

## STRATEGY OF ECONOMIC EFFICIENCY ENHANCEMENT FOR LAND USE OF AVIATION TRANSPORT

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**Abstract.** *The issue of forming an effective land use system for aviation transport, which aims at obtaining a certain volume of material goods with minimum capital and energy costs, as well as achieving maximum productivity of natural resources use and environmental protection of the natural environment, was considered.*

*Operation of the aviation industry is an extraordinary economic contribution to the level of productivity of other industries, which is a powerful fixative for their growth. Such influence, in turn, contributes to the increase of the productivity level of the world economy.*

*It was substantiated that the economic evaluation of efficiency is a very important concept, which aims to determine the most optimal for the airline labor costs and capital, profit, compensation, use of labor, material and, above all, land resources as an indisputable territorial basis. One of the first issues that reveals the level of economic efficiency of land use of aviation is revenue (profit) as a result.*

*The main economic indicators of the efficiency of land use of aviation transport port, calculated with the obligatory consideration of the area of the land plot and the specific period of time during which the given land was exploited: the potential of land use; land use intensity, land use efficiency and insurance risk assessment.*

*The main ways to increase the level of economic performance of land use of aviation transport are to improve the structure of investments and the planning of infrastructure development in areas where the expansion of industrial and commercial facilities is possible. This investment strategy also aims to reduce the amount of residential development in areas near airports, as these objects are incompatible with each other.*

**Keywords:** *aviation transport land use, economic efficiency indicator, improvement and development strategy*

### **Topicality.**

The aviation industry has completely changed the way of travel and interaction with other types of production activity.

Modern society doesn't represent the world without aviation. So, thanks to series of democratic changes for the last 40 years, the cost of air transport services decreased by almost 60%, making it more accessible for more people on the planet. Also, over the years, airliners have become 70% energy efficient and 75% more quiet.

According to expert estimates in the field of air transport development, by 2030, the number of passengers using the services of air transport will reach 6 billion, and the number of domestic and international flights will increase by 50 million, which is almost three times more than in 2017.

Operation of the aviation industry is an extraordinary economic contribution to the level of productivity dynamics of other industries and a powerful fixative for their growth.

In turn, such influence contributes to the increase of the productivity level of the world economy.

Determining the types of land use with the airport activities, we must necessarily take into account economic factors that are inextricably linked with ecological moments. In most cases, decisions taken at the local level are somehow ignored, but it is a necessary factor of minimizing the negative impact of the airport on the environment and a factor of its protection against attacks on the part of incompatible types of land uses.

Considering the efficiency and eco-security of the main events and policies of land-use for the different countries, we can confidently confirm and we don't have a general strategy which can allow

solving a number of existing problems.

### **Analysis of recent research and publications.**

Issues of determining the economic efficiency of land use of aviation transport in the domestic scientific field are still little investigated. We should note some people among scientists who have made their scientific potential in the development and improvement of processes of ecologically safe and economically efficient of land use of aviation transport: S. Boichenko, O. Zapozhets, Milan Janic, I. Novakovska.

The scientific contribution to improving the processes of ecologically safe, economically efficient of land use and the development of transport infrastructure is contained in the works of domestic scientists: D. Babmidry, I. Bystryakova, N. Bondarchuk, Y. Dorosha, K. Marintseva, A. Martina, L. Novakovskii, A. Miroshnichenko, A. Tretyak, M. Stetsyuk, A. Yurchenko and others.

**The purpose of the research is the** definition of the main indicators of economic efficiency of land use of aviation transport and strategic directions of their improvement.

### **Results of the research and their discussion.**

According to expert estimates, the use of land for the purpose of accommodation and operation of aviation transport has always been very scarce, mainly for two reasons:

*first*, the question of using the territory for aviation needs is considered in the context of environmental indicators and by assessing the profitability;

*secondly*, in spite of the general international cooperation, the issue of land use

of the airport has always been considered at the local level, but for one country, we take into account regional and national development programs of airports.

The system of effective land use of aviation transport is aimed at obtaining a certain amount of material wealth, provided the minimum capital and energy costs, and achievement of the maximum productivity of natural resources using and environmental protection of the natural environment.

