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An evaluation of the sound pollution of aircraft using the Northern Cyprus Ercan Airport in the settlements in the descent and climbing routes

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***Abstract*---**Although the effects of noise and noise pollution on the people living in the settlements located in these areas on the people living in these areas are of great importance, it affects their mental and psychological conditions negatively, and this situation creates a domino effect and causes greater health problems. As a result of the technological developments that took place in the second half of this century, although the sound and noise levels caused by the aircraft decreased, the measurements made show that this is not at a sufficient level. In this context, the aim of the study is to determine the effects of the noise and noise pollution caused by the existing settlements in the Ercan Airport region during the descent, take-off, or landing and take-off of the aircraft and the measures to be taken. In the study, due to the lack of publications on the subject and the coronavirus pandemic all over the world, it was tried to come to a conclusion by using ready data and combining these data with Google earth and flyradar24 programs. In the study, the disturbances caused by noise pollution on people in terms of decibels were taken as a basis, and then it was determined how many decibels of noise pollution were caused by aircraft types using Ercan Airport intensively at certain altitudes. Then, using Google earth and flyradar24 programs, the approximate altitudes and over which settlements these aircraft types passed during the descent and climb stages of Ercan Airport were determined, and by determining the severity of noise pollution these settlements were exposed to, suggestions were made on how to eliminate these negative effects.

***Keywords*---**environmental pollution, noise, noise pollution, decibel.

Introduction

The promising economic developments in North Cyprus in the sectors of education and tourism impacted positively the most prominent leg of transportation, air travel, and increased the number of flights. Although these improvements enhanced economic gains in the course of 15 years, they have equally made the way for environmental problems to emerge. Between the years 2018-2019, Ercan Airport hosted a total of 26000 landings and departures and, 213000 transit flights utilized the airspace of the island. Human as the main actor of the environment has lived over millennia in conformity with the nature, however, in the course of time, sacrificed this balance to the zeal of "dominating the nature" and ignited the accelerated process of detorriating the nature. Environmental pollution is a change in the environment that negatively affects all activities of people, or the wrong use of resources in the wrong place, in other words, it is the modern people that force the ecosystem in an ecologically unacceptable way (Fırat, 2013). The way people experience and perceive noise from all types of sources can vary significantly. But noise is not always just decibels; pitch, vibration, variation in intensity, and length of exposure time can also have effects. While the level of discomfort will vary depending on factors such as the length of time a person has lived in an area affected by aircraft noise, personal sensitivity, the influence of external impacts, and the activity the individual is involved in at the time, the noise level of an aircraft can vary greatly depending on a number of factors. Whether the airplane's height above ground level is directly in the air, or how far laterally away from the receiver it is (in any direction), whether the airplane is coming in such a way that it can affect the amount of engine thrust it uses (and therefore its noise level), the amount of air resistance around the fuselage, wings, and undercarriage. Weather conditions, which can increase or decrease the noise experience depending on the conditions, take off and land with the effect of wind, which runways are used, and in what position the aircraft is in the sky also have important effects. Noise is not just a factor that has the potential to cause a nuisance to workers. In areas with very high noise exposure, there is evidence that aircraft noise has been linked to health problems such as sleep disturbance, cardiovascular effects, and potential adverse effects on memory and learning in children.

Within the scope of the main objectives of the Northern Cyprus Civil Aviation Authority, There are tenets such as to ensure the safe and efficient operation of the Northern Cyprus airspace system and to accept this as a duty, guarantee that the system can effectively fight and cope with the increasing air traffic, and to reorganize the airspace in line with the increasing need. In this regard, It is very important to design the studies for the design. In this case, the main goal is to balance the effects of factors such as efficiency and safety, and noise so that the positive factors outweigh the negative factors. The noise of the planes in air transportation, which is the fastest and most comfortable transportation method of today, is increasing day by day and it has become an important environmental problem for airport employees and those living in the residences and workplaces around the airport. If necessary measures to reduce noise are omitted to take in the region, it will prevail to be an environmental problem. Sound is a form of energy that spreads in waves. Its propagation occurs through the vibrations of molecules in the air. Sound waves make themselves felt by the pressure they

