FRAPORT TAV
ANTALYA TERMİNAL İŞLETMECİLİĞİ A.Ş.

NOISE MANAGEMENT PLAN

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INDEX

ABBREVIATIONS

AIIB: Asian Infrastructure Investment Bank
ATM: Air Transport Movement
APU: Auxiliary Power Unit
AYT: IATA - Antalya International Airport
DEG: German Investment and Development Company
DHMI: State Airports Operation Administration (Airport Operator)
EBRD: European Bank for Reconstruction and Development (the “EBRD”)
ECAC: European Civil Aviation Conference
FEGP: Fixed Electric Ground Power Units
FTA 1: Fraport TAV Antalya Terminal İşletmeciliği A. Ş. (Terminal Operator)
FTA 2: Fraport TAV Antalya Yatırım Yapım İşletme A. Ş. (Borrower)
GPU: Ground Power Unit
ICAO: International Civil Aviation Organization
IFC: International Finance Corporation
LTO: Landing and Take Off
NMP: Noise Management Plan
NPD: Noise-Power-Distance
RENC: Regulation on Control of Environmental Noise
SEL: Sound Exposure Level (dBA)
VNIP: Voluntary Noise Insulation Program
WBG: World Bank Group

DEFINITIONS AND NOISE METRICS

Sound: Sound is vibrational disturbance, exciting hearing mechanisms, transmitted in a predictable manner determined by the medium through which it propagates. To be audible, the disturbance must fall within the frequency range 20 Hz to 20,000 Hz.

Noise: Noise is typically defined as "unwanted sound", sound being the human sensation of pressure fluctuations in the air. Sound levels are expressed in decibels (dB) on a logarithmic scale, where 0 dB is nominally the "threshold of hearing" and 120 dB is nominally the "threshold of pain".

Background Noise: Prevailing noise in at a particular location measured in the absence of noise generated by the activities being studied.

Baseline Noise: Atmospheric air pressure defined as decibels at the absence of any air pressure deteriorating effect which can be considered as noise.

Decibels (dB): The unit describing the amplitude of the sound. The human hear responds to sound logarithmically. The bel is a logarithm of the ratio of the two sound power levels (i.e., instantaneous sound power and reference sound power) and decibel is 1/10 bel.

Frequency: The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or Hz.

Sound Pressure Level (Lp): A logarithmic measure of the effective sound pressure of a sound relative to a reference value. It is measured in decibels (dB) above a standard reference level. The commonly used "zero" reference sound pressure in air is 20 micro-pascal RMS (root mean square), which is usually considered the threshold of human hearing (at 1 kHz).

Equivalent Sound Level (Leq): Quantifies the noise environment as a single value of sound level for any desired duration. L_{eq} correlates well with the effects of noise on people. L_eq is also sometimes known as Average Sound Level.

A-Weighting: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response, it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA).

L_{Aeq}**:** A weighted equivalent sound pressure level.

L_{day}**:** Equivalent continuous sound pressure level for reference time interval day (07:00-19:00).

L_{eve}**:** Equivalent continuous sound pressure level for reference time interval evening (19:00-23:00).

L_{night}**:** Equivalent continuous sound pressure level for reference time interval night (23:00-07:00).

L_{dn}**:** Day-night-weighted sound pressure level. Day time defined in between 07:00-23:00, and night time defined as 23:00-07:00.

L_{den}**:** Day, evening- night weighted sound pressure level. Day time defined in between 07:00-19:00, evening time between 19:00-23:00, night time between 23:00-07:00.

Sensitive Receptors: Healthcare Facilities (Health care institutions providing inpatient services, hospitals, Child, disabled and geriatric care facilities, family health centres), educational facilities (Schools, Nurseries,Student residences) and residentials

NON-TECHNICAL SUMMARY

This Noise Management Plan for Antalya International Airport (AYT), outlines strategies and mitigation measures to reduce noise impacts generated by airport operations, such as aircraft Landing and Take Off (LTO), at sensitive receptors. The plan aims to minimize the impact of noise on the surrounding communities and to ensure compliance with national regulations, lenders' standards and Good International Industry Practice (GIIP), to communicate progress made on noise mitigation through the stakeholders and to maintain a balance between airport operations and quality of life of sensitive receptors around the airport. In this context, noise modeling and long-term noise monitoring have been carried out using flight data, as well as mapping studies to better identify noise distributionand the extent of airport-related noise impacts in the vicinity of the airport.

This Noise Management Plan focuses on new measures under FTA's control. Matters managed by DHMI are not new developments and reflect only information already available in the public domain, included for completeness. Within this context, the VNIP is presented as the most significant initiative, as it represents the largest step being taken under FTA's control.

The following is a simplified overview of the key components and goals:

Key Strategies;

- Sustain and maintain Noise Monitoring Program
- Review and update noise mapping zoning studies
- Monitor, collect and report aircraft and flight related stats (If possible)
- Plan an active stakeholder engagement plan
- Sustain and maintain Voluntary Noise Insulation Program

Goals;

- Reducing the number of people significantly affected by aircraft noise during day / night time
- Maintaining compliance with defined framework of scope
- Fostering strong relationships with local communities and stakeholders

Noise management strategies developed for AYT focus on the aircraft movements because of the fact that, during monitoring stage, noise from ground operations found out to be negligible in comparison to the flight noise.

Within the scope of the project, 60 dBA at night was set as the threshold above which households would be eligible for noise insulation. Additionally, to consider the impact of airport noise on educational buildings and healthcare facilities during the day time, grid noise maps were prepared. It was decided that a Voluntary Noise Insulation Program (VNIP) would be implemented in areas exposed to noise levels above 60 dBA during day / night time, as appropriate.

The VNIP will be implemented to assess the impact of aircraft-related noise on surrounding sensitive receptors and to mitigate its effects. The program targets areas exposed to night-time noise levels exceeding 60 dBA for the residential buildings and day time noise levels 60 dBA for educational and healthcare facilities, due to airport operations, offering insulation measures such as window replacements to reduce indoor noise levels and improve residents' comfort. Noise modeling, accounting for future flight projections, was used to identify zones with Lnight > 60 dBA and Lday > 60 dBA. The VNIP applies to buildings constructed before the start of the AYT expansion on 05.01.2022. Eligibility for the program, which will be in effect for 15 years, is determined by an Eligibility Matrix, with all specific details outlined in the relevant document. To ensure the program's effectiveness, it must be implemented sustainably and regularly updated to adapt to changes in noise levels.

PROJECT DESCRIPTION

Antalya International Airport (AYT)

AYT, located in the southern part of Turkey within the province of Antalya, is one of the country's major international airports. Established in the 1960s, it serves as a key gateway for both domestic and international flights, with a particular focus on tourism. It handles millions of passengers annually, making it one of the busiest airports in Turkey. AYT is strategically positioned in terms of international air traffic and continues to experience rapid growth.

The airport serves a population of 3.3 million people living within a 2-hour radius and welcomed 37 million tourists in 2024. It not only caters to the city of Antalya but also to several prominent tourist destinations and nearby provinces, including Kemer, Belek, Side, Alanya, Kaş, and Manavgat. These areas are well-known for their beaches, resorts, and historical landmarks. Travelers from Isparta and Burdur also frequently use AYT due to its accessibility and connectivity. On the other hand, AYT provides connectivity to 327 different destinations worldwide with 131 airlines. The satellite view of the airport is presented in Figure 1.

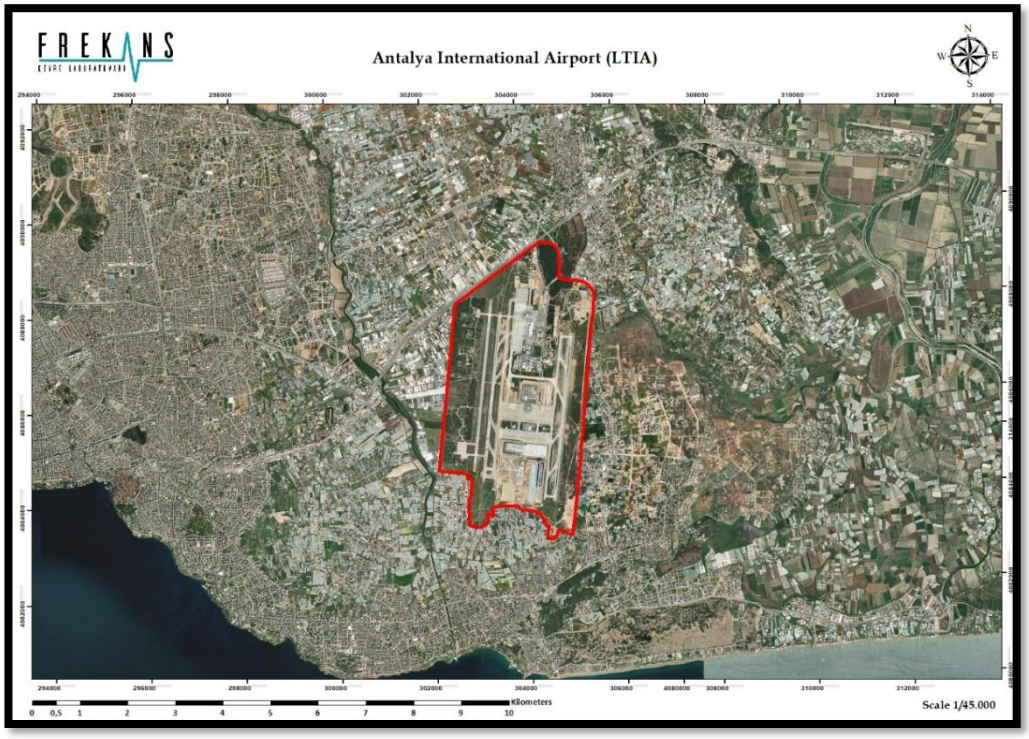

Figure 1: Satellite View of Antalya International Airport

During the 6-month period between June 2024 and November 2024 period which includes the summer season, also known as the peak season, a total of 165,000 flights were detected by monitoring. The distribution of the detected air traffic routes are presented in the map shown in Figure 2.

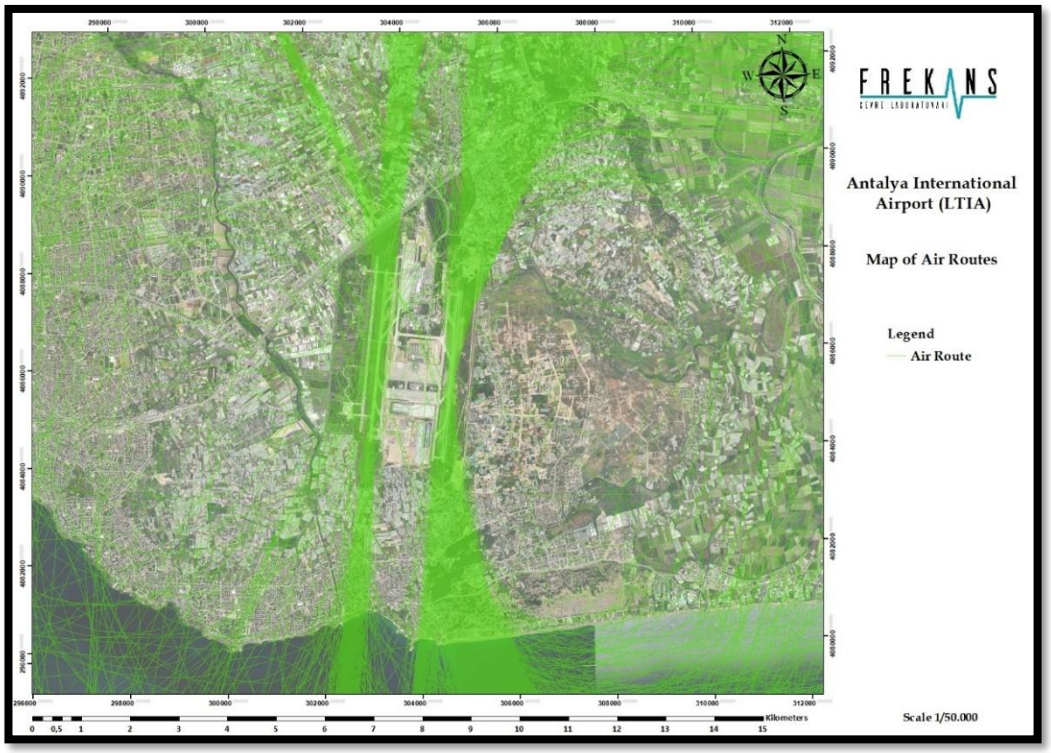

Figure 2: Map of Air Traffic Routes

The airport, with an annual passenger traffic of approximately 35 million, has witnessed a consistent growth in both usage and demand over the years. The exact figures for the expected number of flights and passengers at AYT in 2030 may vary depending on factors such as airline traffic projections, regional tourism potential, and the airport's infrastructure development plans. However, considering the general trends and the airport's growth capacity, AYT is expected to experience significant growth by 2030.

Based on the results of FTA's scenarios and ATM (Air Transport Movement) forecast study, the projected number of flights for 2030 is expected to exceed 250,000. As outlined in the ESIA report for AYT, the results of this forecast study are presented in Figure 3. Based on the results of the forecast studies, the projected number of passengers for 2030 is expected to surpass 50 million.

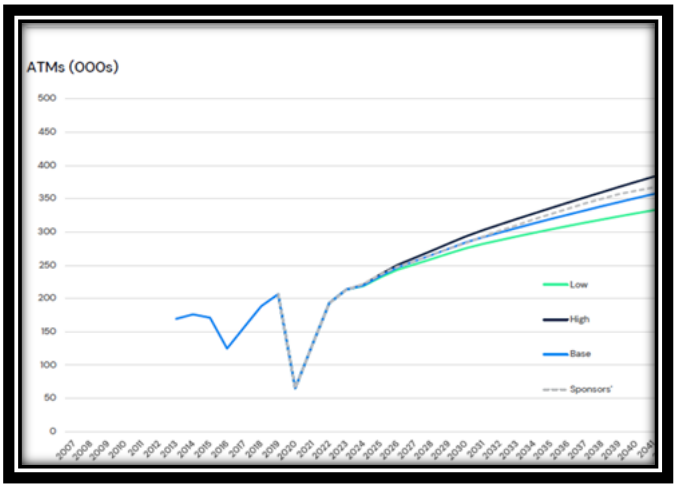

Figure 3: Future Projection Scenarios

The increase in air traffic has exacerbated the problem of noise pollution, particularly in areas surrounding large airports. The noise generated by aircraft during LTO can have effects on both the surrounding ecosystem and the health of people living in nearby residential areas. To minimize the impact of airport-related noise, the implementation of a comprehensive noise management plan has become crucial. By incorporating advanced noise monitoring systems, optimizing flight operations, and implementing structural and procedural interventions, the Noise Management Plan serves as a key tool for managing and controlling noise levels.

