

THE ASSESSMENT OF THE ENVIRONMENTAL PERFORMANCE  
MANAGEMENT IN UKRAINIAN AIRPORTS

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**Abstract.** The comparative analysis of the environmental policy and performance of Ukrainian airports was conducted using specially defined parameters. To improve the existing situation we have developed recommendations on the list and content of environmental documents to be developed and implemented at Ukrainian airports, as well as possible regional environmental aspects of airports to be accounted in their policy.

**Key words:** environmental impacts, nature protecting activity, airport, environmental policy.

## 1. Introduction

Nowadays, air transportation is an integral part of many people's lives. This is a very fast and safe way to move. The more developed the tourism and economic industries are, the greater the demand for air transport is. Like any transport component, the airport impacts the environment, both locally and globally. Moreover, airports are often at the border with cities and towns and thus impose risks for human health.

Ukraine has a well-developed aviation industry, but despite this, the impact on the environment is not given as much attention as needed. The airport environmental policy and activity is the area that needs constant monitoring and improvement. The study and analysis of the environmental performance of airports are needed to identify “weaknesses” in eco-policy and environmental protection, find ways to solve these problems and minimize the impact on the environment. Thus, the work aims at analyzing the environmental performance of Ukrainian airports.

## 2. Analysis of the previous research

The range of negative impacts of air transport operations, in particular flights and maintenance of

airplanes, cargo and passenger services, is extremely wide. According to the results of studies on the adverse effects of aviation on the environment, the most important of them is noise during the operation of airplanes, emissions of pollutants, electromagnetic radiation, thermal pollution, contaminated waste from the airport. The climate impact is among the top issues discussed in relation to aviation activity on a global scale, as it is responsible for roughly almost 5 % of global greenhouse emissions [1, 2]. If the focus of the research is on the airports separately, then the most crucial factor is, of course, the noise pollution [3] and ground-level air pollution by aircraft and special transport emissions [4]. These factors deteriorate the quality of the living environment for the residents of the surrounding territories. However, the airport activities can have impacts on a regional level due to the intensive pollution of surface and underground waters and soils [5–7]. On a local scale, airports are also characterized by certain peculiarities of microclimate due to decreased fluctuation of temperatures, which makes the airport impact area stably warmer compared to the adjoining areas [8]. The presence of concrete and asphalt surface with no shadow at the territory combined with a warming effect of aircraft emissions create the heat islands [9] able to affect both staff and residents at adjoining areas [10].

Thus, most of the countries have already included projects of airport construction into the list of objects with mandatory preparation of the EIA documents before the construction permission is granted. However, it is often limited by setting the minimal length of the runway to 2100 m (USA, UK, EU, Ukraine). In contrast, RF, Kazakhstan and Belarus didn't include airports in the list of the objects hazardous to the environment.

There are about 20 airports in Ukraine (most of which have international status). As in any country in

the world, in Ukraine, airports play a strategic role in the national economy, which is reflected in the “State Target Program for the Development of Airports for the Period until 2023”. According to the plan, the passenger turnover of Ukrainian airports must be doubled by 2023 [11]. It involves plans for development, reconstruction, and modernization of international and regional airports, their integration into a single network, and the increase of services provided by them. However, there are no provisions for the improvement of the environmental safety of these facilities; in particular, investments in the installation of pollution control equipment are not planned. There are also no environmental targets set in the document. We can say that the modernization of the airports will definitely improve their environmental performance, but when it is not formulated as a clear goal, environmental protection will be often neglected. On the contrary, any increase in airport activity will lead to its expansion and, in turn, growing pressure on the environment.

Thus, there is an urgent need for analyzing the level of environmental consciousness demonstrated by the management of airports, as such research works haven't been conducted before. Another special task is to define the environmental issues typical for Ukrainian airports and set the priority list, which should be included in the nature protection strategies for these enterprises.

### **3. Methods and Materials**

The impacts of airports are well studied in a variety of individual research, as well as in complex works by international organizations such as ICAO, IPCC, WHO, US EPA, IATA, UNEP, and EEA. Still, these works represent the external view of the problem, while this research aims at analyzing how Ukrainian airports understand and deal with environmental impacts and nature protection tasks. To fulfill the set task it was decided to study the documents data sheets produced by Ukrainian airports in terms of environment protection. Since an airport is a very hazardous object in terms of environmental impact, based on the legislation of Ukraine, namely the Law on Environmental Protection, such businesses should pay specific attention to environmental measures. The recommendations on such actions are given in special documents by international organizations, the overview of which can be found in [12–15]. These recommendations must be accounted for by international airports to be allowed to serve international transportation. At local levels, airports invest their efforts into the development of environmental plans and

their implementation to mitigate the impacts of airports on the environment.

