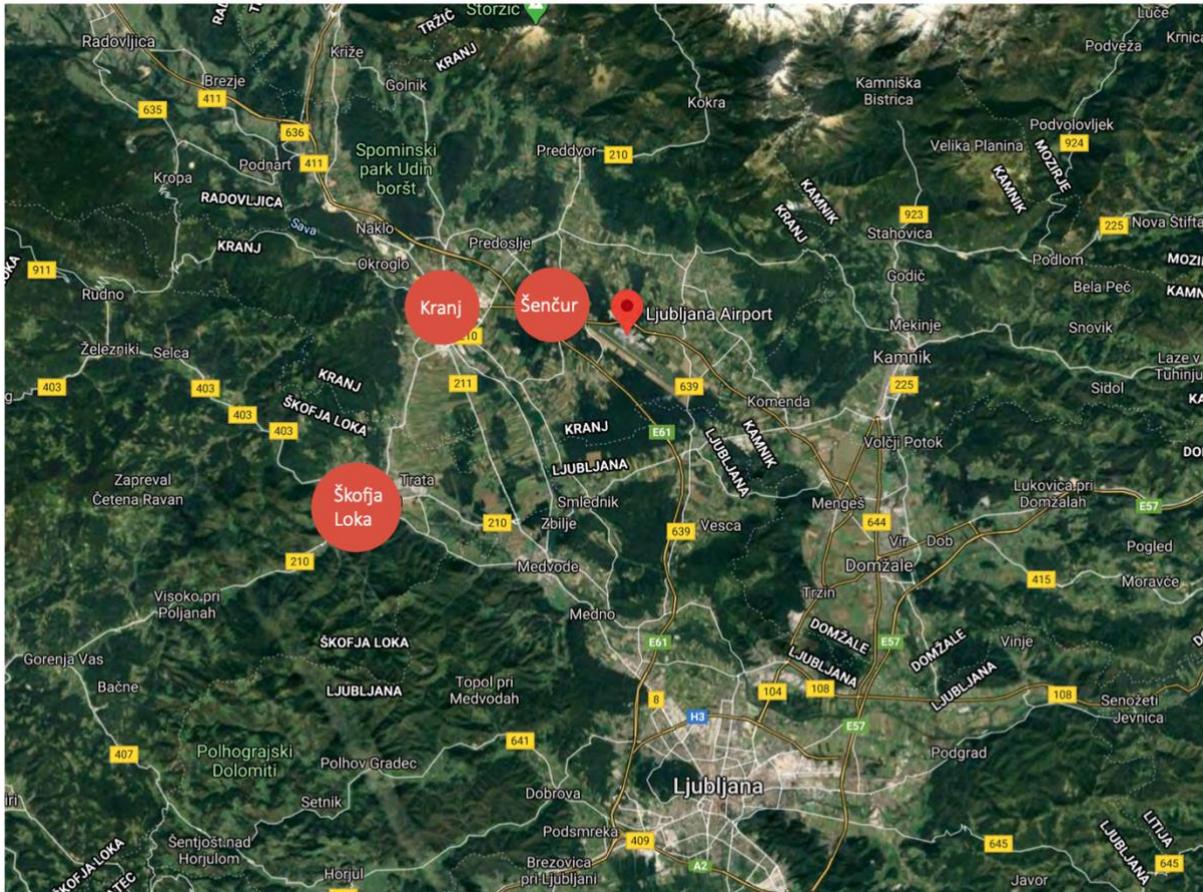


Case study – Ljubljana Airport



Ljubljana Airport and surrounding communities ([source](#))

This case study provides an overview of the previous, current and proposed practices of Ljubljana Airport, as a part of their Noise Management Strategies.

The actions and interventions accomplished by Ljubljana Airport are presented in a descriptive and detailed manner with the purpose of emphasising lesson learning and good practices.

All information used for the development of this case study were gathered from the airport, interviews with relevant stakeholders and online sources. Interviews included representatives from the airport, airlines, Air Navigation Service Providers and other relevant stakeholders (Ministry of Infrastructure, Ministry of Environment and Spatial Planning, Municipality of Kranj, Ombudsman). The interview findings were correlated with all further available information and were included within this case study. Most of the topics of the interviews were formulated around the knowledge, understanding and application of ICAO Balanced Approach, as well as around further actions designed to reduce and mitigate noise and its effects.

The target audience of the case study include airport operators and several other relevant stakeholders such as Air Navigation Service Providers, Civil Aviation Authorities, aircraft operators, environmental and government organisations and other interested parties.



Background Information

Fraport Slovenija is the operator of Ljubljana (Jože Pučnik) Airport, which core business is the airport management and operation, airport infrastructure development, provision of ground handling services and other commercial activities. This is the central Slovenian International Airport, managing approximately 97% of the total passenger air traffic in Slovenia.

Fraport Slovenija, formerly known as Aerodrom Ljubljana until April 2017, is 100% owned by the German company Fraport AG Frankfurt Airport Services Worldwide (Fraport AG), since 2014. The company owns several parts of land, enabling both – airport expansion and development of other complementary activities.

The strategic location of the airport is considered ideal for the development of flight connections and further activities related to the airline industry, as it is located at the crossroads of air traffic flows between the Pannonian Basin and the Po Valley, as well as between the Middle East and the European Union, through Istanbul Strait.

Table 5.1 - General Airport Information [1]

Name of the company	Fraport Slovenija
Aerodrome location indicator and name	LJLJ – LJUBLJANA/BRNIK
Aerodrome geographical and administrative data	
Direction and distance from the city	348° and 20 km from the centre of Ljubljana city
Elevation	388 m (1274 ft)
Reference temperature	27.5° C
AD Administration	Fraport Slovenija, d.o.o.
Types of traffic permitted (IFR/VFR)	IFR and VFR
Passenger facilities	
Transportation	Public buses, taxis, car rental agencies, shuttle service
Radio navigation and landing aids	
Type	VOR/DME, DVOR/DME, MKR ILS RWY 30 L/OM, MM, GP 30, DME, LOC CAT IIIB

Table 5.2 – General Airport and Air Traffic Information [2]

Number of employees	428
Total number of passengers	1,688,558 (19.6% growth from 2016)
Number of passengers in public traffic	1,683,071
Total number of aircraft movements	34,444
Number of aircraft movements in public traffic	26,045
Total cargo	24,314 [t]
Air cargo	12,327 [t]
Scheduled flight connections	26
Charter flight connections	26

RWY Designator	TRUE BRG MAG BRG	RWY Dimensions [m]	THR elevation [m]
12	126.38° TRUE 123° MAG	3300 x 45	THR 388.3
30	306.41° TRUE 303° MAG	3300 x 45	THR 362.9

The airport has a 3,300 m long runway used for both departures and arrivals, being equipped with modern technologies that allow landings in reduced visibility conditions compliant to ICAO IIIB category.

Before 2015, air traffic was declared as moderate, following a 10% increase in 2015 compared to the previous year.