exert on the ear. A normal person can easily hear a sound of 0-50 dB and is not disturbed by them. However, sounds above 75 dB are noise, and being exposed to this noise for more than 8 hours a day can cause hearing impairment (Kınacı et al., 2011). It also creates negative effects such as hypertension, disruption of sleep patterns, speech impediments, stress, and disturbance of peace (Kınacı et al, 2011; Auger et al, 2018; Zannin et al, 2002). The effect of sound pollution on human health may vary from person to person. Noise, which causes temporary and permanent hearing impairments over time, also directly affects the performance in the working environment. Sounds radiating to the environment and having an intensity of more than 60dB(A) disturb the people in the environment in different ways. There is a direct proportion between the intensity of the sound and the effect on human health. This statement shows that the increase in sound intensity increases the negative effect it creates in terms of health (Soylu and Gökkuş, 2016). Noise; It is an important type of environmental pollution that negatively affects hearing and perception in humans, causes physiological and psychological disorders, reduces work performance, disturbs the peace and taciturnity of the environment, and changes its quality. Stating that noise pollution can affect human health physiologically and psychologically, it can cause many results such as nervousness, aggression, hypertension, high stress, tinnitus or buzzing, hearing loss, sleep disorders, although it is impossible to completely limit noise, which is a part of urban lifestyle. It is possible to increase the quality of life of the people with the measures to be taken. In residential areas, the maximum noise required during the day is 65 decibels (db), and at night it is limited to 55 decibels (db). The fact that the planes take off slowly from the runway and cruise very close to the settlements causes the noise to be felt intensely. In accordance with the Environmental Noise Assessment and Management Regulation enacted under the Environment Law No. 18/2012 of the Republic of Turkey, the Environmental Protection Department is the leading authority in the design of strategies and measures for the determination and implementation of environmental noise policies. Data on a current or future noise situation, including the number of people affected and exposed dwellings in a given area, to show whether any applicable limit values have been exceeded; Using the noise indicator on the physical map of the area in question in accordance with the standards increases the importance of preparing a noise map. Daytime noise indicator (Ldaytime); It is the energy average of the A-weighted long-term sound level and expresses the level of exposure used to express the discomfort during the daytime, which is determined according to all the daytime periods of the year. It is the level of influence that is determined according to the whole and used to express the sleep-inducing discomfort during the night. Parallel to this, the vibration; criteria determined by parameters such as vibration acceleration, velocity, amplitude, frequencies, and exposure time show the importance of determining the vibration exposure limit. Since noise is an acoustic phenomenon, it is defined as a randomly structured spectrum without independent frequency components (Kurra, 1982). As can be seen from the Article 14 of the Republic of Turkey Environmental Law No. 2872. “Noise Control Regulation”, which was published on 11 December 1986 and entered into force and with reference to the article, noise; “It is the sound spectrum with a random structure that is subjectively defined as unwanted sound (Anon., 1992). In other words, noise is defined as an unwanted sound that can disturb the human body through the ear, which is one of the five sense organs. Aircraft noise

consists of the noise from the engines, along with the airflow around the aircraft mainframe and wings, parallel to the fact that different types of aircraft produce different noise levels and different noise frequencies and tones. It is stated that the definition of unwanted sound, the subjective aspect of noise carries weight and its evaluation is the subject of human values and environments (Kurra, 1982). Sound is a physical phenomenon that is created by fluctuations in air pressure through a vibrating source and stimulates and activates the sense of hearing in humans (Çepel 1988; Yücel, 1995). Kurra (1982) divided the voice into two as physical and physiological. Physical sound is the pressure changes created by a vibrating object in the environment. Physiological sound is the sense created by pressure changes in an elastic environment in the hearing organs. The air pressure created by the sound waves is called the number of repetitions of the sound pressure vibration in one second, the number of Hertz (Hz), and the distance in which the vibrations spread per unit time is called the speed of sound (Çepel, 1988). The sound pressure at a distance of 1 m from the sound source is defined as the power of the sound. The power of the sound per unit area is called the intensity of the sound, and these levels of intensity are called the intensity of the sound (Yazgan, 1980). The unit of sound pressure intensity is measured with a sonometer in Decibel (dB). Decibel is a sound evaluation unit in which the middle and high frequencies, to which the human ear is most sensitive, are especially emphasized (Yücel, 1995). In other words, it is the intensity of the sound that makes 1000 vibrations per second. Decibel is not a physical quantity, it is a proportional and logarithmic value, making calculations easier (Çepel, 1988). People's perception of sound is different. Accordingly, sounds less than 16 Hz are called infrasonic sounds and sounds greater than 16000 Hz are called ultrasonic sounds. A normal person can hear sounds between 16-16000 Hz. Only the human ear can detect medium frequency sounds (1000-4000 Hz). An evaluation curve was created to measure these perceptions (measurement of sound pressure levels), and since this curve is internationally denoted with the letter "A", it is used as a unit of dB (A) (Yücel, 1995). In addition, db(A), which is another unit of measurement of sound intensity, is used as equivalent noise level or simply as Leg (Yılmaz and Özer, 1997). Airport and airline noise is disturbing in and around the city. Noise is generated during the landing, take-off, and air maneuvers of the aircraft that provide transportation to the airport. In a study conducted in Germany, it was determined that military aircraft make a noise of 115 dB(A) (Uslu, 1995). In addition, as Yazgan (1980) states, a jet plane flying at a height of 152 m produces a noise of 120 dB(A). Due to the high number of flights in cities such as Izmir, Istanbul, Antalya, and Ankara, it gains continuity and reaches very disturbing dimensions. The aim of this research is framed around the effects of the sound and noise pollution created by the existing settlements in the Ercan Airport region during the descent, take-off, landing, and take-off of aircraft and to determine the precautions to be taken.

