity and a gradual increase in the parameters associated with the "Coordinated Airport" status (IATA Level 3)";
3. The potential rescheduling of flights by airlines to other daytime periods.

The scenarios developed for Stakeholder Consultation are based on the implementation of a noise night budget, involving the rescheduling of a portion of traffic from the nighttime to the daytime period, considering the estimates for the three peak weeks over the 2027–2030 period.

In order to evaluate the Airport's capacity to accommodate traffic rescheduled from nighttime to daytime slots, particular consideration was given to the parameters deriving from the coordinated airport status, estimated for the coming years, which reflect the gradual release of infrastructural capacity at the Airport:

	2024	2025	2026	2027	2028	2029	2030
Capacità infrastrutturale							
	Ridotta	Ridotta	Parzialmente rilasciata	Parzialmente rilasciata	A regime	A regime	A regime
Parametri Schengen (seats/h)		W1.500 - S1.100 - W1.500	W1.500 - S1.700 - W1.700	W1.700 - S1.800 - W2.400	W2.400 - S2.400 - W2.400	W2.400 - S2.400 - W2.400	W2.400 - S2.400 - W2.400
	A regime	Ridotta	Parzialmente rilasciata	Parzialmente rilasciata	Parzialmente rilasciata	Parzialmente rilasciata	Parzialmente rilasciata
Parametri Extra-Schengen (seats/h)		W1.000 - S700 - W900	W900 - S900 - W900	W900 - S900 - W900	W900 - S900 - W900	W900 - S900 - W900	W900 - S900 - W900

Figure 38: Estimation of coordination parameters

The evolution of the Airport's parameters is defined through a passenger terminal capacity analysis. This accounts for both the location and timeline of construction sites impacting existing facilities, and the release of additional capacity expected upon completion of the works. Through dynamic simulation, it identifies the maximum passenger flows that can be managed in each season.

Assuming that a portion of the nighttime traffic—associated with non-based aircraft—is rescheduled to non-peak daytime slots, the remaining movements to be rescheduled would likely be linked to aircraft based at Bologna Airport.

Scenario 1: *Maintenance of ENAC Ordinance 05/2023 on nighttime overflights (also in combination with the potential future introduction of a cap on the number of nighttime movements, varying based on the progress achieved in implementing Pillars 1–3 of the Balanced Approach)*

Based solely on structural and infrastructural assessments, the Airport is capable of absorbing the rescheduled volumes into daytime slots without triggering saturation conditions or significant criticalities for the available infrastructure and operational spaces.

Scenario 2: *Absence of ENAC Ordinance 05/2023 on nighttime overflights and reallocation of a percentage of the remaining nighttime movements to the daytime period.*

Given this lower volume of rescheduling, it is noted that, from a strictly structural and infrastructural perspective, the Airport possesses the necessary capacity to absorb the volumes transferred to daytime hours, exhibiting no significant criticalities regarding the saturation of infrastructure or operational spaces.

9.2 Economic-Financial Impacts

During the Summer 2025 season, the operating restrictions stemming from the Coordinated Airport status resulted in a reduction of the coordination parameters. Nevertheless, traffic evolution in Summer 2025 did not experience significant declines, given the carriers' willingness to adjust their schedules in accordance with the modified infrastructural capacity limits, generating a more homogeneous distribution of the same traffic volumes throughout the day. Furthermore, this occurred in a context with a moderate incidence of necessary adaptations.

Scenario 1: *Maintenance of ENAC Ordinance 05/2023 on nighttime overflights (also in combination with the potential future introduction of a cap on the number of nighttime movements, varying based on the progress achieved in implementing Pillars 1–3 of the Balanced Approach)*

Scenario 1, where it contemplates solely the maintenance of Ordinance 05/2023, has a moderate impact under these economic and financial profiles, as it reduces the likelihood of criticalities in the reallocation of movements.

On the contrary, it is highlighted that any substantial reallocation of nighttime movements to the daytime period—additional to the Ordinance—could trigger potential operational criticalities. This is particularly true regarding the management of reallocating a larger number of nighttime movements, considering that, at present, it only seems reasonably feasible to reschedule a modest portion of the substantial volume of nighttime flights subject to the curfew into the daytime period.

The aforementioned criticality could thus cause a significant reduction in network flexibility and, in extreme cases, a potential loss of based aircraft. This would directly impact the airport's overall connectivity and the quality of service offered to passengers. This would entail much higher costs for the system and could also generate a significant risk to maintaining the Airport's competitive positioning.