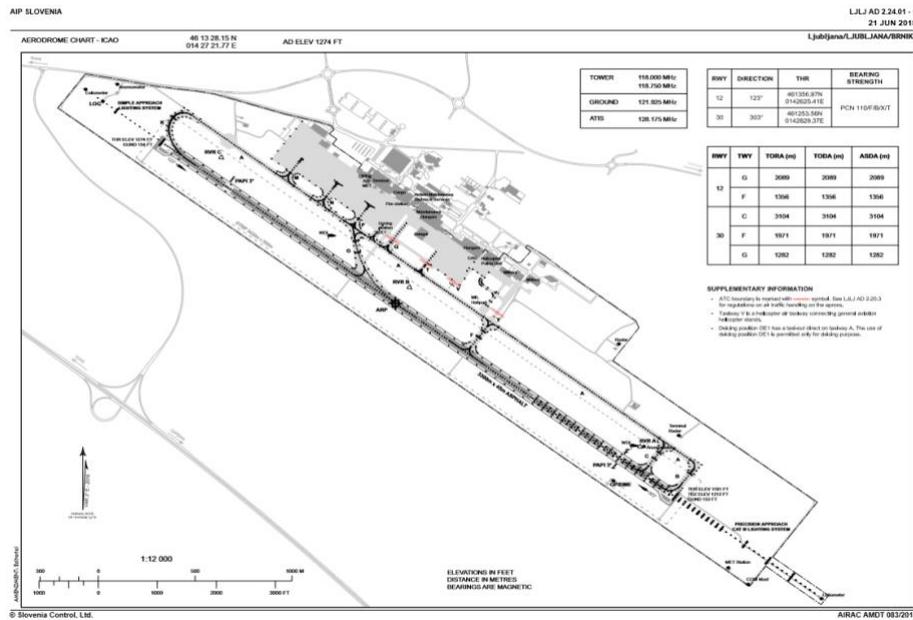


Figure 5.1 - Aerodrome Chart – ICAO [4]

Ljubljana Airport is an active member of various expert groups operating under ACI Europe (Airports Council International Europe), as well as a member of the Aviation Security Committee that deals with civil aviation security issues at airports. Other memberships include the Regional Airport Forum, ACI Communications Group and Digital Communications Forum.



Applicable Noise Rules and Regulations

General Noise Rules and Regulations in Slovenia

The Environmental Noise Directive (END) was implemented in Slovenia in 2004 through the *Decree on the assessment and management of environmental noise* [5].

Limiting values for environmental noise are set by the *Decree on limit values for environment noise indicators* [6]. *Rules on initial measurements and operational monitoring of noise sources and on conditions for their implementation* exist and are applied in Slovenia [7].

Four noise sensitive areas (industrial – IV, residential/retail/manufacturing – III, mainly residential – II and nature/quiet areas – I) were defined by the Ministry of Environment and Spatial Planning, where most residential areas are classified as Zone III, or Zone II. In addition, limit values were established for each noise area.

Aviation Noise Rules and Regulations in Slovenia

Since no airport in Slovenia qualifies as a “major airport”, Strategic Noise Maps and Action Plans compliant with END are not needed. Ljubljana Airport (letališče Jožeta Pučnika) has the highest number of movements per year (32,000 in 2008) out of all Slovenian airports.

Limiting values for aviation noise are set by the *Decree on limit values for environment noise* [6]. Four noise sensitive zones are defined, where one zone (Zone III) includes areas in the vicinity of airports. Small airports have lower limits than major airports (i.e. >50,000 movements/ year). The limits for Zone III and small airports are: $L_{den} = 58$ dBA, $L_{day} = 58$ dBA, $L_{evening} = 53$ dBA, $L_{night} = 48$ dBA.

Table 5.5 – Airport Limit Values [8]				
Type of airport	Noise Zone	L_{den}/L_{day} [dBA]	$L_{evening}$ [dBA]	L_{night} [dBA]
Below 50,000 movements/year	Zone II	52	47	42
	Zone III	58	53	48
Above 50,000 movements/year	Zone II	60	55	50
	Zone III	65	60	55

The Council Directive 89/629/EEC of 4 December 1989 on the limitation of noise emission from civil subsonic jet aeroplanes has been transposed [9].

The position regarding the implementation of ICAO Balanced Approach (BA) operating restrictions was established in 2012 at a meeting within the National Assembly, stating that “The Republic of Slovenia supports the adoption of a proposal for a regulation of the European Parliament and of the Council on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports in the framework of a balanced approach and the repeal of Directive 2002/30/EC of the European Parliament and of the Council”.

ICAO Annex 16 “Environmental Protection” is mentioned as part of the aviation legislation [10].

Noise Control at Source (“Rules on Noise Emission of Aircraft”) is also present in the National Regulations [11].

When the number of airport operations is increased, the National Institute of Public Health (NIJZ) or the National Laboratory of Health, Environment and Food (NLZOH) performed a health impact assessment. An increase in the number of flights is not proportional to an increase of noise, therefore all such information is further included in the assessments, including aircraft categories. The assessment and opinion issued by either NIJZ or NLZOH are sent to the Ministry of Health, which sets the position regarding the spatial plan for the Ministry of Environment and Spatial Planning. They further take into consideration the noise limits for different areas regarding the land use (industrial, residential/retail/manufacturing; mainly residential and nature/ quiet areas). The responsible institution performs the environmental noise impact on public health according to the National Legislation for Spatial Planning, involving the Environmental Protection Act [12], the Spatial Planning Act [13], the Decree on environmental encroachments that require environmental impact assessments [14] and the Siting of Spatial Arrangements of National Importance Act [15].

Guidelines for national spatial plans are in preparation at the Ministry of Health, including aviation noise and recommendations for ensuring compliance with ICAO Balanced Approach.

Further discussions regarding legislative changes consider a change in the noise limit values for airports that are not major in order to establish limit values comparable to road traffic and major airport limit values. Such an action might imply changes from 58 to 65 dBA for L_{den} and 48 to 55 dBA for L_{night} .

Additional expected changes include a change in the Aviation Act and development of "Rules on Noise and Aircraft Emission Control".

Responsible Authorities

The authorities responsible for the general application of rules and regulations in aviation have been listed and described in Table 1 in Annex (1). Authorities responsible for the application of legislative provisions, together with their responsibilities are described in Table 2 in Annex (1).

The approach to ICAO Balanced Approach and Noise Management

Slovenia has no airport exceeding 50,000 movements per year; therefore, Strategic Noise Maps and Action Plans are not required for END compliance. Nonetheless, Ljubljana Airport performs noise monitoring and collects all necessary data for mapping environmental noise. Examples can be found in references [16-18].

General Overview

Regulations that are in force to avoid excessive aircraft noise in the populated areas from the vicinity of the airport include various provisions for the application of Noise Abatement Procedures [3]. The aforementioned state that aircraft not certified in compliance to ICAO Annex 16 (Vol. I, Chapter 3) are not permitted. Exemptions can be granted by the Civil Aviation Agency (CAA) of Slovenia in justified cases.

In order to reduce noise disturbances, all aircraft operators that use the airport shall follow the recommended noise abatement procedures from the manufacturer. In addition, they have to always ensure that unnecessary noise disturbances are not generated in the areas surrounding the airport, especially during the intervals where nighttime restrictions apply.

This compliance shall not be required during adverse weather conditions or for safety reasons.

One instrument departure procedure is in use at Ljubljana Airport as a Noise Abatement Procedure that uses a steep climb gradient. This was designed in order to reduce noise exposure for communities living in the Western side of the airport.

Supplementary noise alleviation measures refer to the use of Auxiliary Power Units (APU). Restrictions include that APU shall be started no earlier than 30 minutes before the engine start-up (off-block time) and be operated no longer than 30 minutes after the engine shutdown (on-block time). In addition, APU shall be started only if aircraft maintenance makes it unavoidable, in which case the service period shall be kept as short as possible.

Reverse thrust, apart from idle, shall not be used in the interval 22:00-06:00 LT (21:00-05:00 UTC), except for safety and operational considerations.