Methods

The qualitative research method was used in the study. Qualitative research is expressed as the process of making sense of social life and human problems by questioning them with its own methods. In general, a qualitative researcher explains concepts, meanings, and relationships based on observations, interviews, and documents. Content analysis, which is an analysis method rather

than observation, is a method that summarizes the existing data, standardizes it, compares it, or transforms it into another form. It meets socio-political, economic, and psychological needs and has the characteristics of objectivity, systematicity, and generality. This study was carried out with the case study pattern depending on the qualitative research method. In the study, document analysis was used as a data collection method. Document analysis is used to reach the sources for the purpose of the research and to determine the data to be obtained. Document analysis includes the analysis of written and printed documents related to the subjects to be studied and includes the analysis of written materials containing information about the case or cases that are aimed to be investigated (Fırat and Kiraz, 2014).

In other words, the research is a descriptive research in the document review model. Findings were obtained through descriptive document analysis in accordance with the aim of the research. Document analysis includes the analysis of written materials containing information about the case or cases that are aimed to be investigated (Yıldırım & Şimşek, 2013). The qualitative research method is preferred when research is being conducted on a subject, event, phenomenon, or a group of people, or when existing research and institutional knowledge are not very extensive (Şencan 2005). A case study is a methodological approach that involves an in-depth examination of a limited system using multiple data collection to gather systematic information about how it works and works (Chmiliar, 2010). case study; It is a method in which a single situation or event is examined in depth longitudinally, data is collected systematically and what is happening in the real environment is looked at. The results obtained, it reveals why the event occurred the way it did and what should be focused on in future studies (Davey, 1991). As in other qualitative research designs, the role of the researcher in the data collection process is very important in case studies; because the data collection process is not standardized. A good researcher; He should ask good questions and interpret the answers, not get caught up in his own ideologies and ideas, and be flexible enough to see new situations as an opportunity rather than a threat. In multi-case studies, different researchers or teams of researchers can be used in studies that require extensive information collected from the same field (Subaşı and Okumuş 2017). Content analysis was used as the analysis method in the study.

Findings

Since the introduction of jet-powered airplanes in the 1960s, airplanes individually generate less noise than previous generations, with more than a 90% reduction in noise. Correspondingly, as the demand for air transport increases and the volume of air traffic continues to grow, this improvement is often offset by the number of aircraft crossing an area.

As a result of the technological development in airplanes, the advances in both engine technologies and aerodynamic structures of airplanes have brought about a serious decrease in the noise level. Otherwise, tolerating aircraft engine noise would cause serious problems in human health. Despite these developments, the decreasing sound intensity creates discomfort even today. Aircraft such as the Boeing 727 and Boeing 747-200, which are now very few in use in the skies, had

noise levels above 100 decibels. The noise level of Airbus A320 and Boeing 737-800 type aircraft, which are widely used all over the world today, is around 93-94 decibels.

It has been possible to reduce the noise level to around 90 decibels in the Airbus A350, Boeing 787, Airbus A320neo, and Boeing 737 MAX type aircraft, which are the most modern passenger aircraft today. Aircraft noise pollution is a harmful noise effect created by aircraft during flight. Sound generation consists of three phases: Mechanical noise - rotation of engine parts, most noticeable when the fan blades reach supersonic speeds. Aerodynamic noise - noise from airflow around aircraft surfaces, especially when flying low at high speeds. Noise from aircraft systems, cockpit and cabin pressurization, and air conditioning systems, and Auxiliary Power Units. As a result, these noises are among the health problems determined by the medical authorities; Sleep disturbance, hearing impairment and heart disease, workplace accidents caused by stress, problems with memory and recall may also be affected. According to the information obtained from the TRNC Civil Aviation Department, a total of 26000 landings and take-offs and at the same time 213000 transit passes were made between 2018-2019 alone.