This is a comprehensive Noise Management Plan covering the years 2025-2030, outlining noise contours, noise affected areas, objectives and measures to be taken to address noise pollution and reduce exposure.

Scenarios have been developed to predict the changes in airport noise impact zones due to the increase in future flight traffic volume. Aircraft movements for the years 2030, 2035 and 2041 were determined based on the ATMs (see Figure 3). According to the model results, day and night-time grid noise maps were created for each scenario to determine the future noise contours. The projections of air traffic movements are presented in the following table.

Table 1: Flight Projections

Year	ATM
2030	241.000
2035	283.000
2041	324.000

1. PURPOSE

This Operational Noise Management Plan has been prepared within the scope of the AYT. The AYT Expansion Project involves a multi-phase program of works to accommodate future growth in passenger traffic and aircraft movements. FTA has been awarded the tender of AYT operation for 25 years between 2027 and 2051. The Joint Venture will ensure to increase the capacity of AYT and obtain a new concession for operation.

Financing for Phase I of these planned works is provided by The European Bank for Reconstruction and Development (the “EBRD”), International Financial Corporation (“IFC”) and Asian Infrastructure Investment Bank (AIIB), German Investment and Development Company (DEG) jointly “the Lenders”.

The current passenger terminals and associated facilities are operated by Fraport TAV Antalya Terminal İşletmeciliği A.Ş (FTA 1), as the Project Sponsor, under a concession until December 31, 2026. The part of FTA which is focused on terminal operations is referred to as “FTA1”.

Another part of FTA is organizationally separate from FTA1 and is responsible for the financing and construction works for FTA – this organization is referred to as FTA2. Following the completion of ongoing construction works of the expansion of Terminal 2 (T2) and Domestic Terminal by FTA2 in the beginning of 2025, the terminals will be operated by FTA1 until the end of 2026. After January 1, 2027, FTA1 and FTA2 will merge and operate the terminals.

This Noise Management Plan aims to identify the impact of night-time and day time noise generated by airport operations, on surrounding community, determine the most impacted residential, educational and healthcare facilities, including by vulnerability degree and to colloborate with stakeholders to reduce or mitigate these impacts. This initiative, undertaken on a voluntary basis, seeks to balance the airport’s growth and operational needs with the well-being of the environment and the local communities.

2. SCOPE

The FTA's Project Management Office (PMO) appoints and supervises an Engineering, Procurement and Construction (EPC) Contractor to deliver these construction works on behalf of the airport owner, The Turkish General Directorate of State Airports Authority ("DHMI" - Devlet Hava Meydanlari İşletmesi Genel Müdürlüğü). Once the Project has been completed, FTA2 will merge with FTA1 and retain responsibility for the management of passenger-focused assets. Any aspects that are not controlled by FTA during the operational phase will be handed over to DHMI as part of their operational obligations. Prior to presenting the VNIP, it is noted that this document includes

only operational aspects under DHMI's control that are already available in the public domain. Consequently, the VNIP emerges as the most prominent measure.

This Noise Management Plan (NMP) specifically covers noise due to air traffic activities. Noise from ground operations, the energy center, and other minor sources were not considered due to their negligible impact compared to air traffic noise. During ESIA stage it was found that the noise generated by the airport cumulatively is dominated by LTO movements. Considering existing baseline nature of the region in terms of environmental noise portion of the ground operations are overshadowed via either existing baseline or dominant noise events from airport. Therefore ground operations are not considered any further in this iteration of the NMP.

The noise level measurement, noise mapping study, aircraft tracking, and relevant analysis were conducted in peak season between June 2024 and November 2024, forming the basis of the plan.

This NMP focuses on assessing the environmental noise impacts caused by AYT air traffic activities on residential buildings (night-time noise) and educational and healthcare facilities (day time noise), exceeding 60 dBA around the airport runways. This assessment aims to identify measures that can be implemented.

Planned actions for noise management include:

- Identification of noise exposure areas through noise monitoring studies, modelling and mapping (Noise monitoring stations have been installed at seven identified locations and the data from these stations are used for updating noise maps and impact analysis),
- Stakeholder engagement (Community, municipalities, mukhtars, DHMİ, Provincial Directorate of Family and Social Policies, etc) (To facilitate public and stakeholder participation, the NMP aims to respond directly to the needs of the community by establishing a feedback mechanism that includes alternative communication channels such as telephone lines, web-based platforms and cooperation with neighbourhood mukhtars), and
- Voluntary Noise Insulation Program (Reduction of noise impacts by window replacement in buildings) covers Healthcare Facilities (Health care institutions providing inpatient services, hospitals, Child, disabled and geriatric care facilities, family health centres), educational facilities (Schools, Student residences) exposed to day time noise and residentials exposed to night-time noise exceeding 60 dBA. The VNIP planned to be implemented by FTA does not cover commercial buildings, even if they remain in the noise impact area. Please refer to VNIP 6.2.3 Eligibility Criteria section for details of the eligibility criteria.

Although FTA, in its role as the terminal operator, it does not have direct enforcement and control over noise-producing activities such as flight paths, LTO procedures, and nighttime operations, will aim to inform and cooperate with the relevant authority on these matters. To support this objective, the NMP includes specific sections on noise optimisation measures.

DHMI, as the airport operator, should identify and implement measures, to reduce noise associated with airside operations, in line with the ICAO Balanced Approach, as part of its roles and responsibilities.

3. RELATED DOCUMENTS

Internal

- Environmental and Social Management System Manual (ESMS)
- Grievance Mechanism Procedure
- Stakeholder Engagement Procedure
- 8.46KY.1.05 - Audit Procedure
- 8.46.KY.1.71 Voluntary Noise Insulation Program[1]

External

- Antalya Airport AIP AD 2 LTAI - 1 A, 23 May 2019, by DHMI [1]
- Antalya Noise Action Plan Report, Antalya Metropolitan Municipality, 2019 [2]
- AYT Noise Map Report, General Directorate of State Airports Authority, 2020 [3]
- CNG (Guidelines for Community Noise,1999) [4]
- EBRD Performance Requirements [5]
- Environmental Noise Directive," DIRECTIVE 2002/49/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, 2002. [4]E. D. 29, "Report on Standard Method of Computing 4th Edition," ECAC-CEAC, 2016. [6]
- Environmental Noise Guideline for the European Region, Copenhagen: World Health Organization, 2018. [7]
- Guidance on the Balanced Approach to Aircraft Noise Management," ICAO, 2008. [8]
- IFC General HSE Guidelines [9]
- IFC Performance Standards [10]
- Regulation of Protection of Buildings from Noise," O.G. No: 30082, Publish Date: 31.05.2017 [11]
- Regulation on Environmental Noise Control," O.G. No: 32029, Publish Date: 30.11.2022. [12]
- S. O. -. ISO, "Acoustics: Description, measurement and assessment of environmental noise, Part 2: Determination of sound pressure levels," 2017.[13]
- W. H. Organisation, "Guidelines for Community Noise," WHO, 1999.[14]
- World Bank Group Environmental, Health, and Safety Guidelines," 2007. [15]

4. ROLES AND RESPONSIBILITIES

Roles and responsibilities are outlined based on functions of relevance to noise management plan

Project Sponsor Responsibilities

FTA 1, AYT Terminal Operator, is responsible for developing the Environmental and Social Management System (ESMS), which identifies the systems and processes established to manage environmental, social and occupational health and safety issues.

FTA 1 is responsible for setting the policies for the Project, implementing the ESMS and ensuring that they are carried out in accordance with other management systems requirements.

FTA 1 has overall accountability for the compliance of Project activities during the operation phase.

FTA 1 is responsible for reporting (government Environmental Authorities, lenders) and stakeholder engagement/grievances mechanism/external communication through FTA Community Liaison Officer (CLO).

[1] *Additional details are available at: https://www.antalya-airport.aero/files/genisleme/Voluntary%20Noise%20Insulation%20Program.pdf*

During the operation phase, the FTA Quality Department oversees and manages all EHS issues.

Functional Responsibilities

In terms of managing possible noise issue roles and responsibilities according to national legislation are defined in the Environmental Noise Regulation [12] and mainly shared among; Ministry of Transport and Infrastructure, Main Airport Operators and DHMI.

These responsibilities can be summarized as follows;

The Ministry of Transport and Infrastructure and DHMI shall,

a) Identify and list the main highways, main railways, and main airports, and report them to the Ministry,

b) Prepare noise maps for the airports under their responsibility,

c) Send the final version of the noise maps to the Ministry,

ç) Establish a noise measurement/control/monitoring system to determine the environmental noise level for major airports,

d) Provide the results of the noise maps to the relevant municipality for use in strategic noise action plans for the provinces,

e) Take noise management issues into account for planned roadways, railways, and airport routes, and prepare a/an acoustic report,

f) Cooperate with relevant institutions and organizations on noise control measures outlined in the action plans, and take the necessary measures in these matters.

The Ministry of Environment, Urbanization and Climate Change shall,

a) Determining programs and policies to reduce environmental noise and preparing documents and documents to facilitate the implementation of these programs and policies,

b) Ensuring cooperation and coordination between institutions and organizations in the implementation of the provisions of this By-Law,

c) Determining the residential areas and main transportation sources for which strategic noise maps will be prepared in cooperation with the relevant institutions and organizations,

ç) Approving strategic noise maps and strategic noise action plans, collecting the information and data contained in strategic noise maps and strategic noise action plans in one center, monitoring the implementation of strategic noise action plans,

d) determining the criteria for preparing acoustic reports, strategic noise maps and strategic noise action plans and the principles to be provided by the institutions and organizations to prepare them,

e) examining and evaluating acoustic reports, strategic noise maps and strategic noise action plans,

f) To inspect environmental noise sources for the implementation of the provisions of this Regulation and to impose administrative sanctions in case of violation,

g) Establishing the database containing the prepared acoustic reports, strategic noise maps and strategic noise action plans and following the data entry process,

ğ) Implementing/implementing and monitoring the training programs to ensure the specialization of the representatives of the institutions and organizations responsible for the implementation of the provisions of this By-Law

h) Carrying out studies to determine the permitted level of environmental noise and vibration for historical and natural structures.

Provincial Directorate of Environment, Urbanisation and Climate Change shall,

a) To ensure cooperation and coordination for the implementation of the By-Law on the Control of Environmental Noise, to carry out monitoring and inspection activities,

b) To impose administrative sanctions in case of violation of the provisions of the Regulation on the Control of Environmental Noise,

c) Organising Provincial Local Environmental Board meetings in cases where a provincial decision is required in order to control and manage environmental noise in the implementation of the provisions of this By-Law,

d) To ensure coordination in the preparation of strategic noise maps in the provinces,

e) Monitoring the implementation of strategic noise action plans, reporting the problems, solution proposals and useful information to the Ministry,

f) To coordinate and control the process of entering acoustic reports, strategic noise maps and strategic noise action plans into the database established by the Ministry,

Municipalities and Special Provincial Administrations shall,

a) To prepare/ have prepared strategic noise maps and strategic noise action plans in cooperation with relevant institutions and organisations and to implement strategic noise action plans,

b) Opening the strategic noise action plans to public opinion, notifying the final version of the strategic noise maps and strategic noise action plans to the public and sending them to the Ministry,

c) To enter the strategic noise maps and strategic noise action plans into the database established by the Ministry,

ç) To take into account the issues related to noise management in the zoning plan studies and licensing phase,

d) In case of delegation of authority pursuant to the Environmental Law, to carry out monitoring and inspection activities for the implementation of this By-Law within the framework of the procedures determined by the Ministry,

e) In case of delegation of authority pursuant to the Environmental Law, to impose administrative sanctions in case of violation of this By-Law and to convey the results of the inspections and administrative sanctions to the provincial directorates,

FTA-1 (Terminal Operator);

FTA has assigned departments or specialized employees within the organization to monitor Environmental and Social Responsibility, Human Resources, Occupational Health and Safety (OHS), Community Liaison and other specific areas.

The FTA does not have the authority to enforce aircraft noise management regulations, given its role as a terminal operator. However, the FTA has voluntarily assumed the following roles and responsibilities through this plan;

- Develop and maintain the Noise Management Plan for aircraft noise
- Establish and ensure implementation of a noise insulation programme to reduce the impact of airport-generated noise on households in the vicinity of the airport. Monitors noise levels through regular assessments and informs DHMI about the monitoring results.
- Collaborations with DHMI on the NMP and municipalities about noise action plans to exchange information and raise awareness

Taking into account the above roles defined by national legislation, the roles and responsibilities of related authorities and FTA to meet the ICAO Balanced Approach can be listed as below:

Table 2: Roles and Responsibilities in line with ICAO balanced approach

DHMI	FTA	Municipalities
• Establishing systems to monitor environmental noise levels, • Preparing noise maps for the transportation infrastructure under their jurisdiction, • Submitting these maps to the ministry and relevant municipalities, • Reduction of noise at source, considering noise management in planned projects, • Operating restrictions, taking necessary measures, implementing noise abatement operational procedures • Collaborating with other relevant institutions.	• Voluntarily assumed the responsibilities of developing and maintaining the noise management plan, • Implementing a voluntary noise insulation program to reduce the impact of airport-generated noise on sensitive receptors, • Regularly monitoring noise levels and informing DHMI on the results, • Collaborating with DHMI, municipalities, etc. to raise awareness	For land-use planning and management • Ensuring the preparation of noise maps in residential areas, • Identifying noise-sensitive areas, • Developing strategic action plans to reduce noise levels, • Implementing noise control measures in new constructions and projects, • Addressing citizens' complaints related to noise, • Conducting awareness-raising activities.

Among mentioned items above, roles and responsibilities of Noise Committee on behalf of FTA can be listed as in the following table;

Table 3:Roles and Responsibilities of FTA Noise Committee

Main Roles	Definitions	Responsible
Project Coordination	• Coordination and overall oversight of the noise management plan. • Facilitating communication among departments and stakeholders. • Monitoring the plan's progress and ensuring alignment with objectives.	Environmental Specialist
Noise Monitoring	• Installation and maintenance of noise monitoring stations. • Collecting, analyzing, and reporting noise data. • Reviewing noise maps annually. • Conducting noise modeling studies and preparing technical reports. • Providing technical guidance on noise mitigation measures.	Noise Consultant

Technical Management VNIP Implementation	• Ensure that monitoring station maintenance and measurement results are carried out in accordance with the consultancy contract and legislation. • Coordinating the implementation of the VNIP and planning the budget • Monitoring of mitigation measures and compliance • Supporting the assessment of housing conditions and refurbishment needs. • Preparation of Technical terms and conditions and execution of the contract process • Determination of technical requirements for insulation • Collaboration with local service providers for construction activities. • Site visits to monitor and report on construction progress.	Energy Systems Manager
Legal Management	• Regulatory compliance support	Attorney
Community Relations Management Collaborations	• Gathering and addressing feedbacks from local residents. • Acting as a bridge between terminal management and the community. • Organizing regular meetings with mukhtars, municipalities and Provincial Directorate of Family and Social Policies. • Conducting public awareness campaigns and establishing communication platforms (e.g., websites, hotlines).	Community Liaison Officer Corporate Communications Asst. Manager Noise Consultant
Collaborations	• Organizing meetings with DHMI and airlines.	Operation Manager Energy Systems Manager Noise Consultant
Community Feedback Monitoring	• Monitoring feedbacks related with noise nuisance. • Coordination and implementation of grievance mechanism.	Quality Specialist Community Liaison Officer
Financial Management	• Planning and allocating budgets for noise management initiatives. • Providing financial support for noise insulation programs and technical investments.	Finance Manager
Procurement	• Coordinating the procurement of equipment and materials. • Ensuring transparent and efficient procurement processes. • Collaborating with local vendors and service providers. Preparation of terms and conditions and execution of the contract process	Procurement Chief

5. NOISE MANAGEMENT

5.1 Legislative Policy and Guidelines

In this chapter, national and international policies and guidelines for the noise management strategies are described.

