noise-sensitive institutions, such as hospitals, schools and kindergartens. Within day zone 1 and the night zone a noise insulation program had to be implemented for existing public homes, and existing particularly noise-sensitive institutions. The data necessary for determining what constitutes an area qualifying for protection from night- time noise are taken from an operational/traffic forecast. With 701.000 movements/year, it over-estimates the current actual amount of aircraft noise.

5.2.2 For the purposes of long-term noise protection, the German state of Hessen has additionally laid down a residence restriction zone around the airport, which locally reaches further than the noise protection buffer area implemented. In accordance with the German Air Traffic Noise Act of 2007, no new residential areas are to be given planning permission in this residence restriction zone.

5.3 Environmental control and management

5.3.1 A number of environmental measuring and monitoring schemes are in place at the Frankfurt Airport.

5.3.2 Since 1964, the Frankfurt Airport Operator (Fraport) has been operating an aircraft noise monitoring facility, which has been continually expanded and updated. The system currently consists of 28 stationary measuring points and three mobile measuring containers. In 1965, for the first time ever in Germany, the local government of Hessen took up the position of an independent body specifically responsible for aircraft noise at Frankfurt Airport, acting as an intermediary between the airport and the airlines on the one hand and the local residents on the other.

5.3.3 In 1966, the "Commission for Protection against Aircraft Noise at Frankfurt Airport" was brought to life, comprising, among others, representatives from the surrounding communities, the relevant authorities, and representatives from the airport, air traffic control and the airlines. The Commission has the task of advising the authorities responsible for granting planning permission and those responsible for air traffic control about measures to protect against aircraft noise and against air pollution caused by air traffic (§ 32b of the German Aeronautics Act).

5.3.4 In the early 1970s, Lufthansa, the Federal Administration of Air Navigation Services (DFS) (the former federal office for air traffic control) and Fraport AG Group (FAG) (Fraport's predecessor) joined forces to develop the noise-reducing "Frankfurt flight approach" procedure, which has since become a global standard. In 1974, Frankfurt was the first airport in the world to give airlines a financial incentive to deploy quieter aircraft and to use the new flight approach procedure. This formed the basis for the method practised at a later date at all German airports, of charging different landing fees for loud and quieter aircraft types.

5.3.5 As part of the airport's efforts to set up an air pollutant control system, a new facility for measuring air pollutants and airborne substances was brought into operation in 2002. While two stationary measuring containers determine the impact of air pollution on a continual basis, a third mobile measuring container gives the airport the opportunity to monitor the spread, in spatial terms, over the entire area affected. Moreover, the airport operates software tools for calculating emissions and their spread. Such tools can show the separate proportions of air pollution specifically relating to the airport and the airport's vicinity.

5.3.6 There have been 370 measurement points set up to check the quality and composition of ground water at the airport premises and in the immediate vicinity, 240 of which are located directly on the airport premises. A large number of these measurement points are a component of the ground water quality control scheme which Fraport has been conducting for many years now. The local authorities and water boards are also involved in this scheme and can gain direct access to the data.

5.3.7 The airport's compliance with all the clauses and stipulations of Germany's water protection policies is supervised by a company representative specifically assigned to the task of water protection. There is a water protection alarm plan in place to assure that if any damage should occur, the problem is reported and corrected immediately.

5.3.8 There is a waste management plan in place in order to steer and control the flow of waste incurred at the airport. The airport's compliance with all the clauses and stipulations of Germany's waste management policies is supervised by a company representative specifically assigned to the task of waste management.

5.3.9 The airport prepares and updates a biotope report in connection with its preventative measures against bird strikes. This report, alongside the airport's general assessment of bird strike risk, provides significant guidelines regarding the content of the cultivation/biotope management plan at the airport and in its immediate vicinity. The landscape is cultivated in such a way as to make it unattractive to large bird species. The areas between the taxiways, amounting to some 500 hectares, probably constitute the region's largest non-agricultural area of greenery. One by-product of the airport's biotope management plan is that its surface areas boast a notably wide and valuable range of unusual plant and insect life.