An economic assessment of efficiency is a very important concept, which aims to identify the most optimal for the airline labor costs and capital, profit, compensation for losses, use of labor, material and, above all, land resources as an indisputable territorial basis.

One of the first issues that reveals the level of economic efficiency of aviation land use is revenue (profit) as a result. In this case, it is necessary to determine specific economic indicators of land use of air transport (Figure).

Economic indicators (Figure) characterize the level of efficiency

of land use with the mandatory consideration of the area of land and a specific period of time during which the land is exploited.

**Potential of land use.** The economic indicator is expressed by the maximum number of air traffic (in the generally accepted system of ICAO, this indicator is called – Air Traffic Management (ATMs), which are carried out in relation to  $1 / A$  of the area of land occupied by the airport during the investigated period of time [3]:

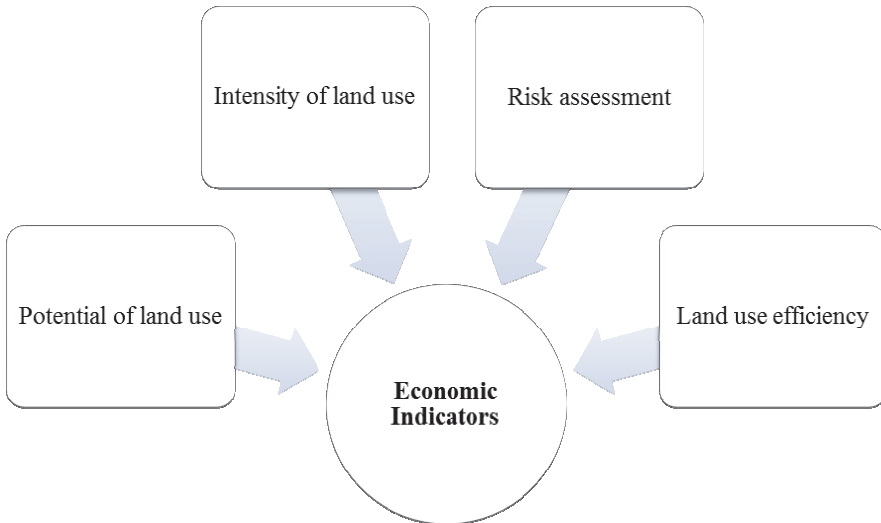
$$C_{LU} = C/A, \quad (1)$$

where  $C_{LU}$  – the potential of land use for a specific area of the land plot in accordance with the specific time;

$C(T)$  – the maximum number of air transportation per year (ATMs / year), while it is advisable to consider that one aviation transportation is equivalent to landing or take-off;

$A(T)$  – the area of the land plot which is occupied by the airport, respectively per year (ha or km<sup>2</sup>).

**Intensity of land use.** The economic indicator should be expressed by



**Economic indicators for determining the level of land use of aviation**

the number of units of workload equivalent to one passenger and his luggage, or 100 kg of cargo, in relation to 1 / A land plot which is occupied by the airport for a specific period of time:

$$I_{LU} = W_{LU} / A, \quad (2)$$

where  $I_{LU}$  – intensity of land use;

$W_{LU}(T)$  – the number of workload units placed at the airport for the year;

$A(T)$  – the area of the land plot which is occupied by the airport, respectively per year (ha or km<sup>2</sup>).

**Land use efficiency.** This economic indicator is expressed by the frequency of carried out transport (ATMs) on 1 / A land plot occupied by a specific airport during a specified period of time. Typically, the frequency is expressed by the time of arrival and departure of flights (ie, according to the schedule, with a delay of 15 minutes). In this case, the land area does not affect this value, and on the other means of management are usually used to balance the demand with the capacity of the airport, which, in turn, follows from the area of the occupied land and is calculated by the formula [7]:

$$Ef_{LU} = p_a * N_a + p_d * N_d / A, \quad (3)$$

where  $Ef_{LU}$  – the efficiency of land use (expressed in terms of: the number of flights / ha, km<sup>2</sup> / year);

$p_a(T), p_d(T)$  – the proportion of flights on arrival ( $p_a$ ) and departure ( $p_d$ ) for a certain period of time respectively (T);

$N_a(T), N_d(T)$  – total number of passengers arriving and departing for a certain period of time (T) (number of units);

$A(T)$  – the area of the land plot which is occupied by the airport, respectively per year (ha or km<sup>2</sup>).