Scenario 2: *Absence of ENAC Ordinance 05/2023 on nighttime overflights and reallocation of a percentage of the remaining nighttime movements to the daytime period.*

This scenario presents no economic or financial repercussions, as the entirety of the traffic could be managed even while complying with the airport acoustic zoning limits

9.3 Impact on the Exposed Population

Following an initial screening of the economic-financial impact associated with each of the considered scenarios, this section illustrates the effects of the two reference scenarios on the exposed population, measured in terms of the generated noise contours.

Scenario 1: *Maintenance of ENAC Ordinance 05/2023 on nighttime overflights*

Preliminary simulations indicate that, while this conFiguretion—even when considered in isolation—does not allow the noise contours to immediately fall back within the airport acoustic zoning, it does prevent the introduction of any deterioration on the side of the city of Bologna, a context characterized by **high residential density.**

Therefore, as supplementary measures potentially useful for mitigating the residual noise impact on receptors, **acoustic insulation** could be evaluated for receptors located outside the airport acoustic zoning but within the identified offset areas. This element would contribute to mitigating the perceived impact and improving overall exposure conditions, yielding positive effects also in terms of annoyance.

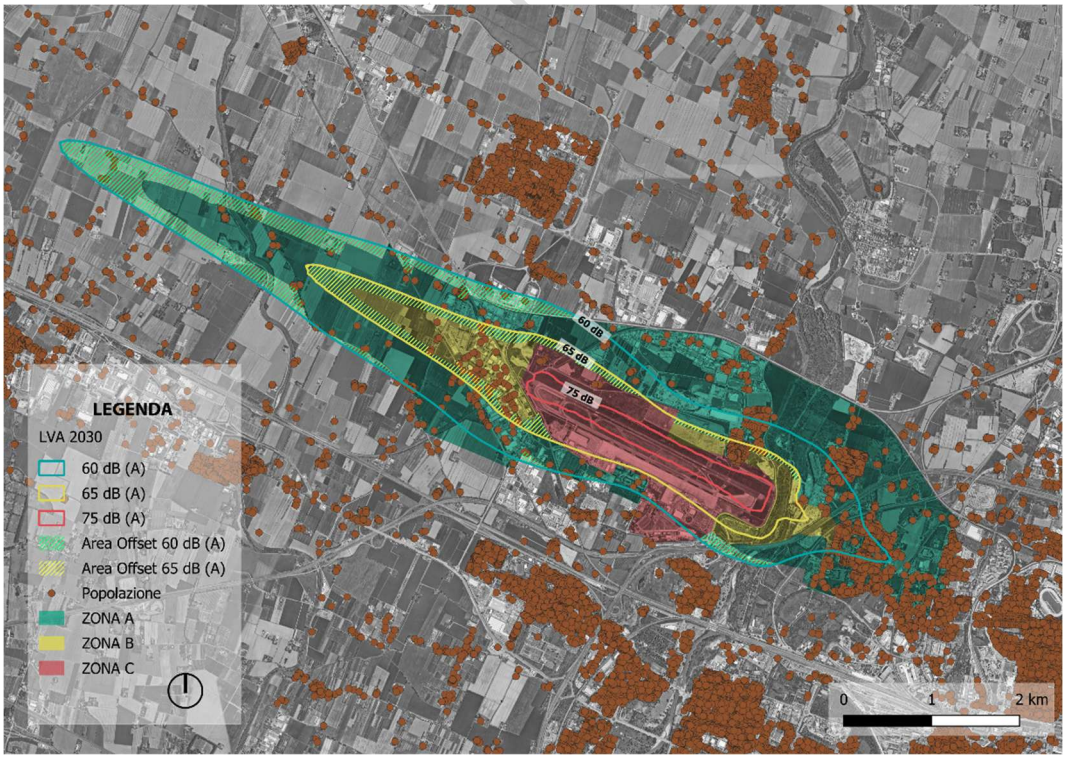


Figure 28: LVA 2030 - scenario 1

Scenario 2: *Absence of the ordinance on nighttime overflights and reallocation of a percentage of the remaining nighttime movements to the daytime period.*

Simulations indicate that, in this case, the overall framework would ensure compliance with the airport acoustic zoning limits. However, **the wider expansion of the contours on the Bologna side would result in an increase in the exposed population**, subsequently worsening annoyance indicators compared to the baseline scenario, thus leading to a less favorable overall outcome. Conversely, the benefit derived from reducing the impact on the Bargellino side would remain positive, although it would involve a highly marginal dimension in terms of affected residents, as the area is characterized by a predominantly rural, low-density context.