5.3.10 In 1999, Fraport introduced an environmental management plan to steer and control its overall operational environmental protection policy. This meets the requirements of ISO 14001 and those of the more stringent European decree EC 761/2001 Eco-Management and Audit Scheme (EMAS). EMAS contains major, tighter requirements as to the examination of legal compliance and information available to the general public. Moreover, EMAS relates to the specific location and thus also includes indirect environmental factors not caused by the airport operator itself.

5.3.11 Within the framework of EMAS/ISO 14001, Fraport makes continual efforts to improve its environmental performance and to moderate the impact of the airport on the environment, wherever this is necessary and feasible. The following points should be mentioned in this context.

5.4 Soundproofing scheme

5.4.1 In October 2011, ahead of the inauguration of the new runway, a new soundproofing scheme was defined by the Hesse Government, based on federal law. This new scheme strives towards daytime and night-time peace for those residents living within an area particularly affected by aircraft noise. This involves, where necessary regarding the occurring noise level, installing of soundproof windows and sound-absorbing ventilation in houses within a specific area qualifying for protection from noise. The boundaries of the daytime noise area correspond to a noise contour within an equivalent continuous sound level of 60 dB(A). Those for night-time noise correspond to a noise contour defined by a combined criteria of, on average, six occurrences of night-time aircraft noise with a maximum noise level indoors of at least 53 dB(A) and an equivalent continuous sound level of 50 dB(A) take place. "Night-time" is defined as the period from 22:00 to 06:00 local time.

5.4.2 The data necessary for determining what constitutes the area qualifying for protection from night- time noise are taken from an operational/traffic forecast which over-estimates the current, actual amount of aircraft noise. The goal of the soundproofing scheme is to reach, on average, an equivalent continuous sound level of 40 dB(A) daytimes and 30 dB(A) night-times, each one for existing buildings. There are some 86.000 households located within the area qualifying for protection from night-time noise and 12.500 households within the area qualifying for protection from daytime noise. The scheme also includes all institutions particularly worthy of protection, such as kindergartens, schools, hospitals and retirement homes.

5.5 Noise and emission related fees

5.5.1 A tariff system linking take-off and landing fees with the aircraft noise actually measured was introduced and took effect on 1 January 2001, and has been continuously updated since then. This tariff system allows airports to differentiate even further than the ICAO classification system permits (Annex 16, Volume I, Chapters III and IV), and separates the various aircraft types into 16 different noise categories, based respectively on their take-off or approach noise level (either individually or as a group) measured by the airport's noise measurement facility. There is a substantial difference in the noise-related surcharges imposed between Class 1 and Class 16. At night, additional noise-related surcharges are imposed.

5.5.2 The purpose of this system is to give the airlines an even greater incentive to deploy state-of-the-art, quieter aircraft at Frankfurt Airport. Additional night-time surcharges are imposed on night-time flights, which are also differentiated according to the 16 noise classes, and noisy aircraft (marginal Chapter III) pay additional surcharges in the evening and early morning hours (20:00-08:00) and on weekends. This system is intended particularly to discourage the airlines from using noisy aircraft during the most sensitive periods.

5.5.3 On 1 January 2008, Frankfurt Airport and Munich Airport introduced an emission charge mainly based on the NOx-emissions of the aircraft. The charge is $3 \in \text{per kg NOx during a standard ICAO-LTO cycle, and is calculated for each individual aircraft. In the meantime, most major German airports have adopted this system. The purpose of the emission charge is to encourage airlines to order aircraft with low NOx engines to improve local air quality around the airport.$

5.6 Night flight restrictions

The restrictions on night flights at Frankfurt Airport have increasingly been tightened, and flights are not permitted to be scheduled between the hours of 11:00 pm and 05:00 am. Late arrivals of aircraft scheduled before 11:00 pm are allowed until midnight. Late departures between 11:00 pm and midnight are possible only with individual permission by the air traffic authority. Between midnight and 05:00 am no exemptions are possible.