**Land use economics.** Ultimately, it is important to define the meaning of the concept of land use economics for aviation in general. The concept is considered from the point of view of the level of profit, the use of labor, production re-

sources and contribution to the general, local, regional, national, social and economic welfare that must be achieved in relation to the unit area of the land plot which is operated by an airport. According to the analysis of the above indicators, to evaluate the economic efficiency of land use in general should be by the following formula:

$$ECLU = PR(T) / A(T), \quad (4)$$

where  $ECLU$  – economic efficiency of land use of aviation transport;

$PR(T)$  – net profit which is received at operation of the airport for a specific period of time (T) (€ or \$ US / year);

$A(T)$  – the area of the land plot which is occupied by the airport, respectively per year (ha or km<sup>2</sup>).

**Ways of raising the economic indicators level of aviation transport land use.** In order to increase the economic indicators level that were considered, it is expedient to apply measures to plan the improvement of the structure of investments [4].

The development of the airport can both stimulate and restrain its existence depending on the following factors:

- the presence or absence of infrastructure, which usually includes roads, a network of communal facilities (electricity, gas, water, sewage);
- the presence of such public facilities as schools, police departments, fire brigades.

Improvement of the structure of investments must be planned for infrastructure development in those areas, which are aimed at expanding industrial and commercial facilities. This investment strategy also aims to reduce the amount of residential development in areas near airports, as these objects are incompatible with each other.

It is also advisable to develop a capital investment plan for land-use types

that can interact with a certain level of noise and the maximum permissible level of pollution.

At the same time, measures to improve the structure of investments may be completely unnecessary for areas around the airport with well-developed infrastructure. Also, the provisions of the legislative framework, which do not regulate the conduct of certain measures, may become an obstacle. But still such a strategy is applied, and quite successfully, in Spain, Latvia, the USA, Poland and Korea.

**Risk assessment.** In any economic activity, it is advisable to consider the level of risks that should arise during production. In the case of aviation transport, it is necessary to calculate the risks of fatal aviation crashes, especially for such airport locations where is a tendency for a high concentration of different types of land uses near the runways. Therefore, the insurance risks from accidents to large-scale aviation companies as a result of the airliner crash can be calculated according to the following formula:

$$R_{FA} = r_{fac} * p_{fac/ap} * N * P / A_c, \quad (5)$$

where  $R_{FA}$  – estimation of risks of aviation transport land use;

$r_{fac}$  – the speed of fatal crashes of an airliner for a certain period of time;

$p_{fac/ap}$  – the probability that a car crash will occur in the vicinity of the airport in a specific, defined period of time;

$N$  – the number of flights for a specific, estimated period of time;

$P$  – the number of inhabitants living within the limits of a potential accident, an airplane crash around the airport for a certain period of time and occupying a particular area of the land plot;

$A_c$  – the area of the land plot which is occupied by the airport, respectively per year (ha or km<sup>2</sup>).

## **Conclusions and perspectives.**

Consequently, the economic side of the formation of effective land-use planning for aviation transport should operate and develop in order to achieve the following objectives [2]:

Estimation of the cost effectiveness in the allocation of a free land plot for the operation of aviation transport facilities or the calculation of the expediency of extending the territories of the exiting airport;

An assessment of the expediency of expansion the existing airport's territory, for example, for the construction of a new runway;

Measures for monitoring and comparing the results of land use at different airports, taking measures to avoid problems of incompatible adjacent infrastructure to the land use of a particular airport or vice versa;

Calculations of the future or current prospect of using land plots, which are occupied by airports.

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збитків, використанням трудових, матеріальних, і, в першу чергу, земельних ресурсів, як беззаперечного територіального базису.

Одним із перших питань, які виявляють рівень економічної ефективності землекористування авіаційного транспорту, є дохід (прибуток) як кінцевий результат.