ÇEPEL 98 (Noise intensity dB(A) Effects on human health)

Noise Rating	Noise value dB(A)	Effects on Human Health
Noises of low intensity	<30	The onset of Night Sleepiness
1st degree noises	30-65	Anger, irritation, sleep disturbance, mental fatigue, loss of concentration
2nd degree noises	65-90	Respiratory acceleration, weak heartbeat, dizziness, and headache, sudden reflexes
3rd degree noises	90-120	Persistent discomfort, increased physiological responses
4th degree noises	120-140	Serious damage to the inner ear, balance disorders
5th degree noises	140-180	serious brain damage
6th degree noises	180<	eardrum rupture

As can be seen in Table 1, noise is graded in decibels and its effects on human health are shown. Low-intensity noises (less than 30 dB(A)) affect the onset of sleeplessness at night on human health. 1st degree noises (values between 30-65 Db(A)) have effects on human health such as anger, irritation, sleep disturbance, mental fatigue, loss of concentration. 2nd degree noises (values between 65-90 dB(A)) have effects on human health such as accelerated respiration, weakened heartbeat, dizziness and headache, and sudden reflexes. The 3rd degree noises (values between 90-120 dB(A)) have effects on human health that cause constant disturbances and increase in physiological responses. 4th degree noises (values between 120-140 dB(A)) can cause serious damage to the inner ear and balance disorders effects on human health. Noises of the 5th order (values between 140-180 dB(A)) cause serious brain damage effect on human health. It is seen that the

6th degree noises (values more than 180 dB(A)) have an effect on human health, such as the explosion of the eardrum.

NATS GEO Noise Pollution in Climb and Descent by Aircraft Types

	AIRCRAFT TYPE	ALTITUDE ft	DESCEND dB(A)	CLIMB dB(A)
MIDDLE-RANGE AIRCRAFTS	Airbus 319	1000-2000	67.7 – (65-90)	(120-140)
	Airbus 319	2000-3000	65,9 (65-90)	(90-120)
	Airbus 319	3000-4000	64.1 (3500ft) (30-65)	(90-120)
	Airbus 319	3000-4000	60.3 (3800ft) (30-65)	70.2 (65-90)
	Airbus 319	4000-5000	(30-65)	69,7 (4500ft) (65-90)
	Airbus 319	4000-5000	(30-65)	67,9 (4800 ft) (65-90)
	Airbus 320	1000-2000	64.9 (30-65)	(120-140)
	Airbus 320	2000-3000	(30-65)	(120-140)
	Airbus 320	3000-4000	64.7 (30-65)	(120-140)
	Airbus 320	4000-5000	59.2 (30-65)	69.7 (4500 ft) (65-90)
	Airbus 320	4000-5000	59.2 (30-65)	67,9 (4800 ft) (65-90)
	Airbus 321	1000-2000	69.6 (65-90)	(120-140)
	Airbus 321	2000-3000	(30-65)	(120-140)
	Airbus 321	3000-4000	58.1 (30-65)	(120-140)
	Airbus 321	4000-5000	(30-65)	(65-90)
	Airbus 321	5000-6000	(30-65)	(65-90)
	Airbus 321	6000-7000	60.2 (30-65)	(65-90)
	Boing 734	3000-4000	62.1 (30-65)	(65-90)
	Boing 737	1000-2000	70.7 (65-90)	(120-140)
	Boing 737	2000-3000	(30-65)	70.9 (65-90)
	Boing 737	3000-4000	(30-65)	70.8 (65-90)

Table 2 shows the intensity of the noise from the dB(A) value of the planes landing (descending) and taking off (climbing) at Ercan Airport at certain heights. As can be seen from the table, the aircraft types that use Ercan Airport the most are the medium-size class aircraft, these are; Airbus 319-320-321, Boeing 734 and Boeing 737.

As can be seen from Table 2; When Airbus 319 descends at altitudes between 1000-2000 ft, it creates a noise of 65-90 Db(A), which is associated with Table 1 on people; It appears to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. If the same aircraft type is climbing at the same altitude; Among these values, where it