The theoretical and applied background for the transformation of airport operation towards environmentally sustainable practices is provided by the Environmental Management Systems approach, developed and adapted for application within a variety of certification systems. The most widely used standard on which an EMS is based is ISO 14001 within the EU EMAS framework, the other possibilities work mostly at national levels, like Acorn Method BS 8555 (UK), “Iniciativa e+5” (Spain), Ecoaction 21 Certification, and Registration Scheme (Japan), Eco-lighthouse program (Norway), Ecoprofit International (Austria). Among the specific solutions the Ecomapping System, Belgium, is successfully used at the preparatory stage for certification by the ISO standards family and MCERTS Monitoring Certification Scheme, UK, provides accreditation of environmental monitoring systems. The collection and management of data on the environmental performance indicators is a separate field of work and there is a variety of international software and management solutions enabling efficient control and processing of the key parameters, such as Cority, Gensuit, Donesafe. Even though they have some industry-specific packages, there are no systems developed for the aviation industry and airports in particular.

The work on the environmental protection at aviation facilities could be also formulated and formally declared in the form of the “environmental policy” which should be available through the airport websites. Most often, such information includes the basic principles of the enterprise environmental policy, the objectives of the environmental policy, and the environmental goals achieved.

The other important mirror for the environmental performance of the airport is environmental reports and environmental inspection findings. These data are available at the official web-portal of the State Environmental Inspectorate of Ukraine in the section “Results of State Supervision (Control)”.

Besides, based on the legislation of Ukraine, namely the Law of Ukraine “On Access to Public Information”, the community may receive any information, concerning the environmental safety of any industrial facilities, which makes any documents publically available.

To conduct the comparison of the airports in these three dimensions, we developed the system of grading and assigned them points by the following principles:

- Parameter 1– planning and documentation of environment protection activities –1 point for each of

the environmental document available in open access: environmental policy; report on environmental activities; environmental reports (official statistics submitted by airports); notifications of planned activities; EIA reports, Environmental Impact Statements and Conclusions of impact on the environment; Strategic plans for the development of the airports and Reports on the strategic environmental assessment; environmental safety rules; Management reports; Comprehensive environmental programs; Reports on the natural environment condition in the regions; Statements of environmental consequences;

– Parameter 2 – violations of the nature protection legislation according to the official information from the State environmental inspectorate – minus 1 point for each infraction;

– Parameter 3 – presentation of the environmental activity in mass media – plus 1 point per each organized positive event and minus 1 point per each negative event mentioned in mass media.

Having collected data about the environmental performance of Ukrainian airports from all the above-mentioned sources, we could rate their environmental efficiency in points of the scale.

## 4. Results and Discussions

### 4.1. Grading of Ukrainian airports by environmental performance

Since the focus of the study is the work of the airports on environment protection and delivering corresponding information, our study was based on the data from mass media and official sources, such as airport websites, municipal authorities, State aviation administration of Ukraine, and State environmental inspectorate of Ukraine.

Table 1 shows that few airports in the country have plans for implementing environmental measures and progressive environmental policy, as well as any environmental documentation. Most businesses either do not present environmental information and documents or do not develop the environmental field at all. Some airports with international status do not have even minimal information on their nature protection facilities, and some small businesses do not even have their own sites. Since most airports do not have environmental documentation, we have found the data in regional reports, city environmental passports, student surveys, and research papers.

Table 1

The total results of the evaluation of environmental performance management

No.	Name of airport	Availability of documents	Violations	Media information		Total
1	Boryspil International Airport	8	0	1	–	7
2	Lviv International Airport	4	0	2	+	6
3	Dnipropetrovsk Internat. Airport	3	0	2	+	5
4	Zaporizhzhia Internat. Airport	2	-19	2	+	-15
5	Mykolayiv International Airport	3	0	2	+	5
6	Ivano-Frankivsk Intern. Airport	0	0	0	0	0
7	Kyiv International Airport	3	0	1	–	2
8	Kryvyi Rih International Airport	0	-13	0	0	-13
9	Odessa International Airport	3	0	0	0	3
10	Sumy Airport	0	0	0	0	0
11	Rivne International Airport	2	0	0	0	2
12	Uzhhorod International Airport	1	-1	1	–	-1
13	Kharkiv International Airport	0	0	0	0	0
14	Ternopil International Airport	0	0	0	0	0
15	Chernivtsi International Airport	0	0	0	0	0
16	Poltava International Airport	0	0	0	0	0
17	Kherson International Airport	0	0	0	0	0
18	Vinnitsia International Airport	0	-2	1	+	-1
19	Cherkasy International Airport	0	0	0	0	0
20	Zhytomyr International Airport	0	-4	1	–	-5

According to the inspectorate data, environmental legislation has been violated for the last three years and as seen from Table 1, not all airports have been checked over this period (they are marked with 0 in the corresponding boxes). These omissions must be corrected by the authorities because such facilities must undergo more frequent control. Nevertheless, the data from other sources (reports on the state of the environment, city environmental passports, and research papers) prove the negative impacts of the airports. Therefore, those airports, which have negative scores, reflect the general trend for all businesses of this kind in Ukraine.