5.7 Ecological projects/environmental fund

Since 1997, Fraport has been giving its support to specific projects in the field of nature and environmental protection, environmental promotion and ecological research within a circumference of some 30 km around the airport. The environmental fund set up by the airport for this purpose has since sponsored more than 200 projects, investing a total amount of 13 million euros.

5.8 Compensation measures

For all airport planning work performed at Frankfurt Airport, Fraport undertakes every effort to keep the impact on nature and the surrounding landscape to an absolute minimum and implements compensatory and replacement measures if this is either not possible or is possible only to an insufficient degree. For the most part, such measures involve cultivating new biotopes or replanting forests.

5.9 Communications

The airport reports on its environmental management performance in various ways. Notably, every two years, it issues an environmental statement which is examined by an external expert, and in the years in between it releases abridged statements. It prepares an aircraft noise report twice a year, which the results of the aircraft noise measuring facility are shown and explained in detail. This report also provides information on current measures in place and new knowledge gained on the subject of aircraft noise. There is also an annual Air Quality Report. Furthermore, Fraport's website also provides a wide range of information on the topics of environment and planning. It also offers detailed information on the personal situation concerning noise pollution by an address-related approach.

6. ITALY'S LAND-USE PLANNING AND MANAGEMENT RELATED TO AREAS ADJACENT TO AIRPORTS

6.1 Current State policy on land-use planning and management related to areas adjacent to airports

6.1.1 In Italy, land-use planning and management is under the direct responsibility of Regions and Municipalities, in compliance with the National Regulatory framework.

6.1.2 A new approach-related to flight operations and additional and special rules on airport surroundings, is provided by the Italian primary legislation (Air Navigation Code) and other specific laws related to environmental issues.

6.1.3 In order to implement the Air Navigation Code provisions, the Italian Civil Aviation Authority (ENAC) has defined and issued technical requirements and policies about the land-use planning in areas adjacent to airports, in compliance with ICAO and EASA regulations, and identified as areas of constraint.

6.2 States best practices

The relation between the airport and its surroundings must be carefully analysed from two different points of view: flight operations safety issues and neighbourhood issues (safety and health).

6.3 Flight operations safety

6.3.1 The Italian Air Navigation Code provides specific requirements. Other requirements are issued by ENAC through specific regulation, endorsing ICAO Annex 14 into national regulation. In addition, specific requirements are provided for various hazards, such as photovoltaic installations dazzle, lasers dazzle, and wildlife strikes.

6.3.2 Related constraints provide specific requirements for buildings, constructions and human activities in the ATS of the airport and are related to Instrumental Procedures Surface, Building Restricted Areas (BRA ICAO EUR DOC 015) for CNS facilities and other provisions issued by ENAC.

6.3.3 These requirements are collected/shown on a map called "*Mappa di Vincolo*" provided, published and approved by local municipalities in agreement with ENAC. After the map is approved, the municipality has to adjust all the local planning accordingly, and consequently, can authorize new buildings assuring that their height complies with the applicable constraints and that the potential risk to air navigation is minimized.

6.4 Neighbourhood safety and health

6.4.1 The Air Navigation Code foresees two typologies of planning tools, developed by ENAC:

- a) The first is a Risk Management Plan, for all civil airports, drawn up and adopted by the local Administration, based on the criteria fixed by ENAC regulations. Each Risk Management Plan is produced and developed by the local municipality and approved by ENAC.
- b) The second is a constraint related to the Third-Party Individual Risk Analysis, also requested by the Air Navigation Code, Third-Party Individual Risk Analysis. This planning tool limits anthropic levels through limitation of people in the areas and avoiding specific activities (e.g. shopping center). These restrictions apply to new buildings and new activities.

6.4.2 The Risk Management Plan allows the identification of land use not compliant with the level of exposure to the risk generated by a potential aircraft incident and provides limitations for the number of people who live, work or are present in the surroundings. Figure A2-3 and A2-4 show the different layout of the Risk Management Plan for airports with runway lengths classified codes 1 and 2 or codes 3 and 4.