creates a noise of 120-140 dB(A), in humans; It is seen that it causes serious damage and balance disorders in the inner ear. The same type of aircraft creates a noise of 65-90 Db(A) while descending at altitudes of 2000-3000 ft. It appears to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. If the same aircraft type is climbing at the same altitude; Among these values, where it creates a noise of 90-120 dB(A), It causes to trigger health ailments such as constant discomfort and increased physiological responses. When the same type of aircraft descends at altitudes of 3000-4000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It appears to cause health disorders such as irritation, anger, sleep disturbance, mental fatigue, and loss of concentration. If the same aircraft type is climbing at the same altitude; Among these values, where it creates a noise of 90-120 dB(A), in humans; It appears to induce health problems such as constant discomfort and increased physiological responses. When the same type of aircraft descends at altitudes of 3000-4000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It appears to cause health disorders such as rage, anger, sleep disturbance, mental fatigue, and loss of concentration. If the same aircraft type is climbing at the same altitude; it creates a noise of 65-90 Db(A) while descending, which is associated with Table 1 on people; It brings about health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. When the same type of aircraft descends at altitudes of 4000-5000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It appears to cause health disorders such as anger, anger, sleep disturbance, mental fatigue, and loss of concentration. When the same type of aircraft is climbing at an altitude of 4500 ft, it creates a noise of 65-90 Db(A), which is associated with Table 1 on people; It appears to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. When the same aircraft was climbing at an altitude of 4800 ft, it created a noise of 65-90 Db(A) and this was associated with Table 1 on people; It appears to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes.

Airbus 320 creates a noise of 30-65 dB(A) while descending at altitudes between 1000-2000 ft, which is associated with Table 1 on people; It is seen that it causes health disorders such as rage, anger, sleep disturbance, mental fatigue, and loss of concentration. The same type of aircraft creates a noise of 120-140 dB(A) while climbing at altitudes of 1000-2000 feet. It is seen that it causes serious damage and balance disorders in the inner ear. When the same type of aircraft descends at altitudes of 2000-3000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It is seen that it causes health disorders such as anger, anger, sleep disturbance, mental fatigue, and loss of concentration. If the same aircraft type is climbing at the same altitude; Among these values, where it creates a noise of 120-140 dB(A), in humans; It is seen that it causes serious damage and balance disorders in the inner ear. When the same type of aircraft descends at altitudes of 3000-4000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It is seen that it causes health disorders such as rage, anger, sleep disturbance, mental fatigue, and loss of concentration. Among these values, it creates a noise of 120-140 dB(A) while climbing at the same altitude values; It is seen that it causes serious damage and balance disorders in the inner ear. When the same type of aircraft descends at altitudes of

4000-5000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It is seen that it causes health disorders such as irritation, anger, sleep disturbance, mental fatigue, and loss of concentration. When climbing at the same height, it creates a noise of 65-90 Db(A), which is associated with Table 1 on people; It appears to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes.

Airbus 321 creates a noise of 65-90 Db(A) while descending at altitudes between 1000-2000 ft. It ignites health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. If the same aircraft type is climbing at the same altitude; Among these values, where it creates a noise of 120-140 dB(A), in humans; It is observed that the aircraft causes serious damage and balance disorders in the inner ear. When the same type of aircraft descends at altitudes of 2000-3000 and 3000-4000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It creates health problems such as irritation, anger, sleep disturbance, mental fatigue, and loss of concentration. Among these values, it creates a noise of 120-140 dB(A) while climbing at the same altitude values; It is seen that it causes serious damage and balance disorders in the inner ear. When the same type of aircraft descends at altitudes of 4000-5000, 5000-6000, and 6000-7000 ft, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It appears to cause health disorders such as anger, sleep disturbance, mental fatigue, and loss of concentration. When climbing the same type of aircraft, it creates a noise of 65-90 Db(A) at altitudes of 4000-5000, 5000-6000, and 6000-7000 ft. It appears to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes.

When Boeing 734 descends at altitudes between 3000-4000 ft, it creates a noise of 30-65 dB(A), that is associated with Table 1 on people; It is proved that it causes health disorders such as anger, sleep disturbance, mental fatigue, and loss of concentration. When the same type of aircraft is climbing at the same altitude, it creates a noise of 30-65 dB(A), which is associated with Table 1 on people; It is seen that it causes health disorders such as anger, sleep disturbance, mental fatigue, and loss of concentration.

The Boeing 737 makes a noise of 65-90 Db(A) when descending at altitudes between 1000-2000 ft. It seems to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. The same type of aircraft makes a noise between 120-140 dB(A) when climbing to the same altitude. It appears to cause serious damage and balance disorders in the inner ear. When the same type of aircraft descends at altitudes of 2000-3000 and 3000-4000 ft, it produces noise of 30-65 dB(A), which is associated with Table 1; Although it is seen that it causes health disorders such as anger, rage, sleep disturbance, mental fatigue, loss of concentration, it produces a sound of 65-90 Db(A) when climbing at the same altitudes. As this is shown in Table 1; It appears to cause health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes.