Information in mass media is also very poor, which shows low involvement of publicity to the regulation and improvement of the environmental performance of airports. Most of the media content related to airports deals with either some kind of reconstruction or complaints from residents about noise and chemical pollution, coming from the airports. This is a serious problem as the information flows from and into the airport have nothing to do with each other and hardly contribute to the improvement of both environmental safety and public perception of airports.

The total results of the evaluation show that airports with positive environmental performance are Boryspil International Airport, Lviv International Airport, Dnipropetrovsk International Airport, Mykolayiv International Airport, and Odesa International Airport. Eight (8) airports demonstrated zero efficiency (due to lack of any environmental information). The airports with negative efficiency (the number of violations detected by the inspection greatly affected the result) are Zaporizhzhia International Airport, Kryvyi Rih International Airport, and Zhytomyr International Airport.

#### **4.2. Development of environmental policy for airports**

The analysis of environmental reports, plans, declarations, and other documents shows that formulated environmental policy is available for Boryspil International Airport, Odesa International Airport, Lviv International Airport, and Dnepropetrovsk International Airport, while Zaporizhzhia Airport has only declared commitment to mitigation of environmental impacts. The Kyiv (Zhulyany), Mykolaiv and Kryvyi Rih International Airports, Ivano-Frankivsk Airport, Rivne International Airport, Sumy Airport, Uzhhorod Airport, Kharkiv Airport, Chernivtsi Airport, Poltava Airport, Ternopilaviaautotrans Company, Kherson Airlines, Vinnytsia Airport and Zhytomyr International Airport

have no formulated environmental policy or any declared commitments.

Airport environmental policy is a system of measures related to the management of airport environmental performance. The aim of environmental policy is to develop and implement the strategy for the mitigation of impacts on nature. Thus, the airport must take specified environmental responsibilities for minimizing its impact on the environment.

Any environmental policy should include strategic goals and tools/methods to achieve these goals. It is also necessary to develop the procedures to control the progress of implementing any environmental plans. Reporting procedure is also a must for the efficient environmental management of airport activity. Before planning or improving environmental policy, an airport should conduct an environmental audit and define the areas that need to be managed. Yet, aggregating the results of mass media, inspectorate control results, and international guidelines, we can recommend the major issues to be addressed by the environmental policy of any airport:

- Electromagnetic pollution;
- Vibration and noise pollution;
- Discharge of industrial and municipal wastewater;
- Air pollution (emissions of pollutants from stationary and mobile emission sources – aircraft, special transport and shuttle transport);
- Global and local climate effects;
- Soil pollution with petroleum products and heavy metals;
- Landscape change;
- Leakage and spillage of special liquids, used for aircraft surface treatment;
- Waste generation;
- Risk of accidents due to outdated equipment;
- Non-compliance with environmental legislation to be solved.

The environmental policy is obviously not the only document necessary to ensure the efficient nature protection activity, but rather a complex of documents and solutions is necessary. But there are some differences in the scale of implementation, funding, status, location, capabilities of the company, etc. with large and small airports. Thereby, the complex of environmental documentation to be available at any airports is slightly different depending on the scale of operations (Table 2).

Nowadays, environmental policy is not only a reflection of the attitude to the environment, but also a powerful market tool. Thus, if the company wants to gain certain reputation and status, it is impossible without minimizing the impact on the environment.