Night flying restrictions are also included under the chapter of Noise Abatement Procedures within the AIP, where the interval of application is between 22:00-06:00 LT (21:00-05:00 UTC), in which two restrictions apply for noise abatement reasons. Firstly, RWY30 will not be normally used for departures during the interval 22:00-00:00 LT (21:00-23:00 UTC), while pilots shall expect departures from RWY12. Secondly, departures from RWY30 between 00:00-06:00 LT (23:00-05:00 UTC) are not permitted. Such restrictions do not apply to departures including safety, meteorological, technical and SAR reasons.

Run-up tests are presented as another category of noise abatement procedures [3], according to the Slovenian AIP. Engine ground runs on the aprons are not permitted when they are not associated with the planned aircraft departure. Exceptions for engine check starts and run-up tests to the ground idle power may be granted by the ATC (main apron) and GAC (general aviation apron) in justified cases. During such engine ground runs, continuous radio communication shall be ensured with the ATC and GAC. Engine ground runs having the performance level greater than idle must be performed in the Engine Run Zone. Exceptions may be granted by the ATC in justified cases for the use of the authorized area (run-up position) within the manoeuvring area, during which continuous radio communication shall be ensured with the ATC. Such ground runs with performance level greater than idle may be performed in the interval 06:00-22:00 LT (05:00-21:00 UTC), for which time limit exceptions are granted for engine tests on ERZ AAT for aircraft on the line maintenance.

Engine tests on maximum take-off power are not allowed.

Operator Adria Airways is a major operator at Ljubljana Jože Pučnik Airport, actively engaged with the Ministry of Infrastructure, CAA, Slovenia Control and Ljubljana Airport in the development of operational procedures that take into account the reduction of the noise imprint on the environment during departures and arrivals.

Further considered actions include the implementation of Continuous Descent Approach (CDA), displaced landing thresholds and reducing power/ drag. A recommendation includes the revision of non-standard procedures in terms of noise impact.

Due to the lack of National Regulations for land-use planning and management for aviation noise, no specific measures are established.

Runway operations are the main source of noise in the airport area, this being the reason why all noise management actions were initiated by the airport [2].

In December 2008, a systematic approach to monitoring noise by continuous measures of noise in the immediate surroundings of the airport was established. Based on the data



sent by measurement units into the control centre, noise sources are identified and noise burden is determined on a daily and yearly basis. As a main result, noise maps are produced on a yearly basis. Data acquired is correlated with radar data in order to ensure an easier and more reliable manner of identification of various sources of noise. Such measures are performed in compliance with both National and International Regulations, in cooperation with external performers in four most exposed points, focusing on settlements under the take-off and landing surfaces. According to these results, air traffic noise as an average monthly indicator has fluctuated below the prescribed limit value of noise in the environment. Two measuring points obtained data showing that the level of noise for the limit indicator is achieved, particularly in the evening summer days, when the level of traffic is increased. In this respect, a sound level meter was relocated in 2014 from Lahovče, where the measuring results have constantly been below the limit values, to Kranj. The motivation was that this area was exposed to a higher number of movements, according to the aircraft departure procedure in use since 2013 [8].

Low levels of noise emissions are perceived as essential for the quality of life in local settlements, therefore the airport decided to provide the information on noise measurements to locals to the fullest extent. Apart from the regular periodical noise reports, an interactive application on the website is available, where people can monitor the average noise indicators of overflying aircraft over the settlements during take-off and landing [18].

A policy on insulation is unavailable at the moment.

Recommendations from interviews suggest considering noise as a criterion for building authorisations. In addition, the need for a legislation for land-use planning and noise zoning was expressed.

The Environmental permit for noise emissions due to the operations of Ljubljana Jože Pučnik Airport has been extended in 2015, being valid until the end of November 2020.

The Airport is using operational restrictions only as an action to reduce noise exposure, during the nighttime (00:00-06:00 CET), when departures in the direction of Šenčur Municipality are not permitted. As a general practice, clearances are not granted for departures in the direction of Šenčur during the interval 22:00 – 00:00 CET. This agreement, including a limited number of flights above settlements during the night was established between the airport and the local authorities, therefore it was ensured that the noise limit is never exceeded during the nighttime. Results showed a significant reduction of noise complaints.

Trends, overarching processes and internal systems that underpin the implementation of ICAO Balanced Approach

Flight Procedures

The flight procedures applicable for flights within the Ljubljana TMA (Terminal Manoeuvring Area) for the approach, holding and departure, are based on the provisions from ICAO Annex 6 ("Operation of Aircraft"), ICAO Annex 14 ("Aerodromes"), Doc 4444 – RAC/501 ("Rules of the Air and Air Traffic Services (PANS-RAC)"), Doc 8168 – OPS/611 ("Aircraft Operations (PANS-OPS), Volume I and II") [3].

RNAV SID/ STAR (Area Navigation Standard Instrument Departure Route/ Standard Arrival Route) procedures are applied and based on GNSS only for RNAV 1 (P-RNAV) certified aircraft. RNAV instrumental procedures are developed in compliance with ICAO PANS-OPS Doc 8168, Volume II criteria and with EUROCONTROL Guidelines for the design of Terminal

Procedures for Area Navigation. RNAV 1 (GNSS) certified aircraft shall plan RNAV SID/STAR. A database coding table according to the ARINC 424 standard exists for each SID and STAR procedure. SIDs also include the textual description of each procedure [3].

In the case of airborne RNAV equipment failure, the ATC will provide radar vectors. Procedures are designed at or above MRVA and are monitored by radar.

Aircraft not equipped with appropriate RNAV systems that are departing or arriving shall plan their route according to published conventional procedures [3].

Due to the lack of DME facilities, the use of DME/ DME is not acceptable [3].

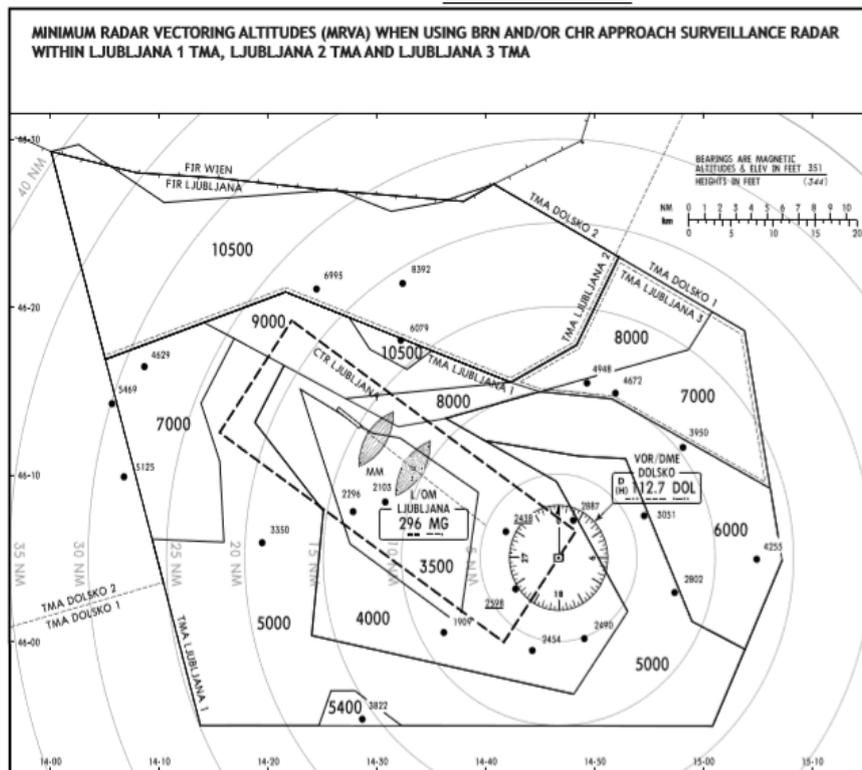


Figure 5.2 - RADAR VECTORING CHART – ICAO [19]

RNAV STAR procedures are defined by a route that is associated with a profile which includes flight levels/ altitudes and speed restrictions. Air crews should plan RNAV STAR in compliance with the vertical restrictions specified by STAR charts, unless they are specifically cancelled by the ATC. If no different instructions are given by the ATC, the aircraft shall follow the speed restrictions published in RNAV charts. If possible, CDO (Continuous Descent Operation) should be applied through the entire STAR procedure [3].