5.1.1 ICAO Balanced Approach

ICAO defined a balanced approach to manage the environmental noise emitted from airport activities [8].

ICAO balanced approach categorizes noise management strategies into 4 main categories. These categories are summarized in Figure 4 and can be listed as;

- Reduction of noise at source
- Land-use planning and management
- Noise abatement operational procedures
- Operating restrictions

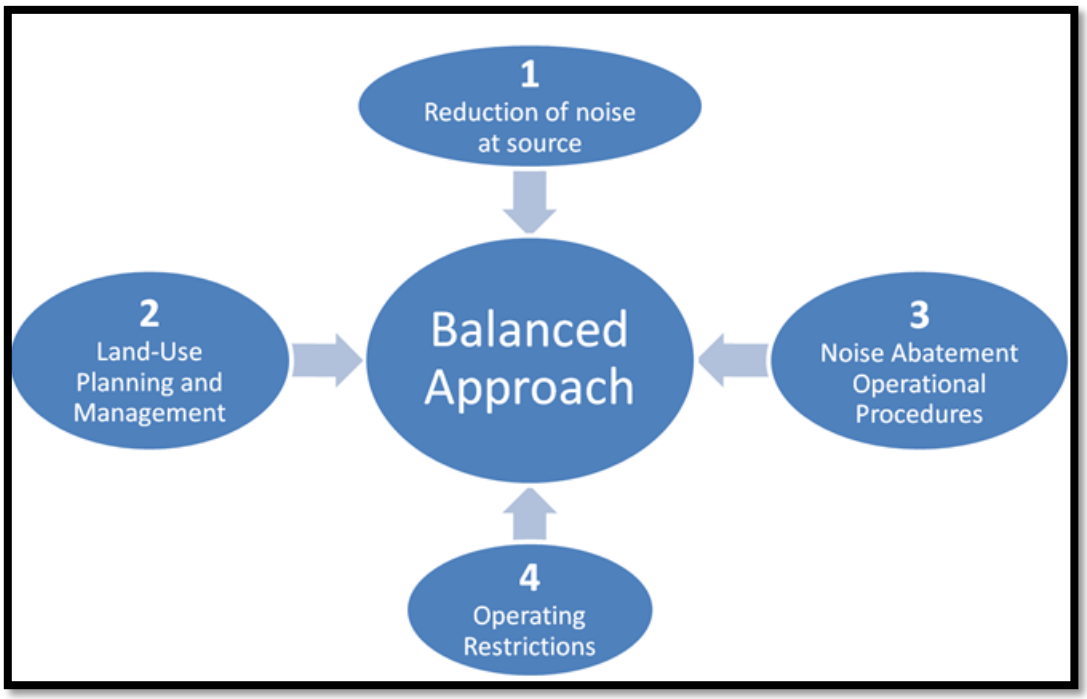

Figure 4: Balanced Approach Strategies

Noise management strategies created in this document are prepared in-line with the guidance defined by ICAO.

At AYT, the many of the measures to be taken in line with the noise management strategies outlined in the ICAO Balanced Approach are under the authority and control of DHMI as the airside operator. However, where it is not under the responsibility of FTA 1, as the terminal operator, it supports the noise management strategies set out in the ICAO Balanced Approach and will endeavour its best efforts to ensure the necessary co-operation with DHMI and relevant stakeholders. In addition, FTA carries out the voluntary noise insulation programme within the scope of Land-use planning in the ICAO Balanced Approach.

On a voluntary basis and with a commitment to contribute to environmental sustainability and benefit affected communities, to meet lenders‘ performance requirements FTA carries out various initiatives, including awareness and informational campaigns, monitoring activities, voluntary noise insulation program, and collaboration with stakeholders.

These voluntary efforts are an integral part of our activities to contribute to the objectives of the ICAO Balanced Approach and to improve the quality of life for communities around the airport.

5.1.2 Applicable Environmental Noise Policies and Guidelines

- **International Guidelines**

The international policy in the assessment of noise levels followed in this study is outlined in the World Bank Group's & IFC's Environmental, Health and Safety Guidelines [9]. Recommended noise levels are presented in Figure 4.

The values presented can be applied to both the construction and operation phases of the project. The noise levels should not exceed the levels presented in 4 or result in a maximum increase in current background levels of 3 dB at the nearest receptor location off-site.

Table 4:WBG - IFC Noise Level Guidelines

Receptor	Day time (07:00 - 23:00)	Night time (23:00 - 07:00)
	1 Hour LAeq (dBA)	
Residential areas	55 dBA	45 dBA
Commercial/industrial areas	70 dBA	70 dBA

- **National Regulation**

Environmental noise and vibration levels are regulated by the Turkish [3](RENC) (Official Gazette Date/Number: 30.11.2022/32029). RENC was prepared in accordance with European Noise Directive's (END) [6] noise indicators and standard methods.

For operations, limit values for noise emissions are defined in "RENC Annex 2 Table 1", of RENC for airports. RENC Annex 2 Table 1 does not explicitly mention airports but sets limits for 'Industrial facilities, transport sources,' which include airports under the category of transport sources. The maximum allowable environmental equivalent noise levels to be met for different periods of the day are presented in Table **Error! Reference source not found.**5. Limits defined according to RENC are source levels and obligatory to follow.

Table 5: Environmental Noise Limits for Airports

Noise Source	Measured Parameter	Day (07:00 - 19:00)	Evening (19:00 - 23:00)	Night (23:00-07:00)
Industrial facilities, transport sources	5min, Leq	65 dBA	60 dBA	55 dBA

- **Standards**

The standard methods recommended in END and RENC were selected for noise level analysis are:

- Noise Measurements: ISO 1996-2:2017: Description, measurement, and assessment of environmental noise [13]

- ECAC Doc. 29 Vol. 1 Appendix C, European countries have their own methodologies and assessment strategies in terms of aircraft noise. (ECAC Doc. 29) [6]

Apart from the noise limits defined in RENC and International guidelines, a night time noise quality concept of sleep disturbance is also defined in “Environmental noise guidelines for the European Region” by WHO, 2018 [7].

According to WHO sleep disturbance is one of the critical health effects that can be created by aircraft noise.

In order to minimise the most adverse noise effects and focus efforts on those most in need of support, a sleep disturbance limit of 60 dBA Lnight has set as eligibility criteria for noise insulation program.

Since sleep disturbance is most likely to occur during night-time, management strategies for adverse noise effects are built on sleep disturbance concept. But these strategies also include the environmental day time noise impact on educational facilities and healthcare facilities..

Table 6:Community Noise Guidelines from WHO(1999), Sleep Disturbance Limits

Specific Environment	Critical Health Effect	LAeq, dB	Time base, hours	LAmax, fast, dB
Inside Bedrooms	Sleep disturbance, night time	30	8	45

The "Environmental Noise Guidelines for the European Region" document from the WHO (2018) states that, except for leisure noise, all recommended exposure levels in the current guidelines are average sound pressure levels for outdoor exposure. These guidelines supersede the CNG (Guidelines for Community Noise,1999). However, the GDG (Guideline Development Group) recommends that all CNG indoor guideline values and any values not covered by the current guidelines should remain valid.

Moreover, the sleep disturbance limit is defined in the "Environmental Noise Guidelines for the European Region" document from the WHO (2018) as: "Evidence for a relevant absolute risk of sleep disturbance related to night noise exposure from aircraft at 40 dB Lnight was rated as moderate quality."

The "Environmental Noise Guidelines for the European Region" document from the WHO (2018) states that: “The differences between indoor and outdoor noise levels are usually estimated at around 10 dB for open windows, 15 dB for tilted or half-open windows, and about 25 dB for closed windows. For a more accurate estimation of indoor levels, the relevant scientific literature, such as Locher et al. (2018), can be consulted.”

Considering the right to open and ventilate windows (10 dB insulation) of potentially impacted individuals and the 30 dBA indoor sleep disturbance limit from CNG 1999, the 40 dB Lnight outdoor limit appears consistent.

Starting from this point, considering the closed window insulation of 25 dB and the 30 dBA indoor sleep disturbance limit, regions with 55 dBA Lnight will already likely be protected from sleep disturbance effects.

Practically, improving current windows noise insulation rating from 25 to 30 dBA, will provide 30 dBA indoor level for locations exposed to Lnight 60 dBA.

Consequently, the 60 dBA Lnight limit is chosen as the action limit for the insulation programme.

5.2 Environmental Noise

5.2.1 Noise Monitoring Studies

Based on the findings of the ESIA report, it was decided to install noise monitoring stations around AYT. The initial number of stations, determined through expert assessments, was increased in locations where exceedances were detected. Currently, noise monitoring activities are being conducted using seven stations.

The data collected from these stations is essential for assessing and mitigating noise impacts in the vicinity of AYT. These results are used to delineate the impact area, a key component of the VNIP, and to identify specific locations where mitigation measures will be implemented.

Monitoring noise levels at key sites is an effective way to collect data for the management of environmental noise that is propagated from complicated projects with a variety of sound sources. Collected data leads experts to; generate more reliable outcomes, verification of noise map, increase the precision of the mitigation decisions and efficient budget deployment.

In this section critical aspects of noise monitoring survey such as spatial information, technical needs and utilization of data are explained.

5.2.1.1 Monitoring Locations

Noise monitoring stations have been installed at 7 different locations. These locations were selected based on the runway orientation, potential noise impact and receiver sensitivity. Figure 5 shows the location of noise monitoring stations.

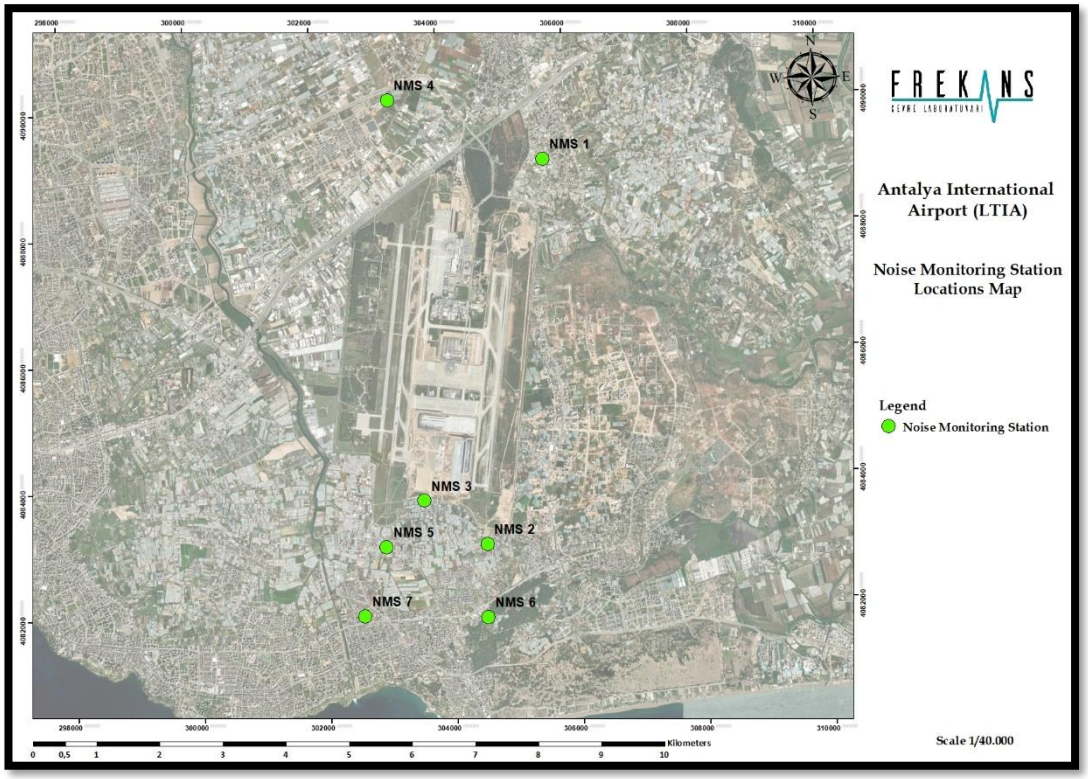

Figure 5: Noise Monitoring Stations

Spatial information regarding noise monitoring stations are given in the below Table 7.

Table 7:Information about Noise Monitoring Stations

Station No.	Coordinates, x(m)	Coordinates, y(m)	Settlement	Remark
NMS 1	305654.00 m E	4089076.00 m N	Güzelyurt	Northern region of the west side tracks, residential locations
NMS 2	304566.00 m E	4083001.00 m N	Güzelbağ	Southern region of the tracks, residential locations
NMS 3	303589.00 m E	4083722.00 m N	Güzelbağ	Southern region of the tracks, educational and residential locations
NMS 4	303216.00 m E	4090081.00 m N	Altınova	Northern region of the east side tracks, residential locations
NMS 5	302965.00 m E	4083006.00 m N	Güzelbağ	Southern region of the east side tracks, residential locations
NMS 6	304542.00 m E	4081845.00 m N	Güzeloba	Southern region of the west side tracks, residential locations
NMS 7	302593.00 m E	4081921.00 m N	Güzeloba	Southern region of the east side tracks, residential locations

Data from noise monitoring stations started being collected from November 2023. Collected data is used in the process of updating and validating the noise maps. The validation results and details on preparation of noise maps are presented in Appendix 1. Below Table 8 shows the equivalent

day – evening and night time noise levels for the peak season – in between June 2024 -November 2024. WHO Environmental Noise Guidelines for European Region, 2018 document defined environmental noise indicators in Chapter 2.2.2. It is stated that both 22:00 and 23:00 is used for the start of the nighttime period. The Lnight indicator is measured over an eight-hour period during night-time, usually between 23:00 and 07:00 (EC, 2002a). For the 8-hour Lnight indicator, the period 23:00 - 07:00 was preferred due to the relatively later sleeping hours of people considering the national standard. Periodical calibrations of the measuring devices at these monitoring stations are carried out. These calibration reports should be attached to the monitoring reports.