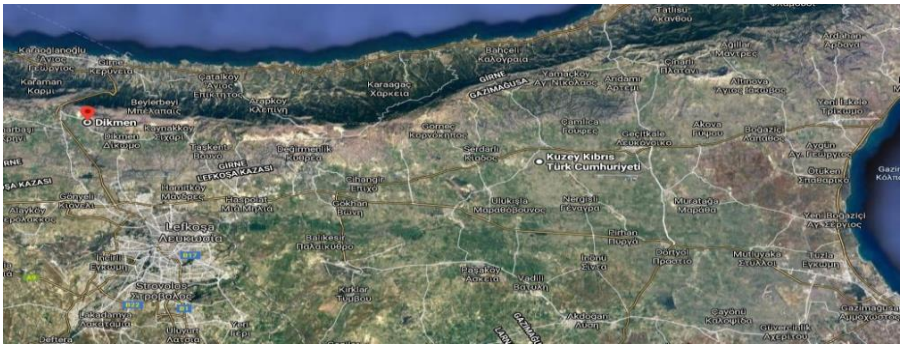
Ercan descending

	AIRCRAFT TYPE					
Residential Area	**ft**	**Airbus319 Db(A)**	**Airbus320 Db(A)**	**Airbus321 Db(A)**	**Boeing734 Db(A)**	**Boeing737 Db(A)**
BAHÇELİ	6186	(30-65)	(30-65)	(30-65)	(30-65)	(30-65)
GEÇİTKALE	5830	(30-65)	(30-65)	(30-65)	(30-65)	(30-65)
MURATAĞA	4925	(30-65)	(30-65)	(30-65)	(30-65)	(30-65)
DÖRTYOL	3875	(30-65)	(30-65)	(30-65)	(30-65)	(30-65)
AKDOĞAN	2650	(30-65)	(30-65)	(30-65)	(30-65)	(30-65)
VADİLİ	2650	(30-65)	(30-65)	(30-65)	(30-65)	(30-65)
PAŞAKÖY	2300	(30-65)	(30-65)	(30-65)	(30-65)	(30-65)
GAZİKÖY	1625	(65-90)	(65-90)	(65-90)	(65-90)	(65-90)
MERİÇ GÜNEYİ	1325	(65-90)	(65-90)	(65-90)	(65-90)	(65-90)
KIRKLAR KUZEYİ	825	(65-90)	(65-90)	(65-90)	(65-90)	(65-90)

Table 3 shows the locations where the existing aircraft types pass on their landing routes, the altitude values there, and the sound noise values (dB(A)) associated with table 2. Along the Ercan Airport landing route, all available aircraft types in the Table are approximately 6186 ft. Paşaköy 2300 ft, Gaziköy 1625 ft, Meriç south 1325 ft, Kırklar north 825 ft and Ercan Airport arrivals.

From time to time, the sound noise levels of all aircraft types seen in Table 3, on the descent routes from Bahçeli' (6186 ft) to Paşaköy (2300 ft) are in the range of 30-65 dB(A), and these values are associated with Table 1. on people; It is seen that it causes health disorders such as anger, anger, sleep disturbance, mental fatigue, and loss of concentration. It is in the range of 65-90 dB(A) from Gaziköy (1625 ft) to the north of Kırklar (825 ft), which is on human health; It is seen that it causes accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes.

Map 1 Settlements on the Ercan Airport Descent Route of Planes



Ercan Ascending

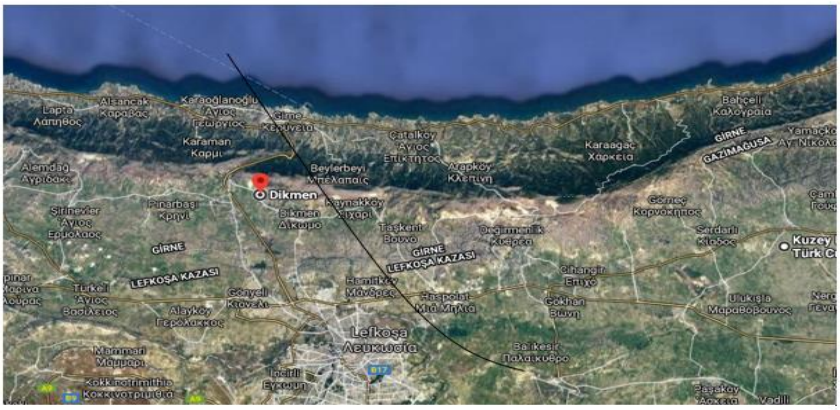
	AIRCRAFT TYPE					
Residential Area	**ft**	**Airbus319 Db(A)**	**Airbus320 Db(A)**	**Airbus321 Db(A)**	**Boeing734 Db(A)**	**Boeing737 Db(A)**
BALIKESİR	1675	(120-140)	(120-140)	(120-140)	(120-140)	(120-140)
HASPOLAT	3300	(65-90)	(120-140)	(120-140)	(65-90)	(120-140)
HAMİTKÖY	4125	(30-65)	(65-90)	(65-90)	(65-90)	(65-90)
TAŞKENT	5125	(30-65)	(65-90)	(65-90)	(65-90)	(65-90)
DİKMEN	6075	(30-65)	(65-90)	(65-90)	(65-90)	(65-90)
BEYLERBEYİ	7775	(30-65)	(30-65)	(65-90)	(65-90)	(65-90)
GİRNE- ZEYTİNLİK	8900	(30-65)	(30-65)	(65-90)	(65-90)	(65-90)
KARAOĞLANOĞLU	9550	(30-65)	(30-65)	(65-90)	(65-90)	(65-90)