RNAV SID procedures may include a published initial cleared level, as well as level restrictions at specified waypoints. Cleared levels issued explicitly by the ATC shall override the published level [3]. SID charts and other detailed information can be found in Annex (2).

The holding procedure is designed above VOR/ DME DOL as a conventional, multi-entry holding pattern. This holding procedure is available for non-RNAV 1 (P-RNAV) certified aircraft, as it is not designed as a part of the RNAV system [3].

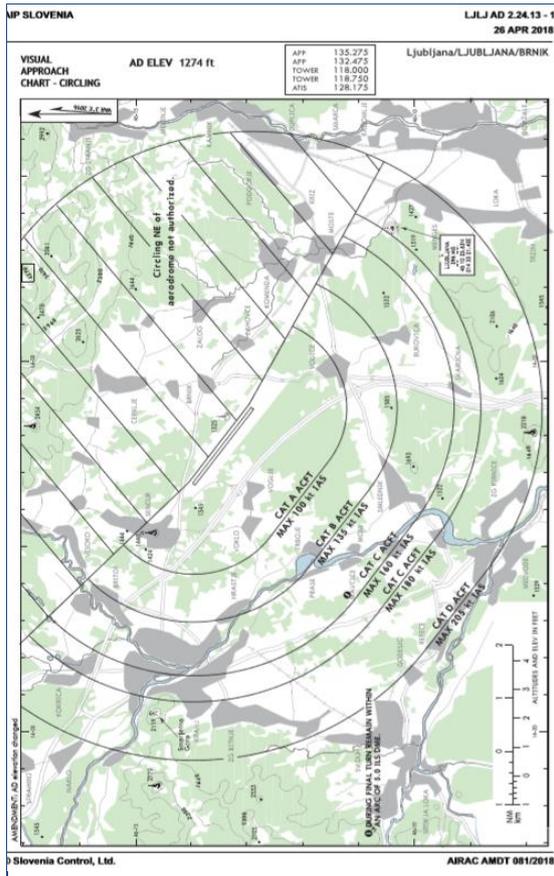


Figure 5.3 - VISUAL APPROACH CHART – CIRCLING [20]

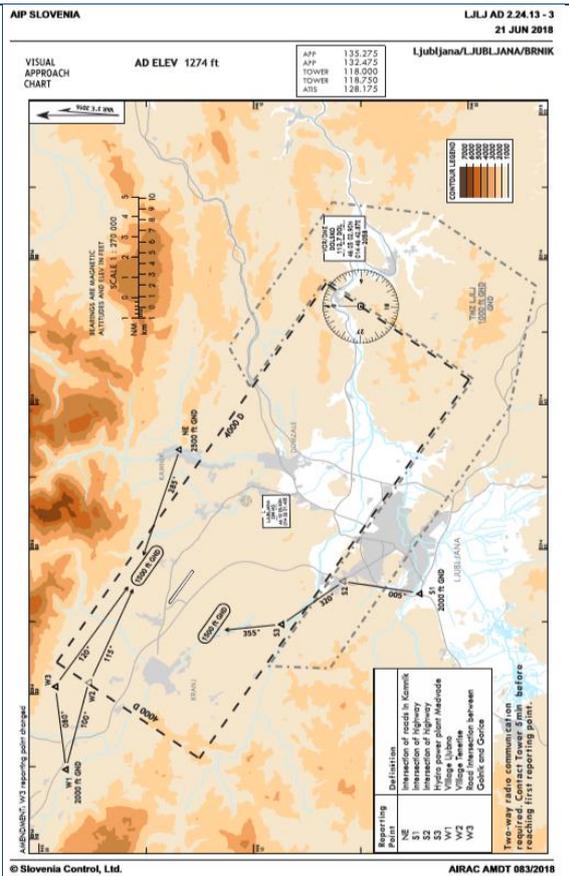


Figure 5.4 - VISUAL APPROACH CHART [21]

VFR flying aircraft, having the intention to enter Ljubljana CTR, shall follow the procedures that include as reporting points the intersection of roads in Kamnik from North-East; the highway intersection and the hydro-power-plant Medvode from South; the village Ljubno, the village Tenetiše and the road intersection between Golnik and Gorice from West [3].

In the case of low visibility operations, CAT II/III approach and landing operations are authorised on RWY30. The minimums for the categories of precision approach and landing operations are as it follows in the table below [3].

Table 5.6 – Minimum Values for the Categories of Precision Approach and Landing Operations [3]

CAT II	RVR \geq 300 [m]	and	200 [ft] > vertical visibility \geq 100 [ft]
CAT IIIA	RVR \geq 175 [m]	or	100 [ft] > vertical visibility \geq 50 [ft]
CAT IIIB	175 [m] > RVR \geq 125 [m]	or	Vertical visibility < 50 [ft]

Such operations are subjected to the serviceability of the available facilities/ systems and procedures. The CAT II/III facilities available on RWY30 are: ILS LOC (IIIE4), co-located GP/DME OM, MM; no-break battery power supply; lighting; precision approach CAT II and III lighting system; threshold and runway end lights; runway centre line (15 [m] intervals) and runway edge light (60 [m] intervals); touchdown zone lights; taxiway edge lights and colour coded taxiways centre line lights on TWY B, C, F, K and G; daylight markings on manoeuvring area; secondary power supply (switch over time 1 [second]); RVR assessment system at position ALPHA (touch-down zone), BRAVO (runway mid-point) and CHARLIE (stop end). The fixed minimum required RVR value for CAT III approach at Ljubljana Airport is 125 m [3].

Guided Low Visibility Take-Off (LVTO) can be performed on RWY30 and non-guided LVTO on RWY12. The facilities required for non-guided LVTO are: threshold and runway end lights; runway centre line (15 m intervals) and runway edge light (60 m intervals); taxiway edge lights and colour coded taxiways centre line lights on TWY B, C, F, K and G; secondary power supply (switch over time 1 second); RVR assessment system at position ALPHA (touch-down zone), BRAVO (runway mid-point) and CHARLIE (stop end) [3].

Guided LVTO	100 m
Non-guided LVTO	125 m

When LVTO is performed with RVR below 400 m, the aircraft operator shall request LVP procedures to be provided. Generally, LVP are applicable for arriving and departing traffic [3]. A detailed description of local flying restrictions can be found in Annex (4).

Airport Obstacles

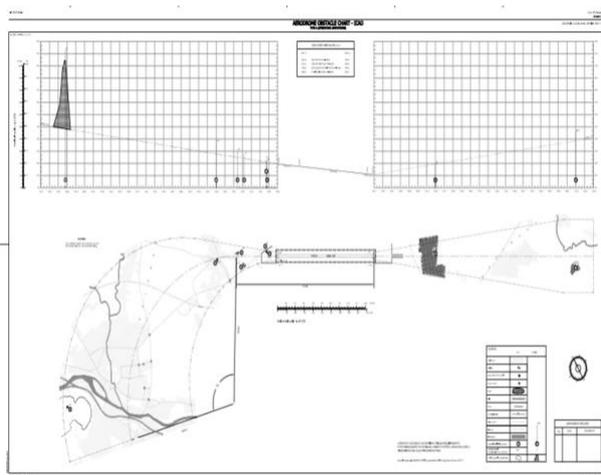


Figure 5.5 - Aerodrome Obstacle Chart – Type A (Operating Limitations) [22]

RWY/ Affected Area	Obstacle Type	Elevation [m]
<i>RWY30 Approach</i>	Forest	467.5
	Forest	389
<i>RWY12 Approach</i> <i>RWY30 Take-off</i>	Building	396.5
	Anemometer	400
	Forest	412
	Forest	422
	Building	442.5
	Antenna	671



Further relevant airport information

Occasional bird concentrations are expected on and in the vicinity of the airport [3].