Table 2

**The recommended extent of environmental documentation and policy development for Ukrainian airports**

No.	Elements of environmental documentation	Large airport	Small airport
1	The environmental policy	must be well developed, with clear formulation of goals and approaches and methods of achievement, and accessible at information posts and web page.	must be well developed, with clear formulation of goals and approaches and methods of achievement and accessible at information posts and web page.
2	Documentation	The EIA report, Statement of environmental impacts, conclusions of ecological expertise, strategic plan of enterprise development, etc. must be present and made available to the public	The same list of documents should be present and made available to the public, <i>but</i> some basic documents may be absent due to the level of impacts on the environment
3	Reporting	Annual report on the environmental performance must be available at the airport information posts and web page.	Annual report on the environmental performance must be available at the airport information posts and web page.
4	Measures for environmental protection	Continuous plan of measures is required, but it should include legally obligatory measures and some extras; an airport should also participate in local and international environmental programs.	Continuous plan of measures is required, but it should include legally obligatory measures and some extras; an airport should also participate in local environmental programs.
5	Maps	Environmental impacts area, sanitary protection zone; building restriction zone, aviation noise impact zone (day / night)	sanitary protection zone; building restriction zone, aviation noise impact zone (day / night) – if they are applicable, depending on the scale of operations
6	Certificates	must be present and made available to the public	must be present and made available to the public
7	Monitoring and its results	mandatory monitoring and statistics for each environmental aspect must be available for public	mandatory monitoring and statistics for each environmental aspect must be available for public mandatory monitoring and results, <i>but</i> some components could be missing
8	Information on treatment facilities/waste management/ undertaken measures	<i>mandatory information</i> on the implemented measures to reduce the impact on the environment, on the availability and functionality of treatment facilities and waste management	<i>mandatory information</i> on the implemented measures to reduce the impact on the environment ( <i>desirable</i> information on the availability and functionality of treatment facilities and waste management)
9	Environmental education of employees	there must be <i>continuous</i> environmental education of the staff, the airport must ensure that all employees are aware of the policy and understand its content	there should be <i>periodic</i> environmental training of the staff, the airport should ensure that all employees know about the policy and understand its content
10	The legal and regulatory compliance obligations	mandatory	mandatory
11	Commitment to continuous environmental improvements	mandatory	mandatory

**4.3. The regional environmental aspects of airports**

This above presented list of environmental issues of aviation to be addressed in environmental policy includes the most typical areas for environmental responsibility of airports. At the same time, there are always specific factors, typical for different locations. For instance, some airports are located in sensitive areas, demanding specific solutions to address possible local issues. Looking at the airports under study, the Ivano-Frankivsk International, Kyiv International. Sikorsky (Zhulyany), Lviv, Zaporizhia International, Uzhhorod International, Kharkiv International, Ternopil International and Leonid Kadenyuk Chernivtsi International airports

are located near residential buildings. In such case a number of specific actions to reduce the impact on people and the environment are necessary:

- ü enhanced control over dangerous objects on the territory of the airport;
- ü monitoring of atmospheric air and EMF levels at the airport impact area;
- ü additional wastewater treatment if wastewaters are discharged in locally important water resources;
- ü development of green spaces outside the airport;
- ü protection against electromagnetic pollution outside the airport (active and passive shielding, etc.);

enhanced control and reduction of noise and vibration pollution.

In those cases, when an airport is located in the vicinity of protected areas, an important issue is biological safety: prevention of aircrafts collision with birds and overall expansion of biota to the territory of airport, minimization of disturbance of fauna in critical periods; reduction of noise, air and water pollution. The adjoining agricultural fields will be also sensitive to potential pollution of ground waters and soils.

Additionally we believe that there is a need to involve public to organization and optimization of nature protecting activity in airports. For this purpose the recommendations for airports on the public participation organization in the field of environment protection were developed. In order to identify the environmental concerns of consumers and local people, a series of actions should be taken:

1) A consumer survey, which will include both answers to questions about problems and suggestions that consumers would like to implement.

2) Surveys among the local population, which will include both answers to questions about problems and proposals that consumers would like to implement.

3) Creation of hotlines or a reception center for local residents / visitors regarding complaints and suggestions on the environmental issues (it could be integrated with the customer support center).

## Conclusions

1. The airport is rather large and complex engineering structure, so the influence on the abiotic components is quite significant, including destruction of soil, pollution of air, underground and surface water, noise, vibration and thermal pollution. The changes in physical environment have strong influence on biota. The population living in the impact zones of airports is also exposed to health threats. Therefore airports are subjected to state environmental control and numerous international and non-governmental organizations strive to mitigate negative environmental effects of aviation development. Still, there are questions on how the airports understand and fulfill their role in protection of the environment.

2. For the evaluation of the nature protecting activity at the Ukrainian airports, 3 parameters were chosen: availability of environmental documentations, violations of the nature protection legislation according to the State environmental inspectorate, and presentation of environmental activity in mass media. The activity of the Ukrainian airports was graded by the given parameters, using specially developed scale. The results of the evaluation showed that only 7 airports demonstrate positive efficiency, while 5 have negative performance. The other airports have zero efficiency, which is also a negative trend,

as the absence of positive actions is also the reason for environment degradation.

3. The analysis shows that environmental policy is available and accessible for Boryspil International Airport, Odessa International Airport, Lviv International Airport and Dnepropetrovsk International Airport, while Zaporizhzhya Airport has only declared commitment to mitigation of environment impacts. The rest of the airports have no formulated environmental policy or any declared commitments.

4. To improve the existing situation developed recommendations on the list of the most important and possible region specific environmental issues to be addressed by airports, content of environmental policy, type and scope of environmental documentation for large and small airports were developed. One of the most important guidelines is to address the problems faced by local communities and ecosystems due to airport functioning.

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