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MANAGING NOISE EMISSION IMPACTS OF AIRPORT TRAFFIC

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ABSTRACT
Field noise measurements were collected at selected locations around the Beirut International Airport, and the Integrated Noise Model was applied for the analysis and prediction of airport traffic noise impacts on communities near the proposed airport expansion. The model simulations were used to evaluate future noise levels, optimize airplane flight path, and assess mitigation measures to minimize potential impacts of aircraft-induced noise emissions.

1 - INTRODUCTION

The principal effects of aircraft noise on humans include the risk of hearing damage, and speech and sleep interference, which can develop into stress [1]. As such, it becomes essential to locate, design, or expand airports in a way to reduce noise exposure to nearby communities. For this purpose, it is essential to assess changes of noise impact resulting from new or extended runway configurations, evaluate traffic demand and fleet mix, evaluate revised routings and airspace structures, and assess alternative flight profiles and modifications to other operational procedures. In this context, field noise measurements were collected at selected locations around the Beirut International Airport (BIA), and the US Federal Aviation Administration Integrated Noise Model (USFAA INM) was applied to analyze and estimate aircraft noise impacts on communities near the proposed expansion at the BIA. The model was also used to forecast future noise contours and assess mitigation measures to minimize potential impacts of airport noise emissions.

2 - NOISE MEASUREMENT RESULTS

Field noise measurements were conducted at twenty-eight locations, mainly on major intersections and roads in the study area. Average noise levels in residential areas around the airport are depicted in Figure 1.

The highest levels were recorded in the closest area to the airport. Noise levels recorded during the day, exceed the recommended Federal Highway Administration Noise Abatement Criteria (FHWA NAC) level of 72 dBA except at some locations for the evening time in a residential area under the flight path. Noise levels recorded during the night exceed the World Health Organization (WHO) recommended level of 55 dBA in outdoor residential areas. The noise levels measured at different locations inside the airport are shown in Figure 2.

Maximum noise levels of 92.5 dBA with an average of 82.9 dBA were recorded near the airfield, while the minimum average level of 63.6 dBA was recorded in the arrival hall. Employees working on the apron and inside the baggage room are exposed to moderate noise levels (73.9-86.2 dBA); however, the exposure period is long (based on survey results: daily shift of 12 hours). The WHO recommends that the average noise levels do not exceed 75 dBA for an 8-hour shift.

3 - NOISE MODELING

Three basic scenarios were simulated in order to evaluate current and future noise exposure levels due to aircraft operations (Table 1).

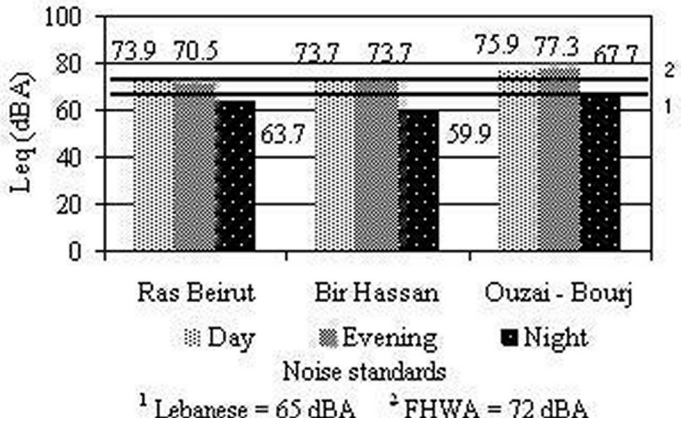

Figure 1: Average noise level at areas around the airport.

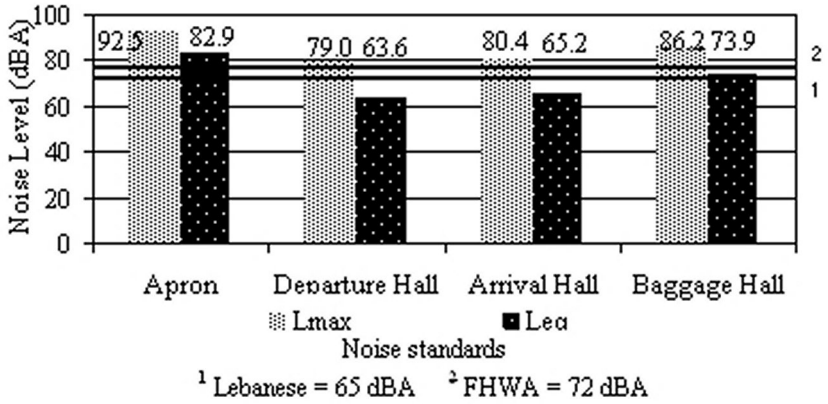

Figure 2: Noise levels recorded at the BIA.

Aircraft fleet composition and weekly arrival and departure schedules were obtained from airport authorities. According to these data, an average traffic of 78 daily operations (landing and take-off) occurs during a typical 24-hour day. The estimated current number of passengers per year using BIA is 2.2 millions. The Airport Master Plan study predicts 6 million passengers would be handled by the year 2015. This would account for 184 daily operations based on an annual estimated average of 90 passengers per aircraft.

Scenario	*Year*	*Runway Configuration*
1	2000	Eastern (21/03) and western (36/18)
2	2015	Eastern (21/03) and western (36/18)
3	2015	Eastern (21/03) and maritime (35/17)

Table 1: Different simulations scenarios.

Figure 3 compares the areas of each day-night noise level (DNL) contour limit in different simulations. The change in the arrival flight path to a new maritime runway indicates that a significant reduction of noise in the heavily populated residential areas is possible. A 27 percent reduction in the area affected can be achieved in the 55-60 dBA contour zone. When the new maritime runway is used, the total noise affected area would remain the same despite a three-fold increase in traffic in the year 2015. Extension of new neighborhoods surrounding the airport will continue to be the most affected.

4 - MITIGATION MEASURES

Noise mitigation due to aircraft traffic can be achieved by:

- Reducing noise at the source (airport) by following new operational measures (flight scheduling and enforcement of international environmental regulations) [2].

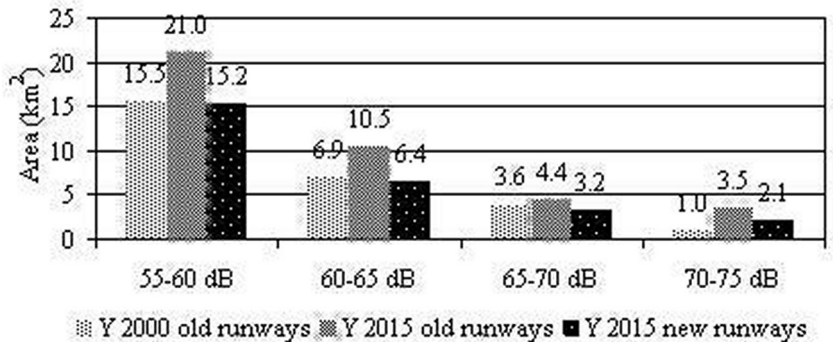

Figure 3: Comparison of contour areas in simulated scenarios.

- Limiting the number of people exposed to noise by following a new land use planning and changing the flight path.
- Protecting the exposed people by providing ear protectors [3] and shorter shifts (airport employees), by constructing a shielding wall around the airport [4], and by establishing proper building code that specifies zoning regulations.

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