A military airbase is located in the proximity of the airport.

THE CASE STUDY

Introduction [2]

Based on regular meetings with local municipalities and recorded complaints, the airport concluded that noise is an important issue for communities, followed by local air pollution and climate change.

Apart from all previously mentioned interventions and noise management actions undertaken by the airport, the development of Sustainability Reports on a yearly basis is an exemplary model for Community Engagement within Aviation Environmental Management [23], currently incorporated as a part of Land-Use Planning and Management within ICAO Balanced Approach. Various aspects regarding the daily operations of the company are presented and described in a transparent manner, together with their implications to the overall environment, including communities. Benefits are highlighted, together with all past, current and proposed efforts to overcome negative effects that can result from such operations, including noise management.

The development of the airport is described as focused on understanding and assessing their importance in the overall environment, being aware that the business organisation and the development of infrastructure levels have a direct impact on economic, social and environmental aspects. In this respect, business can support the employment sector, encourage entrepreneurship and the development of new infrastructure. Apart from the aforementioned, the airport acknowledges and understands the negative impact that such operations can bring to the environment, therefore a strong commitment on dealing with environmental issues was declared.

In this respect, a systematic collection of all endeavours in terms of sustainable development was created for the first time. This measure was necessary in order to provide all relevant information about the approach of the company to sustainability and to ensure transparency, showing that their projects resulted in positive outcomes by being incorporated into daily operations.

Since 2014, the ownership of Ljubljana Airport changed to Fraport AG, a German company. Within this context, various work processes were changed, adjusted and optimised, therefore 2015 was the year dedicated to focusing on internal organisation changes. Similar objectives included a focus on changes with external visibility (2016), by planning a reconstruction of the passenger terminal to improve passenger experience and eliminate airport bottlenecks. In addition, a project of relocating the road passing the airport was planned – it will enable a spatial development of a business-logistics zone on the North side of the airport. All these projects were formulated as a part of the integration process with Fraport Group.

Airport objectives include the pursuit of development and growth, while taking into consideration a sustainable environmental orientation, customer satisfaction and good quality of life standards for employees. The aim of the environmental management system is to ensure sustainable action for the environment through the development and optimisation of protective measures and minimisation of negative effects.



Identification of environmental needs [2]

Currently, there is no airport in Slovenia exceeding the number of 50,000 movements per year. Therefore, all interventions and relevant actions were voluntarily launched at the initiative of the airport.

The current strategy of the airport is focused on sustainable development, therefore environmental management represents an important pillar within the overall business objectives, including customer satisfaction and community engagement in line with the operational development. The assessment of results from many noise monitoring activities and recorded complaints, emphasised noise as the main environmental issue.

In addition, a method or tool to assess the performance of the company was needed in order to have a clear and realistic view of the level of accomplishment of proposed objectives from their sustainable development strategy, especially in terms related to environmental management, where noise was assessed as being the main issue.

Selected options in response to environmental needs [2]

The development of Sustainability Reports was focused on achieving and maintaining sustainable communication both internally and externally, such that the performance of internal day-to-day operations can be assessed against environmental impacts. Objectives established in this respect provided a definition of sustainable communication – it could approach a planned and systematic in-house and external communication, while pursuing the principles of being proactive, honest and transparent when engaging with the public. In addition, a non-discriminatory communication style, together with providing timely responses were outlined as highly important for the airport.

The objectives established for communication are oriented towards enhancing reputation and credibility of the company, raising awareness of the identity and benefits of the company, building trust in the company, establishing a direct relationship with the service users based on dialogue and highlight of advantages, by positioning the company as an advanced, well-regulated and development-oriented organisation, which intensively monitors trends in the field of aviation and cares for the needs and wishes of all users by providing them comprehensive care.

Implementation processes [2]

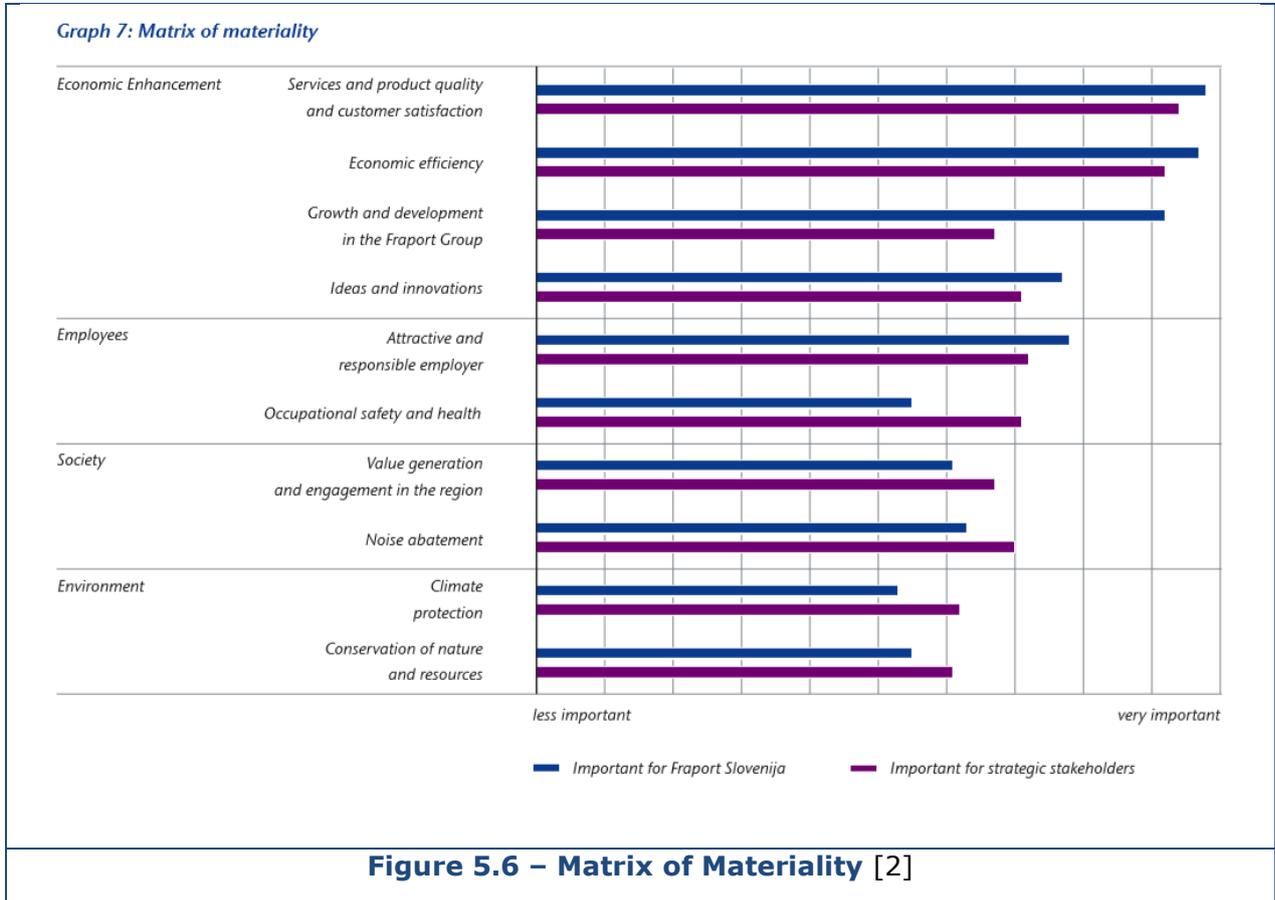
All processes originated from the implementation of the Environmental Management System in compliance with ISO 14001 requirements. Further steps led to the development of Sustainability Reports (since 2016), in compliance with Global Reporting Initiative (GRI) Standards, in order to ensure and promote Sustainable Communication, i.e. the quality of the information, together with the transparency of processes while delivering reliable data.