The settlements of the existing aircraft types on the climb routes, the altitude values here, and the sound noise values (dB(A)) associated with Table 2 are shown in Table 4. In the north direction, Ercan Airport is separated from Balıkesir (1675 ft), Haspolat (3300 ft), Hamitköy (4125 ft), Taşkent (5125 ft), Dikmen (6075 ft), Beylerbeyi (7775 ft), Girne-North. It leaves the north of the island after flying over Zeytinlik (8900 ft) and Karaoğlanoğlu (9550 ft).

When these values, where the sound noise level of all aircraft types on Balıkesir are in the range of 120-140 dB(A), are associated with table 1; It is seen that it causes serious damage and balance disorders in the inner ear. Airbus 319 and Boeing 734 aircraft types on Haspolat create a sound noise intensity in the range of 65-90 dB(A), which has an effect on human health; Although it is seen that it causes health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes, Airbus 320 and 321 and Boeing 737 aircraft types create a noise between 120-140 dB(A) and on human health; It is seen that it causes serious damage and balance disorders in the inner ear. Over Hamitköy, Airbus 319 aircraft type creates a noise value in the range of 30-65 dB(A), which is on human health; While it is seen that it causes health disorders such as anger, sleep disturbance, mental fatigue, and loss of concentration, Airbus 320, 321 and Boeing 734 and 737 aircraft types also create a noise intensity of 65-90 dB(A); on human health; It is seen that it causes health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. Over Tashkent, Airbus 319 aircraft type creates a noise in the range of 30-65 dB(A), which is on human health; Airbus 320, 321 and Boeing 734 and 737 aircraft types create a noise intensity of 65-90 dB(A), while it is seen that it causes health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes; on human health. On Dikmen, Airbus 319 aircraft type creates a noise in the range of 30-65 dB(A), which impacts human health; Airbus 320, 321 and Boeing 734 and 737 aircraft types create a noise intensity of 65-90 dB(A), while it is seen that it causes health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes; on human health; It is also

seen that it causes health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes. Over Beylerbeyi, Girne-Zeytinlik and Karaoğlanoğlu, Airbus 319 and 320 aircraft types create a noise between 30-65 dB(A), which has a negative impact on human health; Although it is seen that it causes health disorders such as anger, sleep disturbance, mental fatigue, and loss of concentration; Airbus 320, 321 and Boeing 734 and 737 aircraft types create a noise intensity of 65-90 dB(A); on human health; It is seen that it causes health disorders such as accelerated breathing, weakening of the heartbeat, dizziness, headache, and sudden reflexes as well.

Map 2. Settlements on the Ercan Airport Climb Route of Planes



Results and Suggestions

Although the noise pollution values created at certain heights on the residential units on the routes of the aircraft types landing and taking off at Ercan Airport are between 30-140 db(A), these values also have negative impacts on human health, to mention the prominent ones, from the onset of night sleepiness, anger, sleep disturbance, mental fatigue, loss of concentration, accelerated breathing, weakening of the heartbeat, dizziness and headache, sudden reflexes, constant disturbances, increased physiological reactions, serious damage to the inner ear, balance disorders, serious brain injury. Moreover, it has negative effects strikingly, up to the destruction of the eardrum and rupture of the eardrum as well.

When the law of the Department of Environmental Protection is examined, which is under the Ministry of Tourism and Environment of the TRNC, it can be seen that there is quite insufficient content regarding noise pollution, but it is placed under the heading of environmental noise management principles in Chapter 11. In this chapter, it is stated that the principles related to environmental noise management will be prepared by the Ministry of Public Works and Transportation, approved by the Council of Ministers, and regulated by a statute or regulations to be published in the Official Gazette. Accordingly, it includes regulations in terms of the external noise levels of airline vehicles and the damages that noise levels may cause on passenger health so that they can land and take off at airports open to domestic and international traffic. Depending on

these facts, it is necessary to make noise assessments of the main highways and airports, to prepare strategic noise maps, and to determine and implement the measures to be taken to prevent or reduce the environmental noise from these noise sources. However, as a result of the conducted researches, no findings were found that such studies were carried out especially around Ercan Airport.