Подано основні економічні показники ефективності землекористування авіаційного транспорту, які розраховуються з обов'язковим урахуванням площі земельної ділянки та конкретного періоду часу, впродовж якого дана земельна ділянка експлуатується: потенціал землекористування; інтенсивність землекористування, ефективність землекористування та оцінка страхових ризиків.

Основні способи щодо підвищення рівня економічних показників землекористування авіаційного транспорту мають на меті вдосконалення структури капіталовкладень та планування розвитку інфраструктури в тих районах, на території яких можливе розширення промислових та комерційних об'єктів. Така стратегія капіталовкладень також сприятиме зменшенню кількості житлової забудови в районах поблизу аеропортів, оскільки ці об'єкти несумісні один із одним.

**Ключові слова:** землекористування авіаційного транспорту, показники економічної ефективності, стратегія вдосконалення та розвитку

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СТРАТЕГІЯ ПІДВИЩЕННЯ ЕКОНОМІЧНОЇ ЕФЕКТИВНОСТІ ЗЕМЛЕКОРИСТУВАННЯ АвіАЦІЙНОГО ТРАНСПОРТУ**

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**Анотація.** Розглянуто питання щодо формування системи ефективного землекористування авіаційного транспорту, яке має на меті отримання певного обсягу матеріальних благ за умови мінімальних капітальних та енергетичних затрат, а також досягнення максимальної продуктивності використання природних ресурсів і додержання екологічної безпеки природного навколишнього середовища.

Функціонування авіаційної галузі є надзвичайним економічним внеском щодо рівня продуктивності інших видів промисловості та є потужним фіксатором їх зростання. Такий вплив, у свою чергу, сприяє підвищенню рівня продуктивності світової економіки.

Обґрунтовано, що економічна оцінка ефективності є дуже важливим поняттям, пов'язаним із визначенням найбільш оптимальних для авіапідприємства витрат праці й капіталу, отриманням прибутку, відшкодуванням

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СТРАТЕГИЯ ПОВЫШЕНИЯ ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ ЗЕМЛЕПОЛЬЗОВАНИЯ АВИАЦИОННОГО ТРАНСПОРТА**

<https://doi.org/10.31548/zemleustriy2018.04.05>

**Аннотация.** Рассмотрены вопросы формирования системы эффективного землепользования авиационного транспорта, имеющего целью получение определенного объема материальных благ при минимальных капитальных и энергетических затратах,

*а также достижение максимальной производительности использования природных ресурсов и соблюдения экологической безопасности окружающей природной среды.*

*Функционирование авиационной отрасли является чрезвычайным экономическим вкладом по уровню производительности других видов промышленности и является мощным фиксатором их роста. Такое влияние, в свою очередь, способствует повышению уровня производительности мировой экономики.*

*Обосновано, что экономическая оценка эффективности является очень важным понятием, связанным с определением наиболее оптимальных для авиапредприятия затрат труда и капитала, получением прибыли, возмещением убытков, использованием трудовых, материальных, и, в первую очередь, земельных ресурсов, как бесспорного территориального базиса. Одним из первых вопросов, которые выявляют уровень экономической эффективности землепользования авиационного транспорта, является доход (прибыль) как конечный результат.*

*Представлены основные экономические показатели эффективности земле-*

*пользования авиационного транспорта, которые рассчитываются с обязательным учетом площади земельного участка и конкретного периода времени, в течение которого данный земельный участок эксплуатируется: потенциал землепользования; интенсивность землепользования, эффективность землепользования и оценка страховых рисков.*

*Основные способы по повышению уровня экономических показателей землепользования авиационного транспорта имеют целью усовершенствование структуры капиталовложений и планирования развития инфраструктуры в тех районах, на территории которых возможно расширение промышленных и коммерческих объектов. Такая стратегия капиталовложений будет также способствовать уменьшению количества жилой застройки в районах вблизи аэропортов, поскольку эти объекты несовместимы друг с другом.*

**Ключевые слова:** *землепользование авиационного транспорта, показатели экономической эффективности, стратегия усовершенствования и развития*