Their structure is developed in a way that an effective communication of their sustainable objectives and strategy is ensured and can be chronologically understood. The content of the report is selected through the formulation of the "Matrix of Materiality". Criteria for selection include the relevance, involvement of stakeholders and sustainable context. Final data selections are further shaped through the filters of additional sub-criteria: balance, comparability, accuracy, clarity and reliability of data. During all these processes, various departments are involved, including an environmental expert.

An important approach to promoting Sustainable Communication was the use of the Matrix of Materiality. This is a tool that supports the company in identifying and managing



opportunities and risks, in relation to the strategic public. The matrix contributes to an in-depth understanding of the company in terms of sustainable development, gathering together all relevant areas, from environmental issues to economic and wider social aspects. Since 2017, the Matrix of Materiality was harmonised with the sustainability guidelines of Fraport AG.



The key materiality areas in communication have been established by the airport through the use of GRI Guidelines and through interactive dialogue with representatives from relevant stakeholder groups. In this respect, the airport with the strategic stakeholders work continuously towards ensuring effective protection against noise.

In order to establish effective means of communication, the strategic stakeholders were clearly defined, in line with the output data from the Matrix of Materiality. Furthermore, the airport has established several goals, according to the needs of each stakeholder, as well as methods and tools to contribute to the accomplishment of each goal.

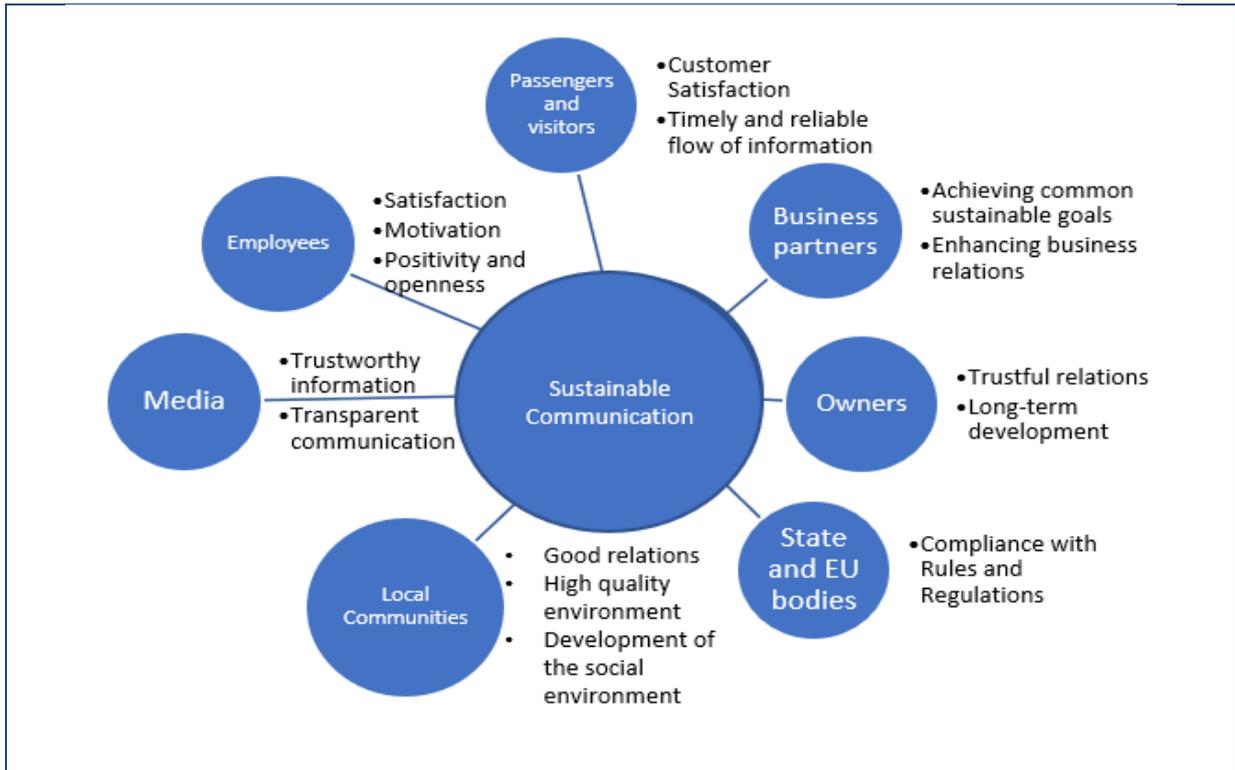
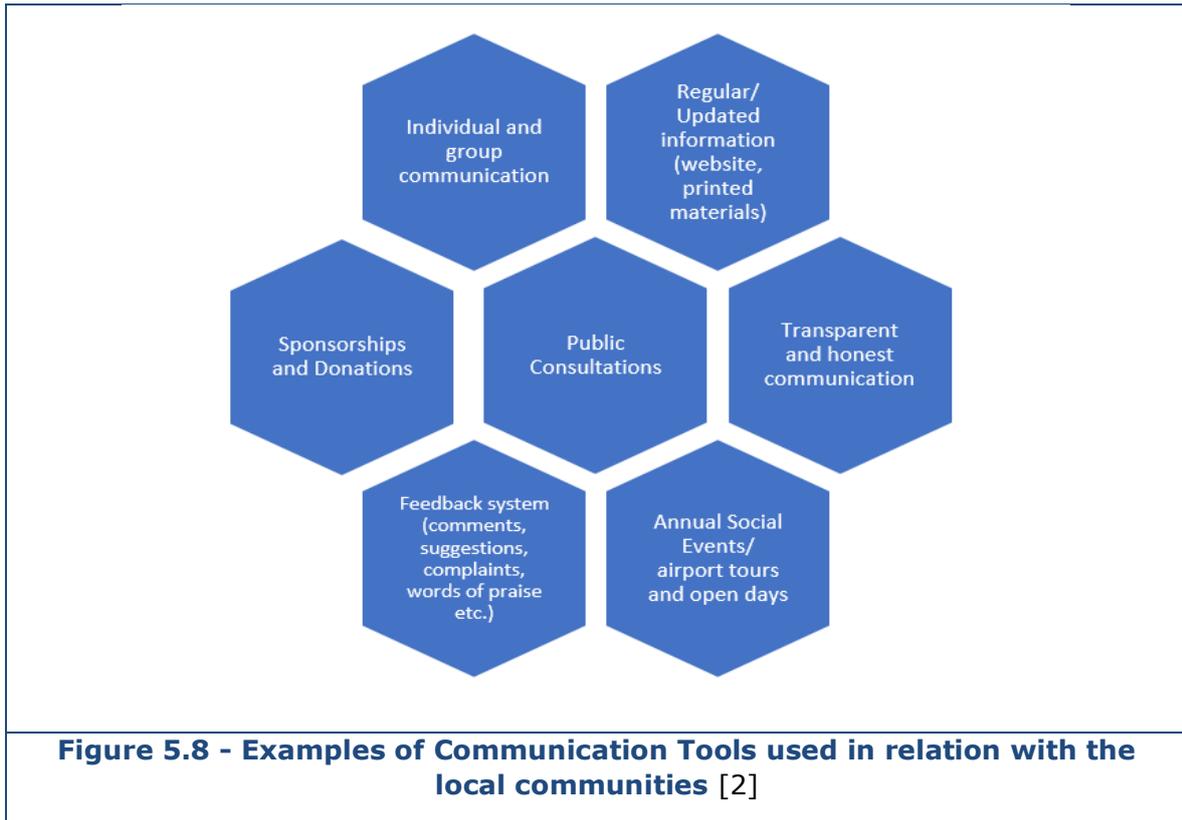


Figure 5.7 - Examples of established airport goals in relation to Strategic Stakeholders [2]

The following strategic stakeholders were identified and defined by the airport – employees, passengers and visitors, business partners, owners, State and EU bodies, local communities and media.