Since Ercan Airport is an existing phenomenon and we cannot change the location of this area, studies should be conducted to accept this as data and minimize its negative effects. These researches can be epitomized and should be framed around the identification of the types of aircraft that increase the noise level, and the solving the technical problems regarding the landing and take-off times of these planes. Necessary measures must be taken which include restriction of landing and take-offs. Furthermore, serious sound level measurements should be made during peak hours on the aircraft landing and departure routes to Ercan Airport, and as a result of these measurements, noise maps of the settlements affected by noise should be drawn, and accordingly, the relevant ministries, authorities and non-governmental organizations should be able to implement sanctions according to the current laws and, regulations. By referencing the noise map, factories, workshops, warehouses, open agriculture should be allowed, especially in areas where airport noise is intense. Airborne noise, especially Kırklar, Haspolat, and Balıkesir, which are closer to Ercan Airport, should be protected with a curtain system or plant clusters with broad-leaved trees in order to in order to minimize the noise levels. It is salient that the health of citizens living in the Ercan Airport area is at risk due to this noise pollution.

Measures to reduce the noise generated by airplanes landing and taking off at Ercan Airport are as follows: First of all, it is necessary to determine the noise sources of the airplanes and to start working on reducing the engine operating noise in particular. In addition, it is necessary to give due importance to the reduction of aircraft noise at its source and to attach sufficient importance to the studies of aircraft noise reduction with economic measures. Moreover, airflow noise (aerodynamic noise) and ground noise ratios should be determined and necessary precautions should be taken. In this regard, due attention should be paid to the legal studies related to noise licensing in aircraft, noise acceptance limit values should be determined and noise emissions measurement processes should be started. Noise-reducing take-off and landing procedures should be given due importance at the airport. It is necessary to rearrange the planes in descending and ascending routes to the area, taking into account the settlement areas, if necessary, giving due importance to the landing and take-off fees due to noise, and the necessary penal sanctions should be applied to the airline companies that exceed the level in this regard. It is anticipated that these measures to be implemented will reduce noise exposure.

In similar studies, it is known that the settlements near the airport are exposed to approximately four times more noise than other settlements. It has been determined that the education level of the children studying in the settlements around the airport is 27 percent lower than the children in other regions, which can cause learning disorders in children living around the airport and, hypertension and many other diseases in adults.

In this study, the following points were put forward. These are determining the environmental noise exposure levels by using the assessment methods for the settlements on the descent and climbing routes of Ercan Airport, with the environmental noise level assessment report; It is thought that it is necessary to inform the public about environmental noise and its effects, and this should be done especially where exposure levels to environmental noise are possible to cause harmful effects on human health and it is necessary to protect the environmental noise quality. In addition to these measures, it is utmost of importance to start working immediately in order to prepare action plans for preventing and reducing noise and to put these plans into practice.

Ministry of Transport should implement the necessary measures regarding the Ercan airport. These implementations should include the studies on strategic noise maps of the areas in the landing and take-off direction of the aircraft and in line with this noise map, the low landing and take-off of the aircraft should be inspected in a strict and controlled manner. In this respect, low-flying aircraft should be prevented and those who do not comply with these rules should be given deterrent penalties.

Noise measurement, control, and monitoring system should be established around Ercan airport. It is also necessary to establish protection zones around Ercan airport and people should not be allowed to settle in areas where noise pollution will be experienced above the noise disturbance limit. In addition, in order not to deteriorate the health of citizens living in existing settlements, buildings should be required to have a high level of sound insulation, particularly in these protection zones.

Restrictions should also be imposed on nighttime aircraft mobility. In addition, airplanes that make a lot of noise should be identified and if there are technical problems that can be resolved, they should be fixed, otherwise, restrictions should be placed on the landing and departure times of these aircraft especially at night, or their landing and take-offs should be prevented. First of all, airflow traffic should be planned. Considering the development of residential areas and noise-sensitive areas, the changes and orientations that can be made in the take-off and landing routes of the aircraft should be made correctly. Preferred routes and procedures for aircraft takeoff and landing need to be followed to minimize potential noise from aircraft approaching and departing in noise-sensitive areas where significant impacts are anticipated.

The "Continuous Descent Approach" can be utilized to avoid noise pollution. In order to minimize the noise that may arise from the airframe as much as possible, low power/low friction should be used in order to be able to fly the aircraft in clean conditions, or some precautions should be taken, such as the use of reverse power minimization guidelines on landings.

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