6.4.3 For each area, ENAC regulations provide guidelines in order to avoid the presence of building typologies related to the presence of a large number of people, such as a shopping center, sports stadium, huge convention center, etc. Furthermore, in such zones closer to the runway, the land use must prevent and limit the construction of new residential areas.

6.4.4 The footprint of the plan has been defined by ENAC on the basis of its own database that considers aircraft accidents that have occurred worldwide in last fifteen years.

6.4.5 In addition to the Risk Management Plan, the Italian regulation foresees the second tool (a constraint related to the Third-Party Individual Risk Analysis, also requested by the Air Navigation Code, Third-Party Individual Risk Analysis) in the case of airports with a traffic volume at least of 50 000 movements per year (current or planned in the Airport Master Plan). this tool is . ENAC has developed a model to assess the Third-Party Risk. The model defines the Public Safety Zones (PSZs) which regulate the destination of use of the territory. ENAC lists those zones for the local Municipalities which take them into account in defining their urban plans. Similar to the Risk Management Plan, the Third-Party Individual Risk analysis limits anthropic level through limitation of people in the areas, avoiding specific activities, imposing a construction burden and, in the highest risk areas, displacing specific activities or buildings outside the safety zones.

6.5 Airport noise management

6.5.1 The main reference within the Italian noise regulation is the Ministry of Environment Decree 31/10/1997 – "Measurement methodology of airport noise, in enactment of the Law n. 447/95". The Italian CAA manages Noise Pollution issues generated by airports through local departments.

6.5.2 A special Commission, chaired by ENAC, approves the mapping of noise contours and cleared zones, in cooperation with the Ministry of Environment, Public Agencies, Regions and local Municipalities.

6.5.3 After the approval of the maps, local Municipalities must modify and give compliance to their urban plans on land-use forecasting.

6.5.4 The Italian regulations consider scientific indicators for the airport noise measurement (LVA) and tree-homogeneous zones for perceived noise levels (noise contours): "A" zone with LVA between 65 and 60 dB(A), "B" zone with LVA between 75 and 65 dB(A) and "C" zone with LVA over 75 dB(A).

6.5.5 In two of these three zones, anthropic activities are limited; in particular, in "B" zones, residential activity is not permitted and any other activity (farming or raising livestock, industrial and similar commercial activities, tertiary or ancillary) are allowed following the adoption of appropriate sound insulation measures. In "C" zones, activities are allowed only if functionally related to the use of airport facilities and services.

6.5.6 In the airport surroundings, noise reduction requirements are defined by ENAC in a specific document.



Figure A2-3. Airports with runway lengths classified codes 1 and 2



Figure A2-4. Airports with runway lengths classified codes 3 and 4

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6.6 Airports Master Plans

6.6.1 Airport Master Plans are drafted by the airport managing company based upon a procedure that involves a preliminary approval by ENAC, an environmental impact assessment by the Ministry of Environment and an urban assessment by the Ministry of Public Works and Transportation, in cooperation with regional and local Authorities to ascertain the proposal's compliance with urban planning. The target is to reach an agreement between the administrations, and integrate the airport development with Regions and Municipalities plans and policies. The final approval is granted by ENAC: it implies a declaration of public utility and benefit of the works reported in the Master Plan and a formal alteration to the local urban planning and related planning instruments.

6.6.2 In this way, the land-use forecast elaborated in the Master Plan in a given timelapse scenario becomes prescriptive and binding.

7. LAND-USE PLANNING AND MANAGEMENT AROUND AIRPORTS IN SWEDEN

7.1 Land-use planning

7.1.1 In Sweden, land-use planning is the prerogative of municipalities. The Swedish Transport Administration is involved in the land-use planning process as a party in the consultation procedure. The Swedish Transport Administration provides relevant information about, and sees to, the interests of the aviation sector in the planning processes. These include, among others, noise restriction areas and obstacle limitation surfaces around airports including areas of interest for the future expansion of the airports.