Furthermore, in accordance with the national standard, both Lday and Lnight indicators have been applied. The time periods used for the Lden indicator (07:00–19:00 for day, 19:00–23:00 for evening, and 23:00–07:00 for night) are fully aligned with the national regulation. Comparison of the measured Lday and Lnight values with the relevant national and international reference limits provides a sound basis for assessing compliance and identifying priority areas for the implementation of mitigation measures.

Table 8: Noise Monitoring Results for Lden[2] and Ldn[3]

Station No.	Noise Levels, dBA				
	Lden Rating			Ldn Rating	
	Day 07:00-19:00	Evening 19:00–23:00	Night 23:00-07:00	Day 07:00-23:00	Night 23:00-07:00
NMS 1	66,9	66,6	63,7	66,8	63,7
NMS 2	67,1	63,8	61,4	66,5	61,4
NMS 3	64	61,8	60,5	63,5	60,5
NMS 4	62,1	57,6	54,4	61,3	54,4
NMS 5	65,8	65,8	62,8	65,8	62,8
NMS 6	65,1	63,5	56,4	64,8	56,4
NMS 7	62,6	63,4	62,7	62,8	62,7

During technical due diligence report stage of the environmental noise and vibration, noise modelling study built on a set of assumptions and limitations. These set of assumptions include a critical subject about flight routes which is distribution of the total LTO movements that are assumed to be distributed homogenously on all SIDs (Standard Instrument Departure). On the other hand, noise monitoring studies so far helped us to develop realistic noise maps, actual flight movements, runway and route usage.

5.2.1.2 Technical Requirements for Monitoring Station

In terms of noise monitoring survey, it is important to define technical framework in order to collect reliable and usable data. International well recognized standards should be used as guides such as; ISO 1996-2 and ISO 20906.

Noise monitoring stations used for AYT fulfils the following aspects;

- Sound level meter standards (type 1 acc. to IEC 61672-1:2013)

[2] L_{den}: Day, evening- night weighted sound pressure level. Day time defined in between 07:00-19:00, evening time between 19:00-23:00, night time between 23:00-07:00.

[3] L_{dn}: Day-night-weighted sound pressure level. Day time defined in between 07:00-23:00, and night time defined as 23:00-07:00.

- Online data availability
- Warning systems for different kind of noise events
- Flexible basis that gives chance to the modifications in terms of parameters and warning system
- Movable to other locations according to developing needs
- Monitoring results are presented and reported monthly and yearly

5.2.2 Noise Mapping Results

Noise model was developed using commercial noise modelling software CadnaA by following ECAC Doc 29. Noise maps has been updated with flight radar data in between June 2024 – November 2024. Noise contours, i.e. grid noise maps have been generated with actual flight data. Noise exposure on population and buildings are analysed. Results presented modelled with the current ANP (Aircraft Noise and Performance database) database which defines the noise curves of the existing commercial aircrafts. Thus; model does not give any projections about the potentially renewed aircraft models in future.

The area exposed to noise levels higher than 60 dBA are presented in the Table 9.

Table 99: Lday / Levening / Lnight > 60 dBA / 65 dBA Exposure Area

	Day	Evening	Night
L>60 dBA Exposure Area (km^2)	29,5	31,9	23,8
L>65 dBA Exposure Area (km2)	12,0	13,3	9,4

The number of buildings exposed to nighttime noise levels above 60 dBA has been analysed. To assess noise exposure in more detail, the number of buildings exposed to noise levels higher than 60 dBA in each runway area has been determined. The settlements located in the northern and southern regions of the runways have been divided into polygons, and noise exposure analysis has been carried out. The northern and southern polygons exposed to noise levels higher than 60 dBA at night are presented in Figure 6.

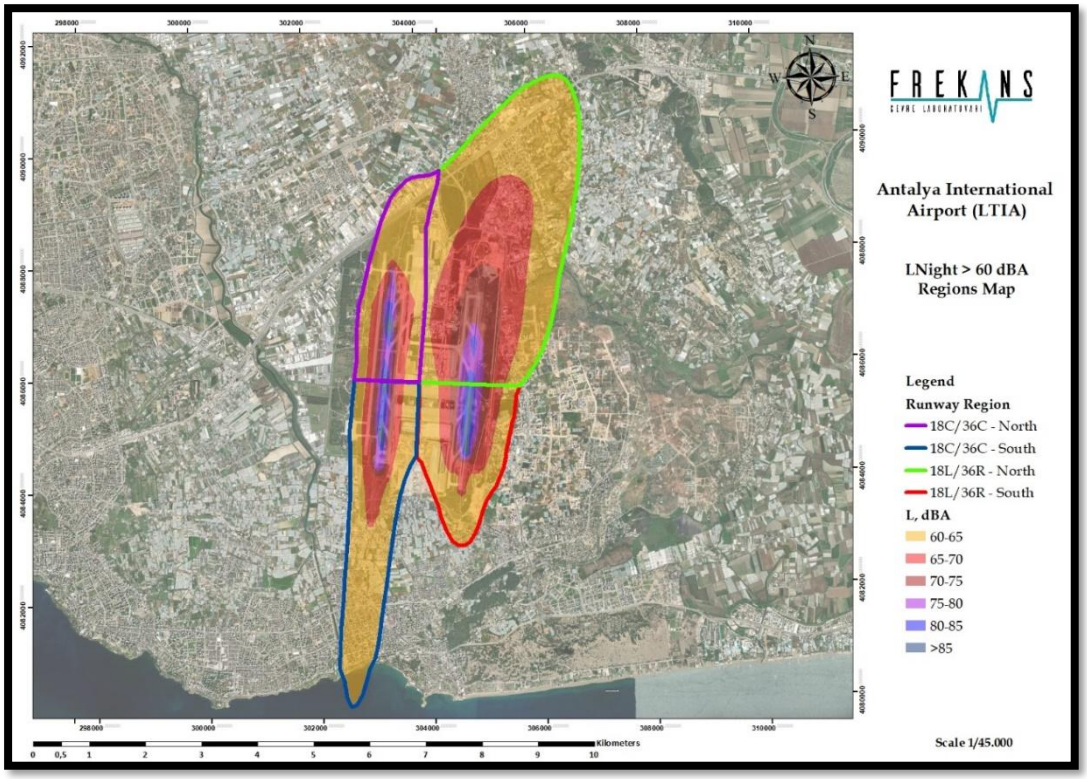

Figure 6: Lnight > 60 dBA Regions

Table 10: Building Census Results for Lnight > 60 dBA

Runway Region	Neighbourhoods	# of Buildings Exposure Lnight > 60 dBA	# of Residential Buildings Exposure Lnight > 60 dBA
18C/36C – North	Yeşilköy, Altınova Sinan	104	67
18C/36C – South	Yeşilköy, Güzelbağ, Güzeloba	1121	1030
18L/36R – North	Yeşilköy, Güzelyurt, Soğucaksu, Hacıaliler, Altıntaş, Cihadiye, Pınarlı	2234	2151
18L/36R – South	Yeşilköy, Altıntaş, Ermenek, Güzelbağ	201	193
Total		3660	3441

Table 11: Building Census Results for Lnight > 65 dBA

Runway Region	Neighbourhoods	# of Buildings Exposure Lnight > 65 dBA	# of Residential Buildings Exposure Lnight > 65 dBA
18C/36C – North	Yeşilköy	0	0
18C/36C – South	Yeşilköy	0	0
18L/36R – North	Yeşilköy, Güzelyurt, Altıntaş	613	588
18L/36R – South	Yeşilköy	14	12
Total		627	600

Since educational and healthcare activities take place during the day time, these buildings have been identified using the Lday grid noise map. The analysis results of noise exposure for educational buildings and healthcare facilities are presented in Table 12.

Table 12:Public Educational Facilities Exposure AnalysisPublic Educational Building List with Lday >60 dBA

Public Educational Building List with Lday >60 dBA			
1	15 Temmuz Şehitler Nursery School	**6**	Celal Sönmez Secondary School
2	Güzeloba Elementary- Secondary School	**7**	Şehit Ahmet Köse Secondary School
3	Ülkü Seyfi Kandemir Elementary-Secondary School	**8**	Güzeloba Nursery School
4	Banu Ufuk Cömeroğlu Elementary School	**9**	Nurcan Rüstem Cömertoğlu Secondary School
5	Çalkaya İncikpınar Elementary School		
Healthcare Facilities List with Lday >60 dBA			
1	Güzelyurt Şehit Komando Er Mustafa GÖKTÜRK Family Health Center	**3**	Antalya Aksu Altıntaş Family Health Center
2	No. 22 Guzelbag Family Health Center	**4**	Kumsal Family Health Center

5.2.3 Area of Influence (AOI)

The area of influence refers to the regions that are significantly affected by noise levels above a certain threshold, in this case, where the Lnight (night-time equivalent continuous noise level) exceeds 60 dBA. This threshold is a key criterion based on action planning studies and selected by considering relevant environmental policies and guidelines and best practices, which are detailed in section 6.3.2 of the report.

To visualize the area of influence, a map has been provided in Figure 7, which highlights the regions where noise levels are above the 60 dBA threshold. This map serves as a critical tool for understanding which areas are subject to higher noise levels, informing decisions related to mitigation and planning.

For a more detailed understanding of the noise modelling studies and the results obtained, the Technical Appendix section of the report provides in-depth explanations and data. This will offer additional context regarding selected parameters, the methodology used in noise modelling, and the outcomes that led to defining the area of influence based on the 60 dBA threshold.

The locations of 9 public schools situated within areas where the Lday (day time equivalent continuous noise level) exceeds 60 dBA is presented in Figure 8. In order to identify the schools in the defined impact area, school data was obtained by scanning the list of schools on the website of the Ministry of National tEducation (https://mebbisyd.meb.gov.tr/kurumlistesi.aspx).