Established goals vary according to each stakeholder and range from satisfaction and motivation (employees), to customer satisfaction (passengers and airport visitors), achieving common sustainable goals (business partners) or establishing and maintaining good relations, together with ensuring a high-quality environment for the local communities.



Noise complaint management is developed from different points of view. First of all, different communication channels are available for the airport to deal with noise complaints. Options include direct phone call, classic mail, Social Media (Facebook) and filling an online form on their website. Specific noise issues can be further addressed on regular meetings with local municipalities, since the airport has established regular communication with the local municipalities in terms of distributing noise reports by demand or special analysis of specific noise events. All complaints and noise-related issues are recorded and managed by the Quality Management System of the airport (ISO 9001 certified), therefore noise data and received complaints are presented on the Management Review Meeting of the Airport on a yearly basis, within internal documents/ minutes.

Evaluation of results. Post-implementation changes. Mitigation actions

Continuous investments and efforts in the knowledge and well-being of employees, together with the development of a well-defined Personnel Policy contributed to the internal development of a culture of sustainability. These processes were dealt with great care since 2015 in order to ensure the establishment of an efficient internal culture first, and to externalise its principles after 2016. Training employees and raising awareness regarding the environmental impact of individually performed tasks through transparency is an ongoing process. Using Sustainable Reports as a tool for analysis and assessment of progress related to predicted objectives, the development and continuity of a culture of sustainability was ensured in a knowledgeable and professional manner, while environmental issues were managed in a more effective manner. As a main result, the status of the airport company was ranked among the best employers.

Focus on the development of employees includes the development and maintenance of a respectful, responsible, safe, pleasant and healthy work environment, while encouraging a healthy and socially responsible lifestyle. At a corporate level, it is planned a continuation



of socially responsible activities that will include a wider airport community in sustainable activities.

A clear performance-based analysis and assessment of the all airport operations and further interventions was obtained, having an important contribution to the annual overview of the company. This showed that previous sustainability forecasts have been accomplished, while traffic growth increased (20% in passenger traffic and 23% in cargo). Well-established analysis structures allowed the airport to formulate an efficient decision-making process to benefit from the favourable economic conditions both nationally and internationally and from existing opportunities, while developing new others.

Sustainability Reports developed by Ljubljana Airport were awarded by the Republic of Slovenia.

Continuous attention is given to maintaining good and ethical relations, as well as a positive dialogue with all the stakeholders of the company, in order to ensure the development of projects for a cleaner and healthier environment, to manage all the energy resources in a responsible manner and to focus on ensuring noise protection.

Methods and tools. Interdependencies. Other relevant information

Together with the local community Šenčur, the airport planned to install a natural noise-reduction barrier to contribute to the reduction of the noise burden from the neighbouring settlements. Additional results and feedback are expected in the following years when the vegetation noise barrier, planted at the end of December 2016, will reach its maximum height growth. The estimated noise reduction is approximately 1-2 dB [8].

In 2017, the new by-pass road or the access road to the airport was completed (planned in 2015), a new strategy was adopted for the company operations and the company entered a new investment cycle. Transparent information and communication with all relevant stakeholders (as defined in Sustainability Reports) was a great contributor to the development of the aforementioned outcomes. The primary investment will be a new passenger terminal, scheduled for opening in 2021. Through this approach, the company aims to adjust the basic infrastructure to current needs that account for traffic growth and to increase the level of airport services. These investments imply the evolution of the company strategy, improvement based on four basic pillars for future development, i.e. passenger traffic, business activity, cargo traffic and development of the Aviation Academy. In 2017, the acquisition of the certificate for the airport infrastructure and for the airport operator was issued by the CAA. All aforementioned objectives are declared in line with the Environmental Management System – environmental protection is ensured by accounting for noise effects, by supporting the transition to a low-carbon society, by separating waste and obtaining energy efficiency, as well as by using renewable energy sources.

Further activities launched by the airport are focused on the development of the social and cultural environment. In this respect, social, cultural, sporting and health activities and events are supported by the airport, including continuous access to education and trainings for their employees.

The Department of Real Estate Management from the airport deals with the airport development. Several projects that are mainly related to the development of airport infrastructure are planned, including the State Road Relocation, the Passenger Terminal Extension and "Airport City". The State Road Relocation is a project that involves the relocation of the road passing by the airport, in collaboration with the Republic of Slovenia and the Municipality of Cerklje na Gorenjskem. Finished in 2017, the road section has a



length of 2.4 km with three roundabouts and ensures ease of access to the terminal and the airport city areas [24].



Figure 5.9 - State Road Relocation Project [24]

The Passenger Terminal Extension is a project proposed to overcome current difficulties and to prepare for predicted increases in the number of passengers, as the existing passenger terminal reaches its capacity ceiling during the highest season. This expansion is expected to happen in the summer of 2020, having an additional 10,000 m², including a new departure hall, a new luggage sorting area, a duty-free shop, a new business lounge, as well as further food, beverage and promotional areas.

The “Airport City” is a project focused on developing the commercial infrastructure of the airport. It meets the needs for hotel accommodation and ensures office spaces, commercial premises and logistics services which are currently unavailable. Three areas are covered for development (approx. 12.8 ha): Area 1 (yellow) to accommodate a hotel, Area 2 (red) for logistic facilities and Area 3 (blue) for logistic facilities.



Figure 5.10 - Airport City Project [24]

Area 1 (yellow) – approx. 2.2 ha; Area 2 (red) – approx. 5 ha; Area 3 (blue) – approx. 5.6 ha

A spatial plan was performed and is available available for the public. Fraport Slovenija is currently looking for investors for the facilities.



Further planned airport infrastructure developments include the construction of a new connector TWY J and shoulders on the taxiways, together with new aircraft ground handling and winter maintenance facilities. In addition, a practice area and buildings for the Aviation Academy are planned on the landside, as well as moving the General Aviation terminal, building commercial premises, expanding the parking garage facilities and the facilities for firefighting and maintenance departments. Third party investors are able to build aircraft maintenance hangars, a new control tower, logistics and aircraft fuelling facilities or commercial buildings in the area designated as "Airport City". The two largest renovation projects include the passenger terminal (2032-2035) and the runway reconstruction (2028-2031).

Fraport Slovenija, as part of the Fraport Group, is an active promoter of the internationally adopted standards, guidelines and principles, especially UN Global Compact principles, Universal Declaration of Human Rights, commitments to reducing air emissions within international aviation and many others.