7.1.2 The major airports in Sweden are designated by the Swedish Transport Administration to be of national interest for transport and communication in accordance with Swedish law. This means that the County Administrative Boards have the obligation to check that the above-mentioned interests of the airports are protected in the planning processes.

7.2 Noise monitoring

7.2.1 In 1996-97 the Swedish government adopted national guidelines for traffic noise which should not be exceeded when building new residential buildings or erecting infrastructure including major reconstructions. These are:

- 30 dB(A) as an equivalent indoor level;
- 45 dB(A) as a maximum indoor level at night;
- 55 dB(A) as an equivalent outdoor level (by the facade); and
- 70 dB(A) as a maximum level at a patio connected to the building.

7.2.2 For aircraft noise, the outdoor level is set to FBN 55 dB(A), which is a noise index identical to L_{den}.

7.2.3 The national guidelines include two steps to reduce aircraft noise exposure. The first step has already been achieved at most of the Swedish Airports. As a second step, noise insulation of buildings should at least include properties exposed to the following noise levels outdoors:

- FBN 60 dB(A);
- 70 dB(A) as a maximum level, when the noise event occurs on average three times per night;
- 80 dB(A) as a maximum level, when the noise event occurs regularly during daytime and in evenings; and
- 90 dB(A) as a maximum level, when the noise event occurs regularly during daytime on weekdays only and during occasional evenings.

7.2.4 The Swedish Environmental Courts have, in several cases, established terms for reductions of aircraft noise that go beyond the goal of the second step

8. LAND-USE PLANNING AND MANAGEMENT AROUND AIRPORTS IN CUBA

8.1 Land-Use planning

State policies on land-use planning and management adjacent to airports are under the control of the Directorate of Civil Aerodromes Aeronautical Institute of Cuba (IACC). The management is done in close coordination with the National Institution that controls the politics of policy planning and organizational charting, which covers physical addresses planning governance structures throughout the country. The legal standard governing the approval process for new development programmes is the Resolution No. 91/06 of the Ministry of Economy and Planning. Section 1, Chapter 1X — Authorization of land use — indicates that the location of investments is established from the plans and studies of Zoning and Planning, which according to their characteristics and peculiarities are analysed by the IACC. Thus, all proposed construction or investment in land adjacent to the airports reach the IACC Address Aerodromes.

8.2 Noise monitoring

The International Standard 26 was established in 1999 — Noise Habitable Zones — Health Hygienic Requirements This standard specifies the method for measuring the sound level, which is used as an indicator of environmental noise with possible forecast models and maximum tolerable levels eligible in living areas, both inside the home and in the surrounding urbanized areas.

8.3 States best practices

8.3.1 The Cuban government considers all recommendations worldwide that are compatible with the attenuation or elimination of all production procedures harmful to the environment and human health. Throughout, the Cuban policy should also contribute to the welfare of human beings.

8.3.2 The IACC state duties are to incorporate the environmental dimensions between policies, plans, projects, programmes and other actions to be in line with the economic and social sustainable development.

8.4 Unsuccessful practices

No unsuccessful practices.

9. LAND-USE PLANNING AND MANAGEMENT AROUND AIRPORTS IN ETHIOPIA

9.1 Land-use planning

Current state policy on land-use planning and management is proactive toward safe aviation operations. The amended aviation act gives a legal basis for land-use planning and management around airports in Ethiopia.

9.2 States best practices

9.2.1 The areas around the airports are declared to be the Aviation zone, in accordance with the specifications of ICAO Annex 14 to Chicago Convention; so that, all land-use requirements are included in the municipality's Master Plan regulations. Aany construction in these areas require the Ethiopian Civil Aviation Authority's approval prior to construction. The ECAA Act basically requires permission from the Civil Aviation Authority prior to any development in the vicinity of an airport.

9.2.2 There is a close relationship and arrangements among the Municipality, Airport Operator and the Civil Aviation Authority in the use of areas adjacent to airports. Upon receiving a request for development adjacent to an airport, the municipality first figures out the necessary requirements based on the ECAA Act and sends a request to the Civil Aviation Authority. The Civil Aviation Authority then studies the proposal with priority to ensure safety of flight operations prior to granting permission and only then may development proceed.