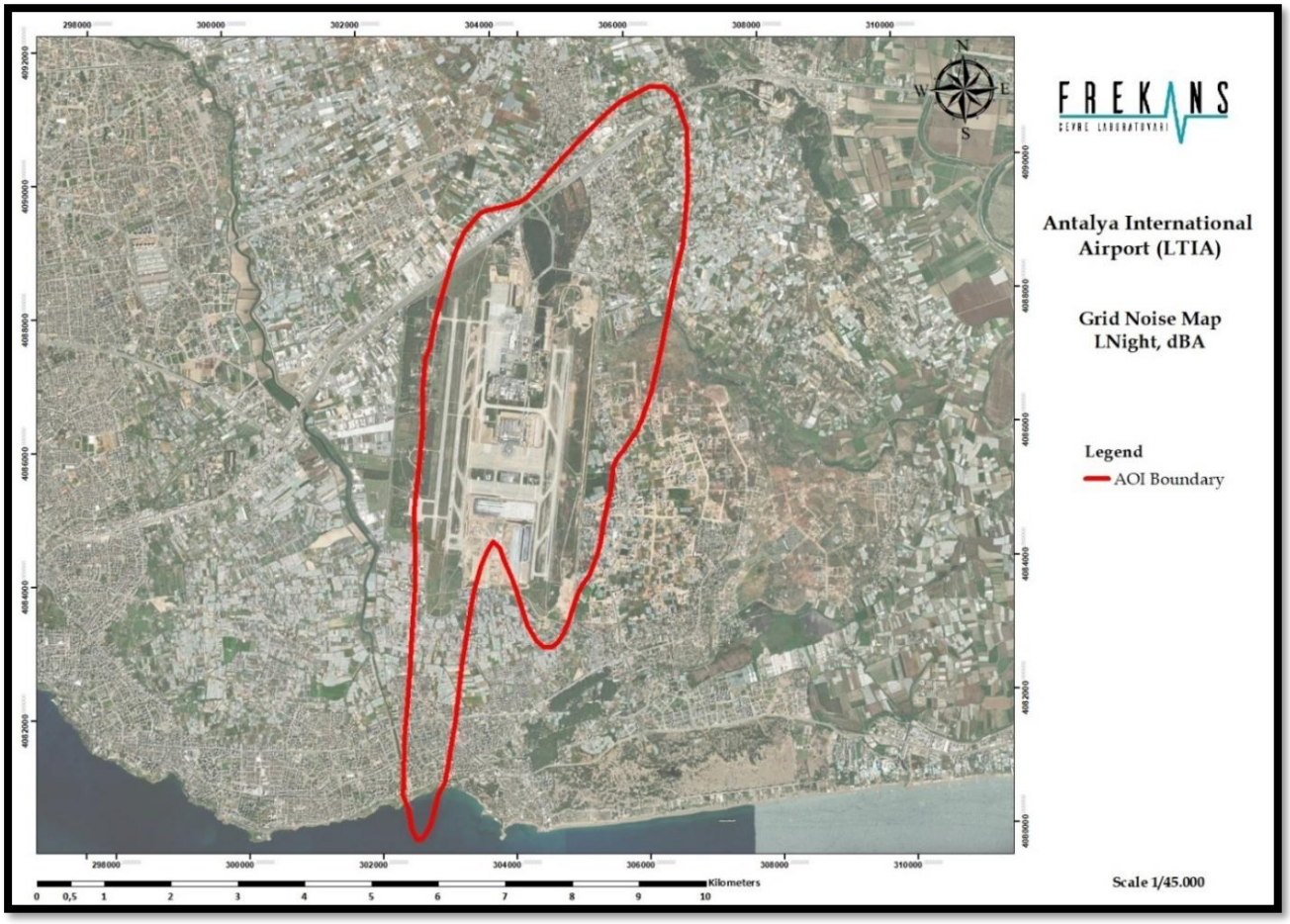

Figure 7: Area of Influence Map, Lnight > 60 dBA

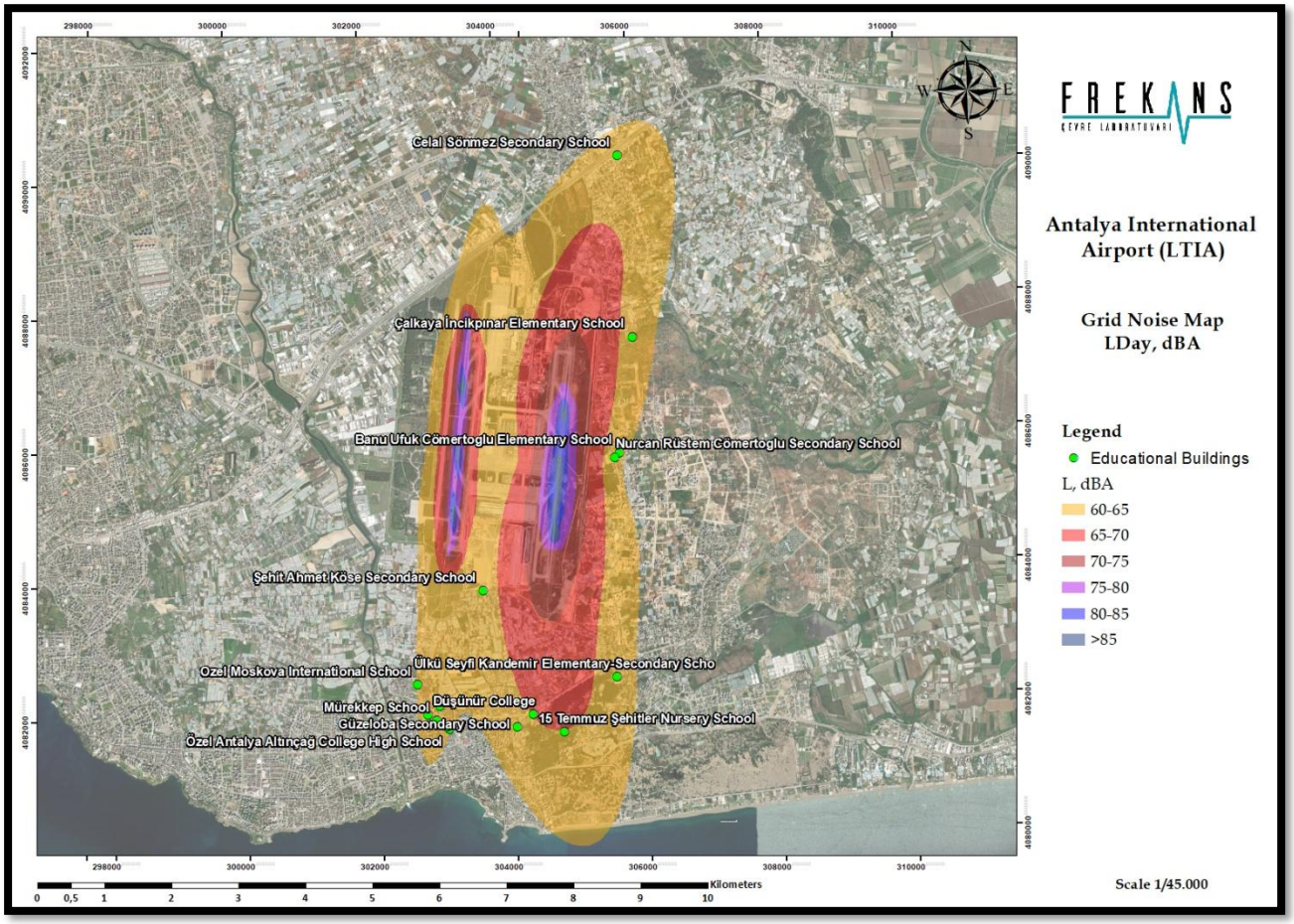

Figure 8: Educational Buildings Lday > 60 dBA

5.3 Noise Projections

Current noise modeling studies conducted with realized ATM's at AYT. All future scenario studies are modelled based on the assumption that the flight distribution, runway usage and aircraft types will remain consistent and similar.

The Noise Management Plan report covers the years 2025-2030 and detailed analysis has been conducted for this period. Additionally, to provide insights into the long-term predictions, noise maps for the years 2035 and 2041 have been prepared, and educational and healthcare facilities within the noise contours have been considered.

All future scenarios have been conducted based on the flight estimations from FTA's scenarios and the ATM forecast study. Grid noise maps and noise contours for the years 2030, 2035 and 2041 have been prepared for the day, evening, and night-time periods. High-resolution versions of all maps are provided in the appendix.

A summary of future projections is given in the Table 13 below. These definitions are detailed in the subsections.

Table 13:Noise Projection Summary Table

Definitions	Current		2030		2035		2041	
	60 dB	65 dB	60 dB	65 dB	60 dB	65 dB	60 dB	65 dB
Night Time (Lnight) Exposure Area (km2)	23,8	9,4	32,1	13,1	35,4	14,7	39,2	16,4
# of Buildings Exposure Lnight	3.660	627	5.432	1.623	6.042	2.034	6.430	2.372
# of Residential Buildings Exposure Lnight	3.441	600	4.827	1.288	5.387	1.664	5.732	1.966

5.3.1 Year 2030

Based on the results of FTA's scenarios and the ATM forecast study, the projected number of flights for 2030 has been determined to be 241,000. The updated noise map based on projected flight data is presented in the following figure.

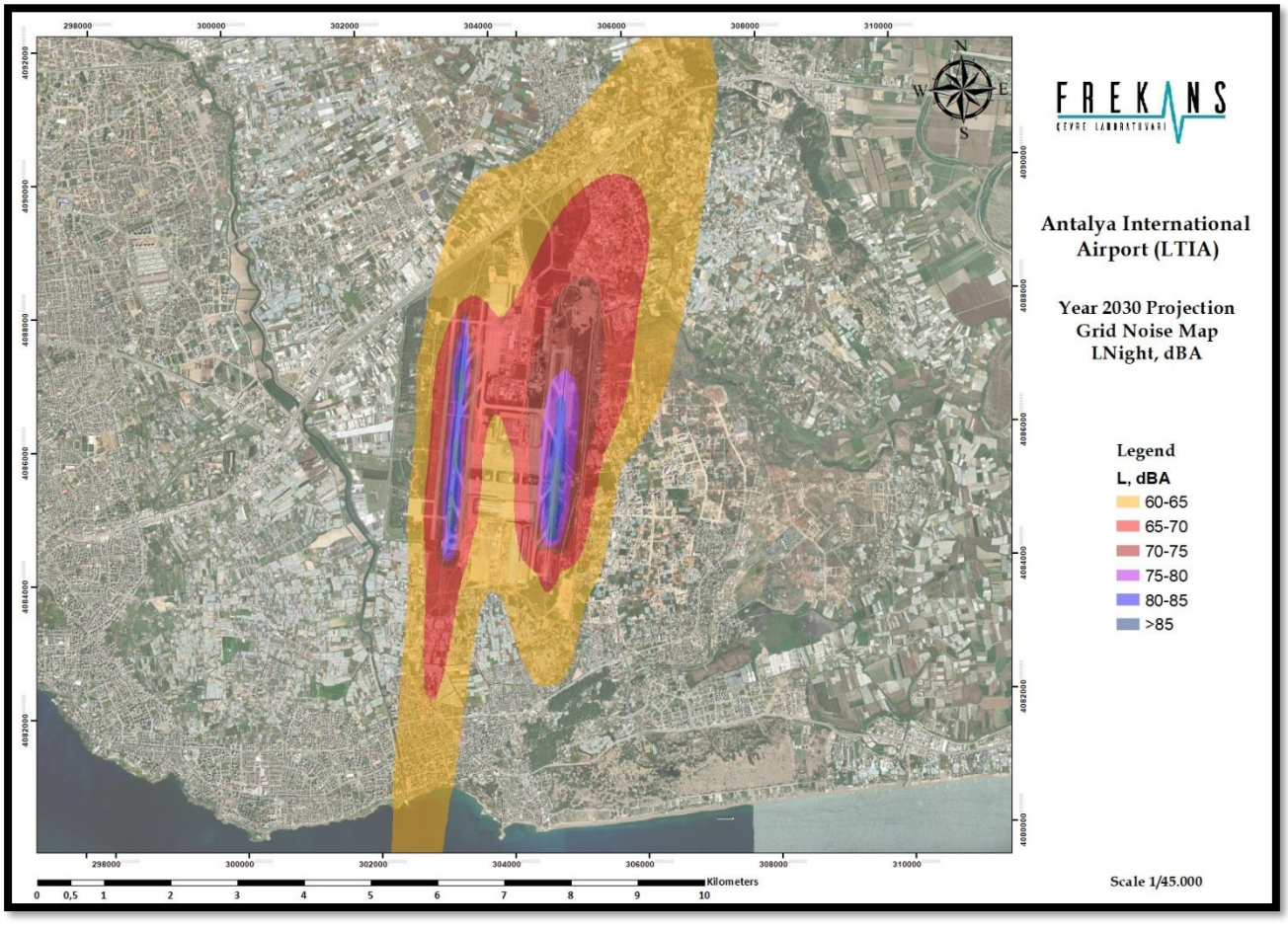

Figure 9: Lnight Grid Noise Map, Year 2030

After the noise contours were determined, the areas and number of buildings within the contours were analyzed. The areas and number of buildings within the 60 dBA and 65 dBA contours are presented in the tables below.

Table 14:Lnight > 60 dBA / 65 dBA Exposure Area Comparison, Current Case and Year 2030 Projection

	Night Exposure Areas
Current Case L>60 dBA Exposure Area (km^2)	23,8
2030 Case L>60 dBA Exposure Area (km2)	32,1
Current Case L>65 dBA Exposure Area (km2)	9,4
2030 Case L>65 dBA Exposure Area (km2)	13,1

Table 15:Building Census Results for Lnight > 60 dBA, Current Case vs Year 2030 Projection Comparison

Timeline	# of Buildings Exposure Lnight > 60 dBA	# of Residential Buildings Exposure Lnight > 60 dBA
Current Case	3660	3441
Year 2030 Projection	5432	4827

Table 16: Building Census Results for Lnight > 65 dBA, Current Case vs Year 2030 Projection Comparison

Timeline	# of Buildings Exposure Lnight > 65 dBA	# of Residential Buildings Exposure Lnight > 65 dBA
Current Case	627	600
Year 2030 Projection	1623	1288

All type of educational buildings within the 60 dBA noise exposure contour for the day time period in 2030 are presented in Figure 10.

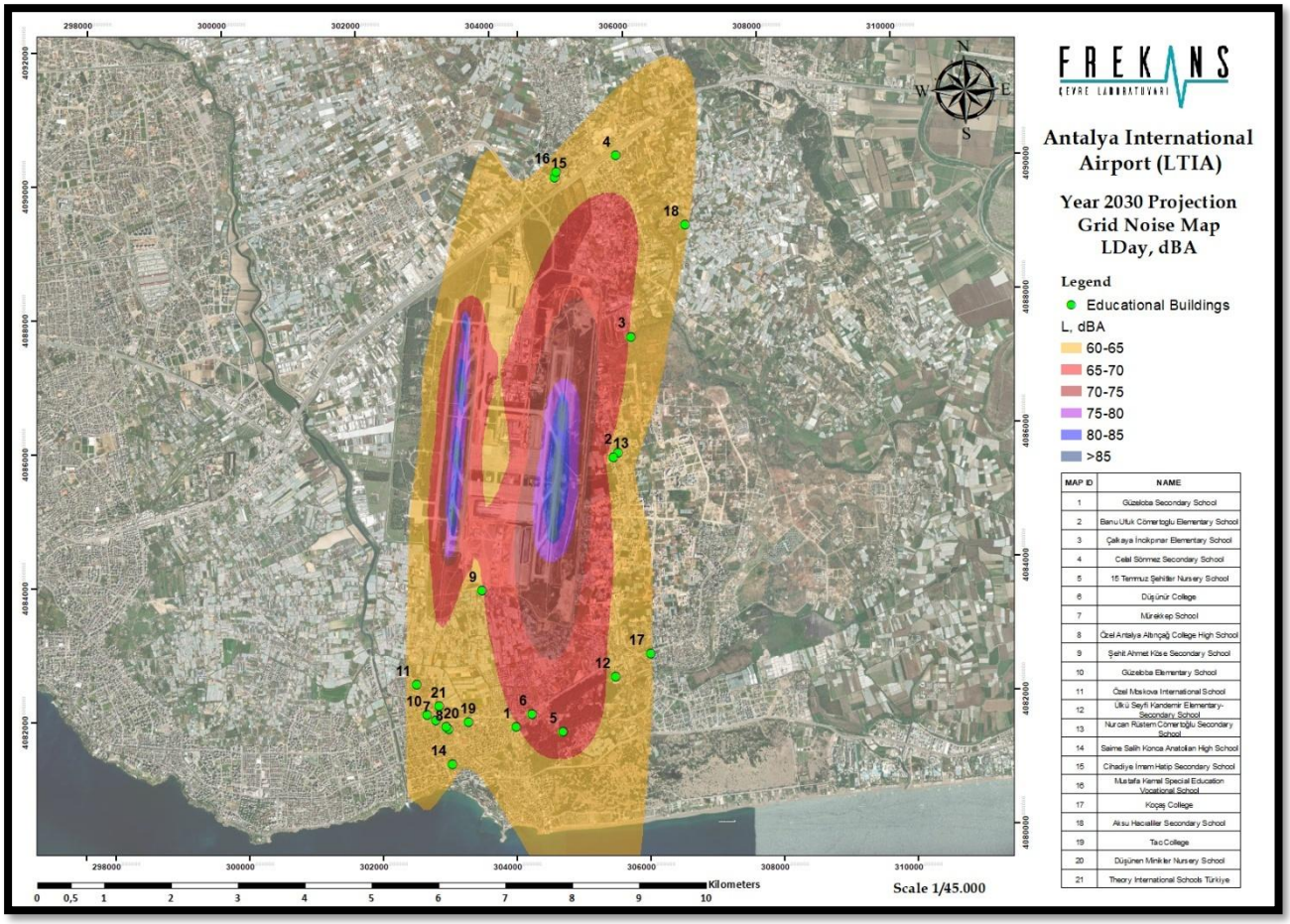

Figure 10: Educational Facilities Lday > 60 dBA, Year 2030

What is more there are 4 additional public educational facilities expected to be located within the identified noise impact zones that exceed 60 dBA during day time hours till Year 2030. It is aimed to update noise maps and eligibility zones annually and to consider educational buildings exposed to noise above 60 dBA for the daytime time period.

Following table shows the additional updated impacted public educational buildings by 2030.

Table 17:Additional Public Educational Buildings Exposure Analysis, Year 2030 Projection

Additional Public Educational Building List with Lday >60 dBA , by Year 2030			
1	Saime Salih Konca Anatolian High School	**3**	Mustafa Kemal Special Education Vocational School
2	Cihadiye İmam Hatip Secondary School	**4**	Aksu Hacıaliler Secondary School

There are 5 additional healthcare facilities expected to be located within the identified noise impact zones as additional that exceed 60 dBA during day time hours till Year 2030.

Table 18:Additional Healthcare Facilities Exposure Analysis, Year 2030 Projection

Additional Health Facilities List with Lday >60 dBA , by Year 2030			
1	Muratpaşa 19 Nolu Güzeloba Family Health Center	**4**	Anatolia Hospital Lara (Private)
2	Antalya Elderly Care and Rehabilitation Centre	**5**	Huzurlu Yaşam Disabled Care Centre (Private)
3	Karpuz Kaldıran Family Health Center		

5.3.2 Year 2035

The projected number of flights for 2035, according to FTA's scenarios and the ATM forecast study, is 283,000. The revised noise maps, based on the forecasted flight data, are shown in the following figures.