The European Green Office Certificate – Ljubljana Airport won in 2013 the award "European Green Office Certificate", being also a holder of a special prize for the best Green Office Management System. Employees formed a Green Team that dealt with various fields of operation (energy, water and fuel consumption, waste management, occupational health and safety etc.). The same team is also informing and training their other colleagues on how to achieve and maintain "green offices" and sustainability.

Energy supplied to the airport by external providers is 100% generated from renewable energy sources.

Conclusions

Ljubljana Airport performs monitoring of noise and has all information needed for mapping the environmental noise, even if it does not exceed 50,000 movements per year. They are actively engaged in the development of Sustainability Reports since 2016, in order to promote sustainable communication in managing noise at such level that an improved quality of life is enabled for the local citizens.

RECOMMENDATIONS AND LESSONS LEARNT

One important issue that was raised is related to the necessity to establish a legislative framework for airports that are not classified as major airports. The main issue in this sense is the lack of noise policies or unclear and ineffective provisions for aviation noise, which further result in poor involvement of the relevant stakeholders in noise management. Additional reasons demanding the definition of specific noise management criteria for airports that are not classified as major include the fact that many airports might never achieve 50,000 movements in the next 20 years or at all, as in the case of Ljubljana Airport, which even if it is the largest international airport in Slovenia, the traffic growth is smaller in comparison with other European countries. In the absence of effective policies, it is considered that other airports might risk to never achieve 50,000 movements per year, especially due to the lack of effective legislative frameworks on noise for smaller airports.

Guidance for establishing effective communication on noise management between all relevant stakeholders is highly needed for all airports.

The effectiveness of noise mitigating actions is hard to be assessed and compared to other airports, since a common framework for noise management for airports that are not major is unavailable.

A more efficient method for planning flights that accounts for all constraints (slots, limited runway capacity etc.) is needed in order to be compliant to operating restrictions effectively.

In hindsight, the communication of any change and intervention should have also been presented to and discussed with the local communities before implementation.

A clear methodology for dealing with noise complaints is needed.

Further meetings between all relevant stakeholders are needed for an effective noise management.

Further trainings on air traffic noise management are needed for most relevant stakeholders.

Public participation in environmental issues is highly demanded by communities. They also require more efficient and transparent information on environmental issues, including national regulations, programmes, reports and action plans.

Guidelines may be needed for airports on available methods and tools to assess their performance in terms of environmental management. In addition, guidance is needed on how to include environmental management, particularly noise management, into the overall management processes of a business in order for them to be aligned to a sustainable development approach, where environmental benefits to be obtained from day-to-day operations and development limitations to be reduced or eliminated.

References

- [1] <https://www.sloveniacontrol.si/acrobat/aip/Operations/2019-01-31-AIRAC/html/index.html>
- [2] Sustainability Report 2017
- [3] <https://www.sloveniacontrol.si/acrobat/aip/Operations/2019-01-31-AIRAC/html/index.html>
- [4] https://www.sloveniacontrol.si/acrobat/aip/Operations/2019-01-31-AIRAC/graphics/eAIP/LJ_AD_2_LJLJ_01-1_en.pdf?
- [5] Decree on the assessment and management of environmental noise – “Uredba o ocenjevanju in urejanju hrupa v okolju (Uradni list RS, št. 121/04)”
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED2682>
- [6] Decree on limit values for environment noise indicators – “Uredba o mejnih vrednostih kazalcev hrupa v okolju (Uradni list RS, št. 105/05, 34/08, 109/09 in 62/10)”
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED3653>
- [7] Rules on initial measurements and operational monitoring of noise sources and on conditions for their implementation – “Pravilnik o prvem ocenjevanju in obratovalnem monitoringu za vire hrupa ter o pogojih za njegovo izvajanje (Uradni list RS, št. 105/08)”
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV8901>
- [8] ANIMA EU Project/WP2/T2.1/Slovenia
- [9] The transposition of the *Council Directive 89/629/EEC of 4 December 1989 on the limitation of noise emission from civil subsonic jet aeroplanes* – “Direktiva Sveta 89/629/EGS z dne 4. decembra 1989 o omejevanju hrupa civilnih podzvočnih reaktivnih letal (UL L št. 363 z dne 13. 12. 1989, str. 27)”
- [10] ICAO Annex 16 “Environmental Protection” mention – “Zbornik letalskih predpisov”
<http://www.caa.si/index.php?id=75&L=-1%2F%2F>
- [11] Noise Control at Source (“Rules on Noise Emission of Aircraft”) – “Pravilnik o hrupu zrakoplovov (Uradni list RS, št. 55/00, 18/01 – ZLet, 40/04 in 75/08)”.
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV2866>
- [12] The Environmental Protection Act - (Zakon o varstvu okolja (Uradni list RS, št. 39/06 – uradno prečiščeno besedilo, 49/06 – ZMetD, 66/06 – odl. US, 33/07 – ZPNačrt, 57/08 – ZFO-1A, 70/08, 108/09, 108/09 – ZPNačrt-A, 48/12, 57/12, 92/13, 56/15, 102/15, 30/16 in 61/17 – in GZ))
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO1545>
- [13] The Spatial Planning Act - (Uradni list RS, št. 33/07, 70/08 – ZVO-1B, 108/09, 80/10 – ZUPUDPP, 43/11 – ZKZ-C, 57/12, 57/12 – ZUPUDPP-A, 109/12, 76/14 – odl. US, 14/15 – ZUUJFO in 61/17 – ZUreP-2))
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO4675>
- [14] The Decree on Environmental Encroachments that require Environmental Impact Assessments - (Uredba o posegih v okolje, za katere je treba izvesti presojo vplivov na okolje (Uradni list RS, št. 51/14, 57/15 in 26/17))
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=URED6527>
- [15] The Sitting of Spatial Arrangements of National Importance Act - (Zakon o umeščanju prostorskih ureditev državnega pomena v prostor (Uradni list RS, št. 80/10, 106/10 – popr., 57/12 in 61/17 – ZUreP-2))
<http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO5830>
- [16] Environmental Management Section
<http://lju-airport.si/en/company/environment/>
- [17] Ljubljana Airport website (Fraport Slovenija)
<http://hrup.lju-airport.si/en/Main>
- [18] <http://hrup.lju-airport.si/en/interactive-airport/noise-protection/>
- [19] AIP Slovenia - LJLJ AD 2.24.11 - 1
https://www.sloveniacontrol.si/acrobat/aip/Operations/2019-01-31-AIRAC/graphics/eAIP/LJ_AD_2_LJLJ_11-1_en.pdf?
- [20] AIP Slovenia - LJLJ AD 2.24.13 - 1
https://www.sloveniacontrol.si/acrobat/aip/Operations/2019-01-31-AIRAC/graphics/eAIP/LJ_AD_2_LJLJ_13-1_en.pdf?
- [21] AIP Slovenia - LJLJ AD 2.24.13 - 3

- https://www.sloveniacontrol.si/acrobat/aip/Operations/2019-01-31-AIRAC/graphics/eAIP/LJ_AD_2_LJLJ_13-3_en.pdf?
- [22] https://www.sloveniacontrol.si/acrobat/aip/Operations/2019-01-31-AIRAC/graphics/eAIP/LJ_AD_2_LJLJ_03-1.pdf?
- [23] Community engagement for aviation environmental management
<https://www.icao.int/environmental-protection/Pages/Community-engagement-for-aviation-environmental-management.aspx>
- [24] Ljubljana Airport website
https://www.fraport-slovenija.si/en/company/airport-development---real-estate/?fbclid=IwAR3xjanskbbbaPkbob-vCOTIhRLJhZ-Ju1x_SY9Sir9qOgJx7vKAqnvFtvDM