9.3 Unsuccessful practices

There have been no reports of unsuccessful practices.

10. LAND-USE PLANNING AND MANAGEMENT AROUND AIRPORTS IN JORDAN

10.1 Land-use planning

The civil aviation regulator in Jordan, namely, Civil Aviation Regulatory Commission (CARC) is fully mandated, by the power of the basic Civil Aviation Law of 2007, to manage the land-use planning around public airports. Such mandate was reinforced by a Council of Ministers/Cabinet resolution as part of the state policy to maintain the safe operation of aircraft within the Jordanian airspace and its public airports. Accordingly, the intervention of CARC on the subject of land-use planning goes further than the boundaries of public airports (when deemed necessary). Nevertheless, to secure the integrity of its assignment, CARC's has based its mandate on the following criteria:

- Protection of national airspace and the surrounding area of public airports from industrial obstacles hazards;
- The environmental factors which have a direct impact on the safety of air navigation and land-use planning around public airports;
- The governmental strategic initiatives, with regard to the alternate electrical power supply projects, such as, generating the electrical power from wind power, solar systems panels, oil shale rocks, and peaceful nuclear power.

10.2 States best practices

10.2.1 In order to control the reliability of the land-use planning practices around public airports and outside its boundaries (when deemed necessary), CARC has formed a specialized committee chaired by an aerodrome expert, including specialists from all the related civil aviation's specialists: ATS; CNC; Commercial Pilot; Aviation Environment and AIS). The committee has been delegated to tackle, through studying and evaluating the applications, are received by CARC from the related governmental agencies, the public and the private sector, and to conduct the required aeronautical studies and risk assessments to ensure the implementation of the state policy as stated above. The terms of reference that govern the said committee's procedure is based on the following legal and technical references:

- 1. The Civil Aviation Law No.41 of 2007;
- 2. Jordan Civil Aviation Regulations No. 77 (Objects affecting Navigable Airspace);
- 3. Jordan Civil Aviation Regulations No.150 (Noise Compatibility Planning);
- 4. Jordan Civil Aviation Regulations No. 301 (Civil Aviation Environmental Regulations);
- 5. The Regulatory Advisory Circular on Establishment of landfill/ Solid Waste Near Airports;
- 6. Annex 14 Vol. I / Chapter 6 entitled "Visual Aids for Denoting Obstacles"
- 7. The determination of CARC on the limitation of the commercial Solar Systems Panels' project locations near the public airports.

10.2.2 To strengthen the States best practices and to control and manage the land-use planning at the national level with reference to the aforesaid criteria, the responsibilities of the governmental and military agencies are consigned, in a precise approach, as follows:

- The Civil Aviation Regulatory Commission is the only entity that, is authorized by the power of the law to tackle land-use planning and air navigation safety;
- The governmental and the military agencies shall provide the Royal Jordanian Geographical Centre with updated data regarding the industrial obstacles;
- The Royal Jordanian Geographical Centre has to bring up to date its obstacle database after receiving the above-mentioned data, in order to fulfill the ICAO requirements concerning e-TOD in coordination with CARC;
- The Jordanian airspace users, who exercise low flying aircraft operations, are obliged to notify CARC about any disrupted obstacle or any surveillance observation that may jeopardize air navigation safety, such as a highrise building within the vicinity of any public airport;
- Every related agency is in charge of overseeing the effectiveness and sustainability of obstacle lighting and marking, which falls under its jurisdiction as per CARC's requirements;
- The land planning authorities, local municipalities and Ministry of Environment are accountable for implementing CARC's requirements, which are interrelated to the landfill locations and the locations of the facilities that may constitute a potential attractant to wildlife/birds. Furthermore, the land planning authorities shall implement all the governing measures to reduce civil aviation noise up to the acceptable levels around public airports in coordination with CARC.