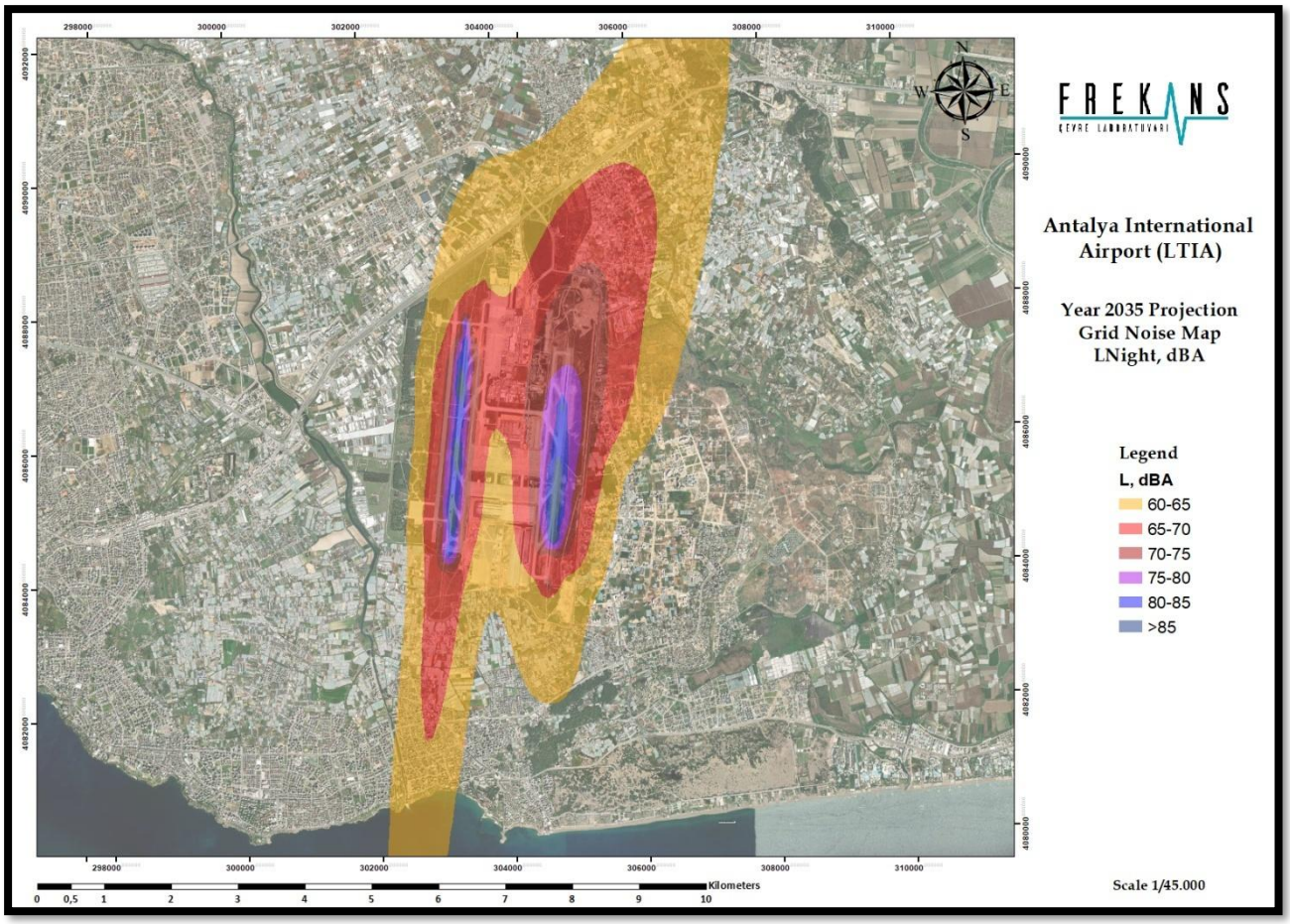

Figure 11: Lnight Grid Noise Map, Year 2035

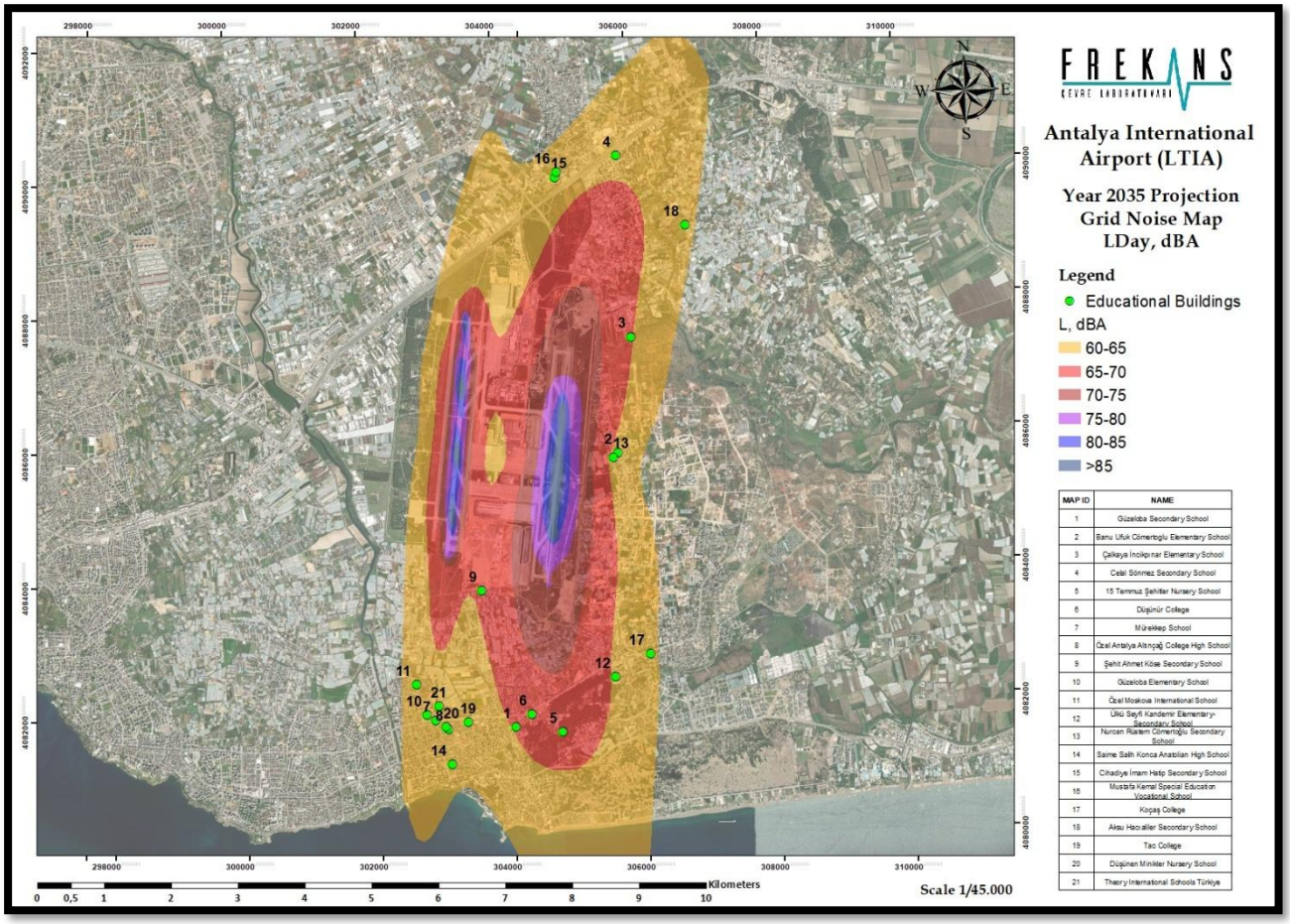

Figure 12: Educational Buildings Lday > 60 dBA, Year 2035

The areas and number of buildings within the 60 dBA and 65 dBA contours are presented in the tables below.

Table 19:Lnight > 60 dBA / 65 dBA Exposure Area, Year 2035 Projection

	Night Exposure Areas
Year 2035 L>60 dBA Exposure Area (km²)	35,4
Year 2035 L>65 dBA Exposure Area (km²)	14,7

Table 20:Building Census Results for Lnight > 60 dBA, Year 2035 Projection

Timeline	# of Buildings Exposure Lnight > 60 dBA	# of Residential Buildings Exposure Lnight > 60 dBA
Year 2035 Projection	6042	5387

Table 21: Number of Building Results for Lnight > 65 dBA, Year 2035 Projection

Projection	Total Buildings	Residential Buildings
2035	2034	1664

No additional educational and healthcare facilities are expected to be within the 60 dBA contours during the day time period till 2035.

5.3.3 Year 2041

The projected number of flights for 2041 is 324,000. The updated noise maps, derived from the forecasted flight data, are presented in the following figures.

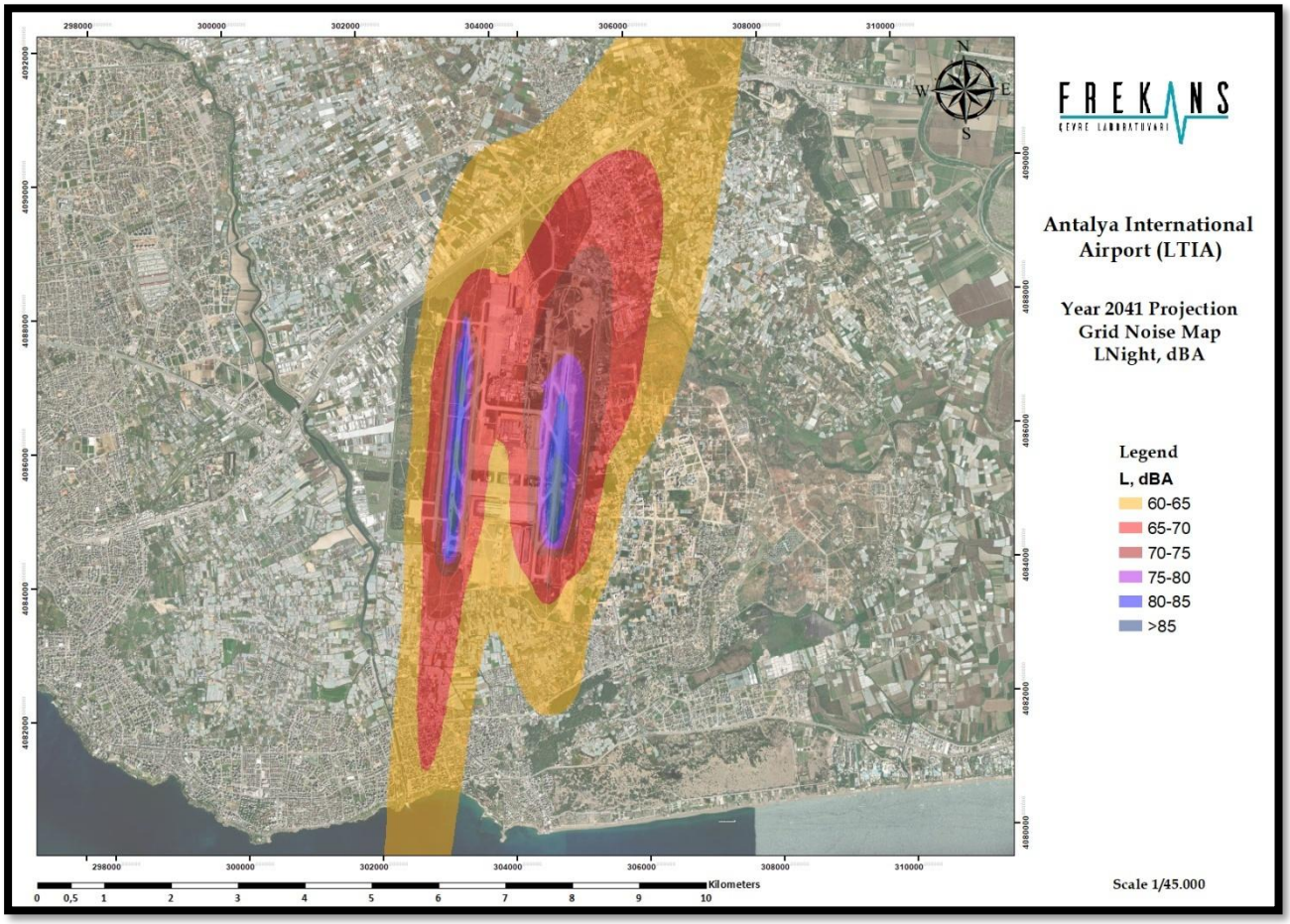

Figure 13: Lnight Grid Noise Map, Year 2041

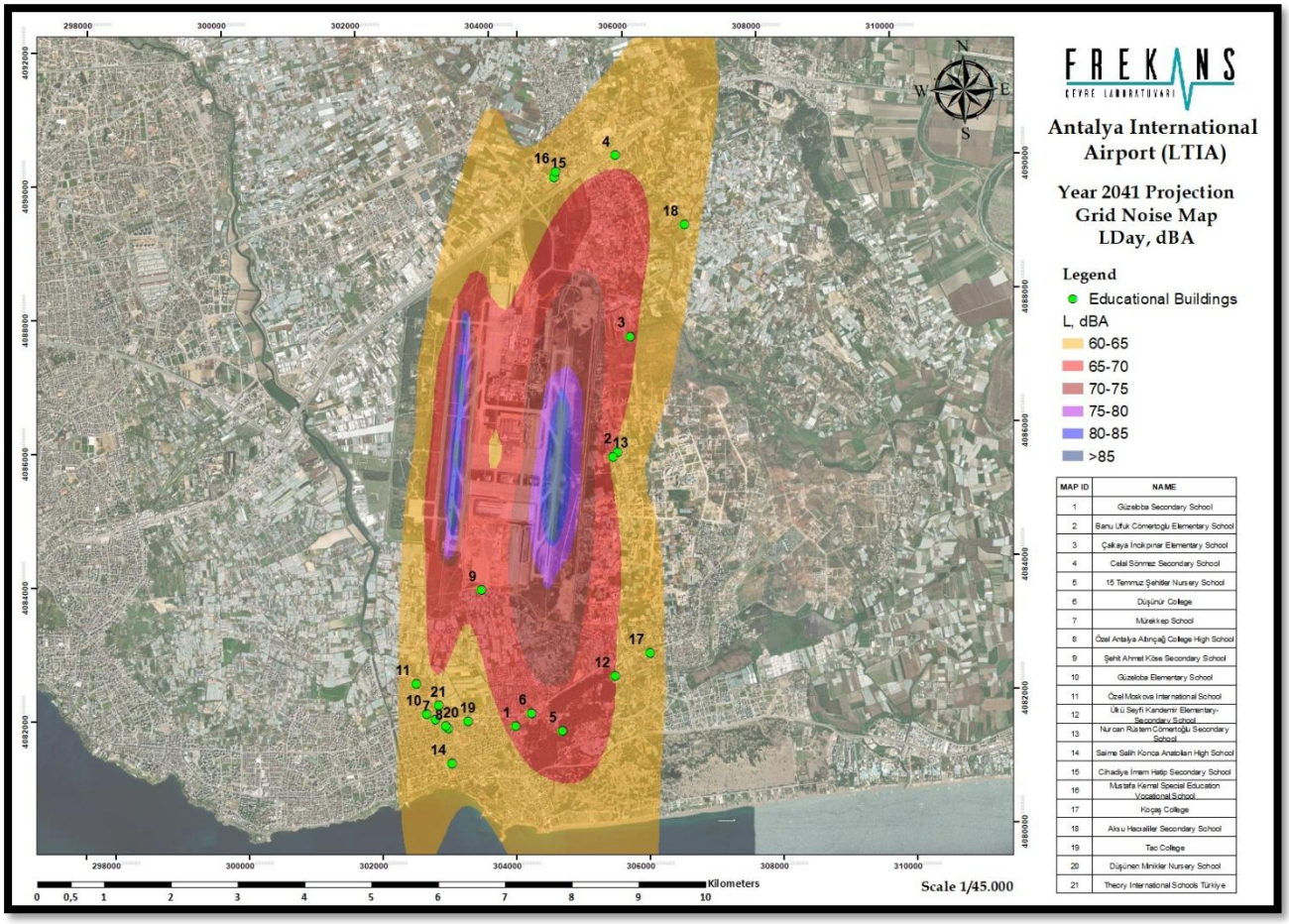

Figure 14: Educational Buildings Lday > 60 dBA, Year 2041

The areas and number of buildings within the 60 dBA and 65 dBA contours are presented in the tables below.