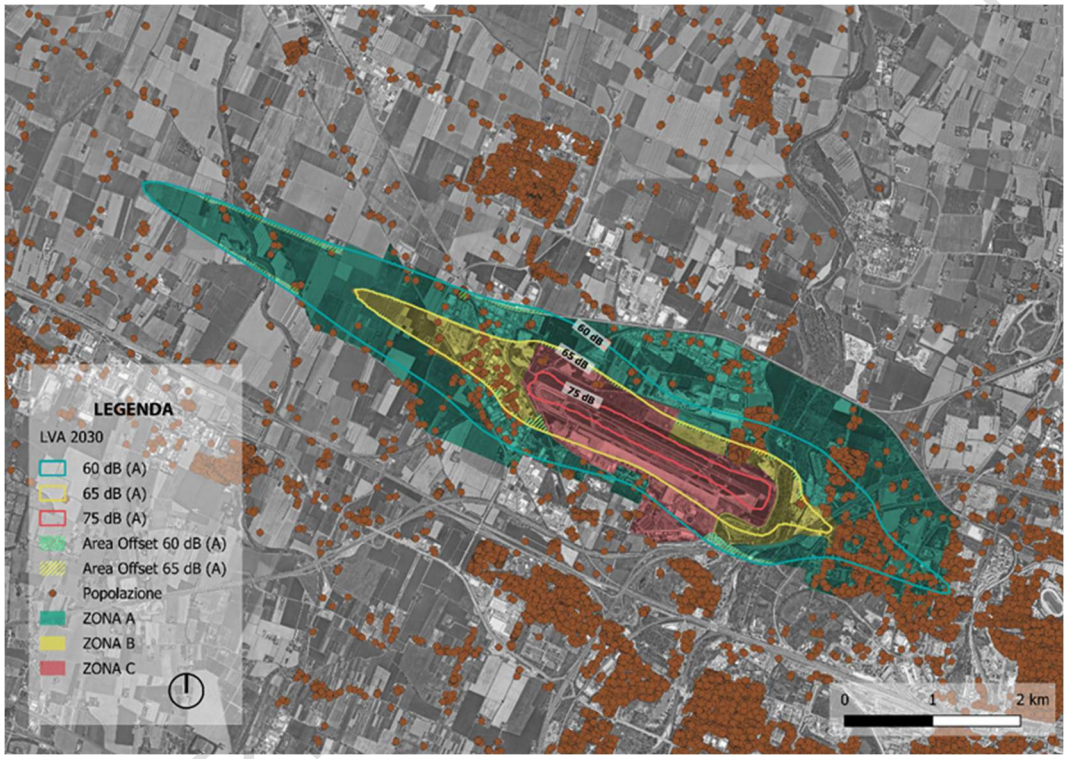


Figure 29: LVA 2030 - Scenario 2

The following table provides a comparison regarding the exposed population and the exceedance of the airport zoning limits for the two scenarios proposed as examples to foster effective Stakeholder engagement.

Exposed Population and Exceedance Areas	60 dB(A)	65 dB(A)	75 dB(A)
LVA 2030 – Scenario 1	4.159 (1,7 km^2)	340 (0,83 km^2))	-
LVA 2030 – Scenario 2	6.113 (0,30 km^2)	150 (0,15 km^2)	-

Table 46: Total exposed population and exceedance areas within the noise contours – 2030 Scenarios 1, 2, and 3

9.4 Cost-Benefit Analysis Considerations

Considering the considerations developed in the preceding sections, and consistent with the principles of the Balanced Approach, the methodology adopted and suggested for both the analysis and the informational briefings for effective Stakeholder Consultation must support an informed and transparent decision-making process. This will guide the selection of measures that the Airport Operator can synthesize and adopt to ensure the best overall, sustainable equilibrium among **environmental benefits, operational feasibility, and economic-financial sustainability.**

In this context, particular emphasis must be placed—in line with the factors identified in Annex II of Regulation (EU) No 598/2014—on protecting the health and safety of local residents in the areas surrounding the airport, as well as on safeguarding airport capacity and competitive dynamics. These are essential elements for ensuring an effective and lasting balance of the involved interests

Appendix A: List of achronims

AEDT	Aviation Environmental Design Tool
BAR	Balanced Approach Regulation
BLQ	Aeroporto di Bologna (codice IATA)
DM	Decreto Ministeriale
EASA	European Aviation Safety Agency
ENAC	Ente Nazionale per l'Aviazione Civile
FAA	Federal Aviation Administration
INM	Integrated Noise Model
MAP	Million Annual Passengers
NADP	Noise Abatement Departure Procedure
PCAR	Piano di Contenimento e Abbattimento del Rumore Aeroportuale
PSA	Piano di Sviluppo Aeroportuale
RWY	Runway
VIA	Valutazione di Impatto Ambientale
KPI	Key Performance indicator