Table 22:Lnight > 60 dBA / 65 dBA Exposure Area, Year 2041 Projection

	Night Exposure Areas
Year 2041 L>60 dBA Exposure Area (km²)	39,2
Year 2041 L>65 dBA Exposure Area (km²)	16,4

Table 23:Number of Building Results for Lnight > 60 dBA, Year 2041 Projection

Timeline	Total Buildings	Residential Buildings
Year 2041 Projection	6430	5732

Table 24:Number of Building Results for Lnight > 65 dBA, Year 2041 Projection

Timeline	Total Buildings	Residential Buildings
Year 2041 Projection	2372	1966

There is 1 additional public school expected to be located within the identified noise impact zone that exceed 60 dBA during day time hours till Year 2041. Following table shows the additional impacted public school. There are no healthcare facilities additional.

Table 25:Additional Public Educational Buildings Exposure Analysis, Year 2041 Projection

Additional Public Educational Building List with Lday >60 dBA , by Year 2041	
1	Tez-Tur Turizm Mesleki ve Teknik Anatolian Highschool

5.4 Noise Management Strategies

The ICAO Balanced Approach is a framework aimed at managing and mitigating the environmental impact of aviation activities, particularly noise. It is built around four key measures: reduction at source, land-use planning and management, noise abatement operational procedures, and operating restrictions.

Noise management strategies are defined in the scope of the ICAO balanced approach and related solid objectives are created in this part of the report.

The measures (if any) are being taken by DHMI under each pillar for airside noise management should be described in below sub-topics.

The objectives for this section are defined in Table 27 (please see objective #1).

5.4.1 Reduction of Noise at Source

Tracking aircrafts, runway usage, route followed, velocity, altitude and other relevant parameters is crucial in alignment with the ICAO Balanced Approach. Regular tracking of these factors not only enhances operational efficiency but also helps manage environmental impacts. Analysing flight paths and runway usage allows for the development of strategies to minimize noise pollution and emissions. Additionally, monitoring parameters like speed and altitude enables the creation of operational procedures that allow aircraft to operate more efficiently, reducing environmental effects. These parameters are also basis of the noise maps. Collecting and analysing this data provides essential statistics that help airport management optimize flight safety, scheduling, and environmental impact.

As in all fields of technology, aircraft are constantly advancing. As a result of this, technologically less noise generating aircraft are most probable to be produced.

The objectives for this section are defined in Table 27 (please see objective #2 ~~and #3~~).

Improvements in Aircraft Technology

ICAO has continuously updated its noise standards to reduce aviation noise pollution, emphasizing environmental sustainability. Each new chapter enforces stricter noise limits, ensuring that newer aircraft are quieter and more eco-friendly.

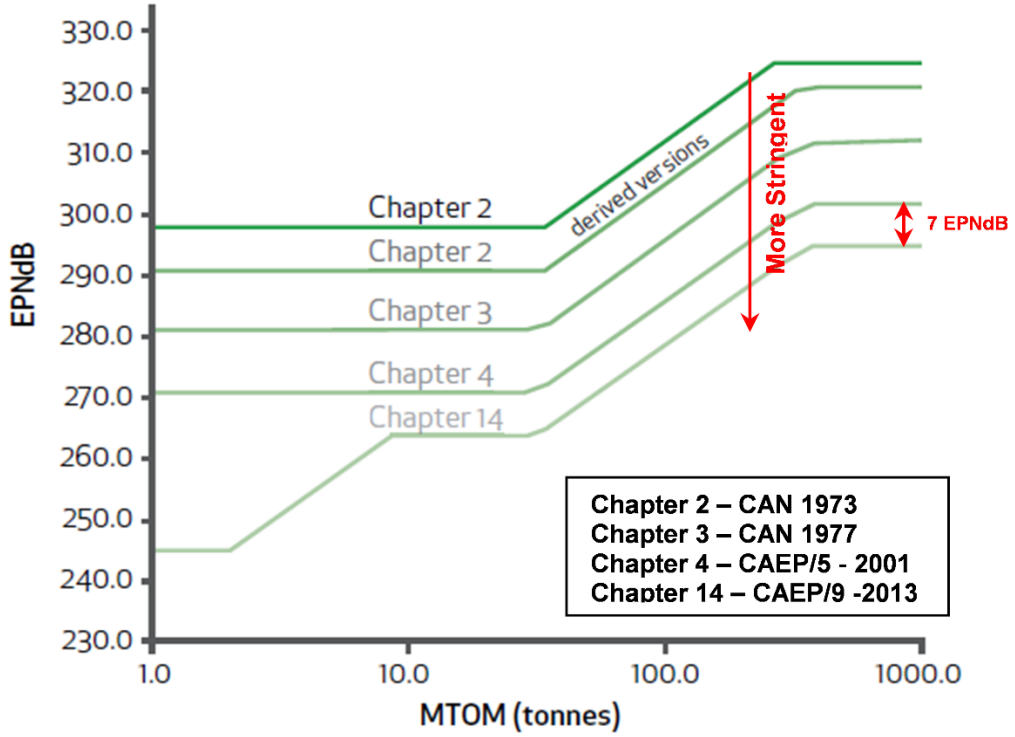

Figure 15: The progression of the ICAO Noise Standards for aeroplanes

ICAO's noise standards have evolved to ensure quieter aircraft. Chapter 2 includes subsonic jets certified before 1977. Chapter 3 introduced better noise reduction (1977-2006) but remained below modern standards. Chapter 4 represents the latest generation, 7 EPNdB quieter than Chapter 3, with advanced engine technology.

Each chapter's stricter limits drive manufacturers to develop quieter aircraft, supporting sustainability. Airports may impose financial fees to reduce aircraft noise, with charges varying by time of day. Exceeding APU operation limits or using noisy aircraft at night may result in higher taxes as a deterrent.

Measures established at Antalya Airport AIP AD 2 LTAI - 1 A document issued on 23 May 2019 by DHMI within the framework of operational procedures for noise abatement are as follows [1]:

1- For departures any aircraft having compliance with the Noise Category ICAO ANNEX 16 Chapter 3 and 4 shall apply NADP-2 whereas all other aircraft whose Noise Category are in compliance with ICAO ANNEX 16 Chapter 2 shall only apply NADP-1
2- Pilots shall apply “Noise Abatement Departure Procedures 1 or 2” (NADP1 or NADP-2) which has been explained in ICAO Doc 8168 Vol-1 until passing 3000 FT.

FTA will cooperate with DHMI to monitor and report aircraft compliance with ICAO noise classifications, tracking manufacturing dates to ensure adherence to standards.

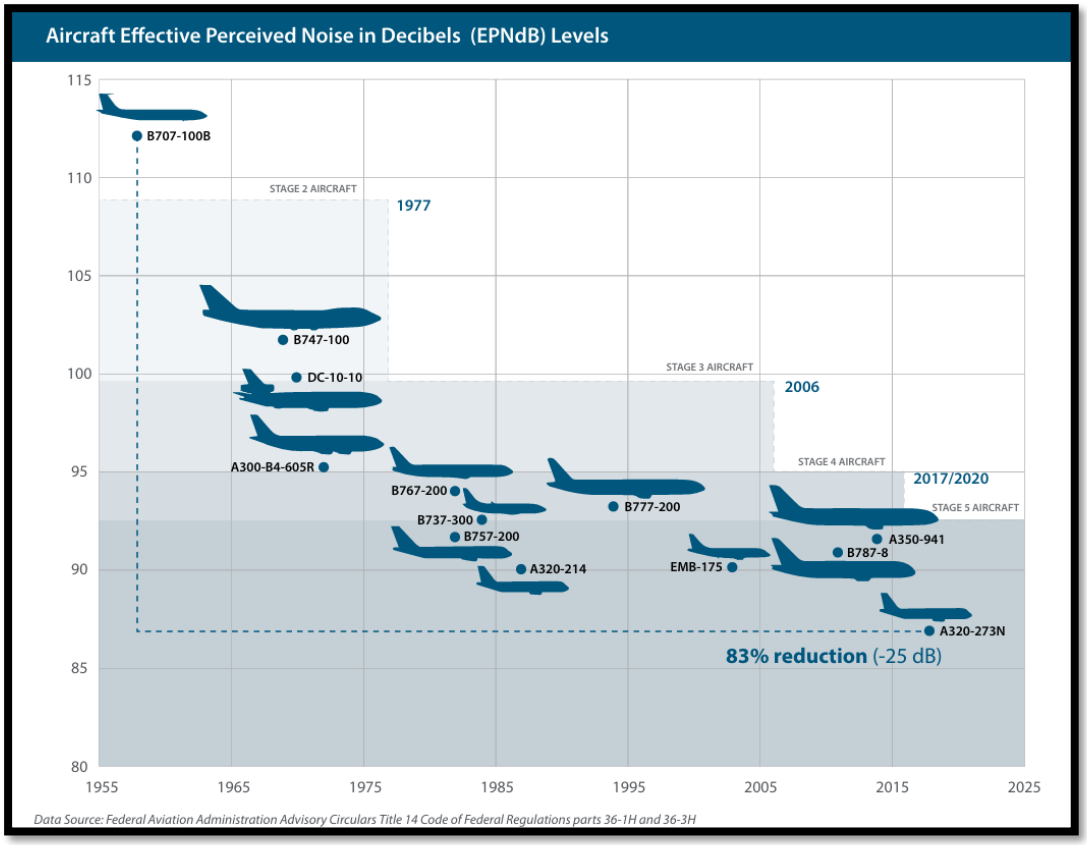

Figure 16: Aircraft Classification

5.4.2 Land Use Planning and Management

According to the ICAO Balanced Approach, land use planning and management measures focus on strategies aimed at reducing the impact of aircraft noise on surrounding areas. Municipalities and provincial private administrations are responsible for taking into account the issues related to noise management in the land use planning and licensing phase within the scope of the Regulation on the Control of Environmental Noise.

These measures include:

Land-use planning and noise zoning: This involves designating specific zones around airports where noise levels are managed and controlled to minimize exposure to the surrounding communities. By preparing noise maps, sharing them with local authorities and establishing noise zones, authorities can guide the development of residential, commercial, and industrial areas to ensure that noise-sensitive areas are not located near the airport, thereby reducing the risk of noise pollution and its effects. Although land use planning and noise zoning are not the responsibility of FTA, it is ready and willing to cooperate with the authorities and share the studies it has carried out (e.g. noise measurements around the airport, identification of impact zones, provision of maps...). FTA will endeavour to participate in the Noise Strategic Action Plan Committee, in which Antalya Metropolitan Municipality, DHMI, Environment Urbanisation and Climate Change Provincial Directorate are also members.

Noise insulation programs and minimizing sensitive land use: Noise insulation programs are implemented to protect buildings and structures in noise-affected areas. These programs focus on enhancing the soundproofing dwellings located near airports. Additionally, sensitive land uses, such

as schools, hospitals, and residential areas, are avoided in high-noise zones to minimize the health and quality-of-life impacts on residents and workers.

The Regulation on the Protection of Buildings from Noise, issued by the Ministry of Environment, Urban Planning, and Climate Change [11], specifies the implementation details for constructing buildings in areas with high noise levels. Local authorities are responsible for ensuring that new buildings comply with required acoustic standards to minimize noise exposure for the residents. Noise control activities in sensitive areas are included in the Antalya Metropolitan Municipality strategic noise action plan.

Monitoring exposure and annoyance: Continuous monitoring of noise exposure and its effects on local communities is essential for effectively managing and mitigating the impact of aircraft noise. This ongoing process allows for the identification of areas where noise levels are problematic, enabling authorities to make informed decisions on how to address and reduce noise exposure. By gathering data on noise levels and understanding the extent of public annoyance, proactive measures can be taken to implement targeted noise reduction strategies. This approach not only supports better decision-making but also ensures that the most effective solutions are put in place to minimize noise pollution and improve the quality of life for residents near airports.

These land planning and management measures, when implemented together, aim to balance the needs of airport operations with the protection of the environment and local communities, ensuring that noise pollution is minimized, and its impacts are carefully managed.

Noise maps and impact zone maps were revised for the peak season of 2024, voluntarily by FTA . The annual verifiying of these maps will ensure that the impact zones are accurately reflected and adjusted in real-time. Regular updates will provide a solid foundation for ongoing land-use planning and management for authorities, allowing effective decision-making. FTA will ensure that up-to-date noise maps are shared with the relevant authorities (municipalities, etc.) to enable them to easily identify the areas most affected by noise and to provide a basis for the strategies to be determined by the authorities to minimize the noise impact.

Sharing updated noise maps and annual noise monitoring reports with municipalities can provide valuable technical information about environmental noise levels, which is essential for evaluating construction permits. According to noise protection regulations, new buildings must meet specific structural acoustic properties based on the existing environmental noise levels at the site. The noise-related information shared by FTA can enable legal authorities to make data-driven decisions during the construction permit process for various land uses and in the planning of noise mitigation measures. This dynamic collaboration approach may support the authorities to implement targeted noise reduction strategies, considering the impacts of new developments, and contribute to the overall improvement of noise exposure management in the future. As noise management is a long-term issue this study by FTA is supposed to be a building block that can be built upon in future iterations of the NMP.

Voluntary Noise Insulation Programme (VNIP)

A Voluntary Noise Insulation Program (VNIP) has been established by FTA to identify the impact of aircraft-related noise on surrounding residential areas and reduce its effects within its jurisdiction. The program aims to determine the most impacted sensitive receptors (residential, educational and healthcare facilities), including by vulnerability degree. In residential areas exposed to nighttime noise levels above 60 dBA due to airport activities, implementing insulation programs—such as replacing windows—will help reduce the noise levels inside homes and mitigate the impact. These measures will contribute to enhancing the comfort and quality of life for residents by reducing noise

pollution. While determining Lnight > 60 dBA zones, a predictive noise modeling approach used to cover future flight projections in terms of total number of flights to be occurred. The VNIP will cover buildings constructed before the start date of the AYT expansion project on 05.01.2022. The entitlement of households to benefit from the VNIP, which will be applied for 15 years, has been determined through the established Entitlement Matrix, with all details provided in the relevant document.

To ensure the program's effectiveness, it must be applied sustainably and regularly updated to adapt to any changes in noise levels or building regulations.

The objectives for this section are defined in Table 26 (please see objectives #3 and #7).

5.4.3 Noise Abatement Operational Procedures

Since FTA does not have enforcement authority over aircraft operations, FTA‘s goal is to collaborate closely with DHMI and relevant stakeholders to exchange information and raise awareness regarding operational procedures.

The noise reduction operational procedures implemented on international platforms include several strategies aimed at preventing or reducing noise within populated areas, specifically for aircraft operations. These strategies include:

- Noise preferred routes (NPR), preferential flight track or runway use
- Concentrating flights above unpopulated areas or areas less sensitive to noise
- Dispersion of flights over populated areas or noise sharing (flying over certain areas on some days and moving the flights to other areas on other days)
- Noise abatement take-off procedures such as the management of engine power during departure
- Approach procedures such as Continuous Descent Operations (CDO) and low power, low drag techniques
- Moving the nominal take-off or landing points on the runway

These procedures help to minimize noise at the airport during ground operations or during flight near the airport during arrival and departures. The ICAO document Review of Noise Abatement Procedure Research and Development and Implementation Results – Discussion of Survey Results provides more in-depth descriptions of many of the arrival/departure procedures mentioned.

Measures implemented or to be implemented by DHMI within the framework of the operational procedures for noise abatement, such as organisation of a technical forum with the participation of aircraft manufacturers, leading airlines, ATM, DHMI Antalya Operations and DHMI Headquarters, review and update of the codes of practice for arrivals and departures and ground operations, establishment of a work plan under this forum, development and testing of operational practices to increase the level of rest during the night and early morning hours, review of the use of landing gear in accordance with the guidelines, consideration of the airlines flying quieter and greener programme (including league table and quiet night charter), described in this section.

Measures established at Antalya Airport AIP AD 2 LTAI - 1 A document issued on 23 May 2019 by DHMI within the framework of operational procedures for noise abatement are as follows [1]:

1- Traffic cleared for visual approach shall perform “LONG APPROACH” in order to avoid noise pollution, environmental pollution; and to permit an appropriate planning of the departure by tower control.
2- In selecting the RWY-in-use, ATC shall also take into consideration other relevant factors such as the aerodrome traffic circuits, the length of the RWY, the approach and landing aids available, meteorological conditions, aircraft performance, the existence of a preferential RWY system and noise abatement.
3- During the PRS operations, ATC unit takes into account the ground wind, traffic situation, local meteorological conditions, environmental restrictions, infrastructure, noise abatement, etc.
   Except in situations where flight safety is concerned, landing traffic shall not use reverse thrust (except on idle) between 00:00 and 07:00 local times.
4- VFR training flights which will be done during night time, a maximum of 2 aircraft will be allowed in the CTR and planned to end at 22:00 local time due to noise problems related to the proximity of aerodrome to the residential areas.

5.4.4 Auxiliary Power Unit Usage

Monitoring and reporting night-time APU (Auxiliary Power Unit) usage of aircraft is an important step in managing noise levels, particularly in airport environments where noise sensitivity is heightened during the night. The APU is typically used to provide electrical power and air conditioning to the aircraft while it is on the ground, especially during times when the main engines are not running, such as between flights or during overnight stays at the airport. However, the use of APUs, especially at night, can contribute significantly to the overall noise pollution at airports, affecting surrounding communities. Although the ground noise of the airport is not found to be significant in AYT for 2024, it is recommended to monitor the night time APU usage and tracking noise related problems and disturbance.

APU utilisation on passenger bridges is systematically recorded and reported. The APU utilisation data will allow us to monitor trends over time, identify patterns of over-utilisation and make data-driven decisions to address noise-related issues in the future.

Measures established at Antalya Airport AIP AD 2 LTAI - 1 A document issued on 23 May 2019 by DHMI related with APU usage for noise abatement are as follows [1]:

1- At docking stands, APU must be switched off within 5 min. after parking, APU is allowed to be switched on 15 min. before the estimated start up. In case of the necessary situations, GPU might be served at the gate parking positions.

The FTA has set a KPI of at least 87% of aircraft using FEGP to reduce noise at source and has taken measures to control noise generated during ground operations by monitoring and increasing the use of FEGP on bridges. All inbound aircraft must be connected to a 400 hz FEGP power supply within 5 (five) minutes of entry into the parking position during docking on bridge. All outbound aircraft from the bridge are allowed to start auxiliary power units (APU) earliest 15 (fifteen) minutes before engine start.

The objectives for this section are defined in Table 26 (please see objective #2).

5.4.5 Operating Restrictions

An operating restriction refers to any noise-related measure that limits or reduces an aircraft's access to an airport and should only be implemented as a last resort. These restrictions can include limits on the total number of movements, noise quotas, and nighttime operating restrictions. They may apply to specific runways or flight paths, particular types of aircraft, certain operations (such as departures or arrivals), or specific time periods. In addition to these measures, it is important to track and monitor the percentage of old technology aircrafts using the AYT, which are known for their high noise levels.

Since FTA does not have enforcement authority over operational restrictions, its goal is to collaborate closely with DHMI and relevant stakeholders to exchange information (such as aircraft operation monitoring data) and raise awareness.

Technical findings for FTA suggest that noise emitted from ground operations are negligible in comparison to the LTO movements. Based on this fact no specific objective to mitigate the ground noise is developed.

Monitoring the aircraft types by developing an airline noise performance table is essential for tracking the aircraft types andnight time flight schedules. This table would include detailed information on each aircraft type's noise classification and the airlines' operational schedules, particularly focusing on flights during night time hours. By compiling and analysing this data, it would be possible to assess the noise impact of different airlines, identify patterns in night time operations. This initiative would help in optimizing noise reduction strategies and ensuring that appropriate measures are taken to minimize disturbance to surrounding communities.

Therefore, FTA willmake best efforts to cooperate with DHMI for access to reports and statistics prepared by DHMI as a result of monitoring and tracking of aircraft movements.

This NMP does not include any new operating restrictions; if such measures are to be introduced in the future, they would be decided by DHMI.

5.5 Stakeholder Engagement and Working with Communities

The NMP and VNIP will be officially announced through various channels, such as publication on FTA's website, transmission to the Mukhtars, and transmission to the Provincial Directorate of Family and Social Policies.

Noise monitoring station measurements and noise maps are accessible through FTA's official website. This application provides the public, authorities, and relevant stakeholders with real-time data on noise levels around the airport, helping to keep track of environmental noise dynamics. The monitoring system will continue to operate, ensuring that noise measurements are consistently updated and available for review. In addition to this, complaints from residents and individuals regarding noise disturbances will be matched and cross-referenced with noise events recorded by the monitoring stations. This process allows for accurate identification of the sources of complaints, ensuring that noise issues are properly addressed. This ongoing effort will contribute to maintaining a transparent communication channel with the public, while also enabling the relevant authorities to take timely action when necessary.

Meetings will be conducted with the Mukhtars of the noise-affected settlements before any public announcements regarding NMP. These meetings will provide information about the purpose, scope and target groups ofthe NMP and VNIP, and will serve as a direct communication channel, and

Mukhtars will continue to act as intermediaries between FTA and the public, helping to address the needs and concerns of the local community.

A multi-channel communication mechanism will be established for individuals who wish to report disturbances related to environmental noise, which will include the following aspects:

- Communication mechanism is designed to be accessible by everybody (considering; i.e. disabled, elderly etc.)
- Ways for announcing complaints is designed to be easy to use
- Mechanism contains different communication ways such as; web-based, written or verbal

Phone hotlines have been established and will continue to be maintained. The number and availability of the hotline are being well advertised, especially in regions expected to be most vulnerable to environmental noise from the airport.

Moreover; any kind of possible grievances can be conveyed through Community Liaison Officer (CLO). All complaints from noise-affected communities, are collected in the Community Grievance Database.

Since the source of annoyance may vary among individuals, a simple and informative questionnaire will be applied to understand the critical aspects of the complainant‘s disturbance. In order to make decisions, the source of the grievance must be related to airport activities. The following questions included in the questionnaire are flexible and open to development, and will be used to collect simple yet critical data from the complainant:

- Annoyance hours
- Type of annoyance (brief explanation)
- Whether annoyance occurs on a specified day/hour/period
- Correlation between annoyance and weather conditions

The objectives for this section are defined in Table 26(please see objective #4, #5 and #6).

6. OBJECTIVES

The summary of objectives for FTA and DHMI are presented in Table 26.

Table 26:The summary of objectives

No	Subject / Related Balanced Approach Strategies	Management Measures / Enhancement	Monitoring Action	Frequency	KPI	Annual Target	Internal Process and Document	Owner/ Responsible
1	Noise Management	Development of a Noise Management Plan with mitigation measures, noise targets, and monitoring systems for noise levels and complaints.	Noise monitoring measurement reports at sensitive receptors for environmental noise at 7 locations shown in Figure 5	Monthly	Compliance with EU regulations related to environmental noise	Annual review of NMP regarding the compliance with IFC/EBRD & EU Regulations	Recording noise measurement results and non compiances in the environmental inspection checklist, and monthly noise measurement report; and reviewing actions to close gaps to target	Environmental Chief
2	Reduction of Noise at Source	Controlling ground operation noise levels	Monitoring FEGP usage on bridges	Annual	Percentage of aircraft using FEGP	87%	Annual Tracking reports	FTA
3	Land Use Planning and Management	Callaborating with municipalities	Updated noise maps Monitor meeting minutes	Yearly	- Meetings with related municipalities to inform on impacts of AYT's air traffic noise to surrounding communities - To give an update on NMP and VNIP prepared by FTA and provide technical information	- Yearly meetings are conducted and updated data is shared - Working with current data and results at any stage of the project	Meeting minute records NMP	CLO Corporate Communication Ass. Mng.

					- To share updated noise maps and impact zones with up-To-date routes and fight trends - To gather information on whether new strategic plans against noise will be conducted	- The noise map created by FTA, may serve as a basis for use in urban planning by the relevant authories. - Municipalities will support informed decision-making for land-use planning and advice noise mitigation strategies defined in regulations for construction of new buildings	VNIP	
4	Stakeholder Engagement	Collaborating with Provincial Directorate of Family and Social Policies	Monitor meeting minutes	Annual	Meeting with Provincial Directorate of Family and Social Policies	Collaboration to anoounce the NMP and VNIP and reach wulnerables with disabilities residenting within the noise impact area	Meeting minute records Brochures, fyers	CLO Corporate Communication Ass. Mng.
5	Stakeholder Engagement	Collaborating with Mukhtars	Monitor meeting minutes	Twice a year	Meeting with Mukhtars	- Collaboration to announce the NMP and VNIP and reach comprehensive feedback insights, and complaints - Official announcement of the VNIP - Adequately inform the public about insulation program	Meeting minute records Brochures, fyers	CLO Corporate Communication Ass. Mng.
6	Stakeholder Engagement (Grievance Mechanism and	As an overaching monitoring tool, develop and establish Grievance Mechanism within the scope of the Project and collate internal and external	Accessible noise maps Questionnaire for possible complaints	Monthly	% grievances received from surrounding community	Well understand public reactions and impacted zones	Recording internal and external grievances in the grievance log and stakeholder meetings register and reviewing/following actions in	CLO and with support from specialists (e.g. Environment Chief) when deemed necessary.

	Grievance Register)	grievance mechanism in all monitoring plan items listed below.	Monitor community grievance records via Grievance Log			Create an alternative for voicing complaints All grievances are reviewedi and grievance owners are responded within time frame set in Grievance Mechanism.	the monthly grievance report to close gaps to target	
7	VNIP	Window replacement of the airport noise affected buildings in the exposure area	Buildings reached, applying, entering the program, completing the insulation work	Quarterly	Number of buildings reached, applying, entering the program, completing the insulation work	To finish window replacements of the applicants / eligible buildings in the exposure area in line with determined timeline	VNIP	FTA

7. AUDIT AND REVIEW

The correct implementation of this plan shall be verified by internal audits and monitoring in accordance with the requirements of the "Internal audit" section of the "ESMS manual and 8.46KY.1.05-Audit Procedure.

The programme, frequency, scope and objectives of the audit and the responsible internal auditors shall be specified in the Audit Programme to be developed and updated by the Quality Department.

Internal audit will address the following:

- Correct implementation of this Plan;
- Correct and timely implementation of the audit and review system;
- The main areas that auditors will specifically address during the audit;
- Records of noise complaints from local communities, as recorded in the complaints management system
- Noise monitoring reports

The evidence and results of the site visit and audit activities are included in the "Site Observation Reports" and "Corrective Actions" records.

Fraport TAV Management reviews the site visit, audit results and the progress of Corrective actions and takes additional appropriate measures if necessary.

NMP will reviewed by annualy and revised every five years.

8. REPORTING

Evidence of the implementation of Actions/Measures and related results are collected through site visit and audit activities as detailed in section 8 "audit and review" of this plan; this evidence is described in audit and site observation reports.

The results of the supervision activities, objectives under the responsibility of FTA will be summarised in an annual Report that will be made available to the stakeholders, including community, for whom FTA is responsible. This report forms the basis for the submission of the Monitoring report to the Lenders.

The findings and monitoring activities observed during the audit and site visits will be reported to the Lenders in an annual monitoring report.

FTA’s website will include, on a dedicated Noise & Community page, the annual L_day and L_night noise contours with a description of the methodology used, a live dashboard from the seven calibrated noise monitoring stations, information on the Voluntary Noise Insulation Programme (VNIP) including eligibility and prioritisation criteria, and details of the available feedback mechanism.