Local Economy in Theory and Practice
Local Development Governance Aspects
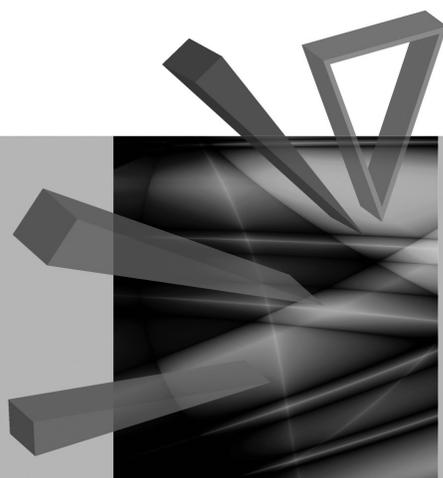
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Streszczenia

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AEROTROPOLIS – THE CITY OF THE FUTURE

Summary: The concept of aerotropolis is completely changing the way airport space is perceived. In the past, the word "airport" was understood as a place where simply planes landed and took off. Together with the rise of the concept, the airport is not only a place to start or end a journey, but also a place to spend spare time, to organize conferences and do shopping. The extra-aviation income became a key source for airport development all over the world. The development of non-aviation activities is influencing not only airport finances, but most of all, it is transforming them into places of innovation, entertainment, relaxation and business meetings. They become not only a stage of, but a final journey destination. All this, makes airports blend into the fabric of cities, and from airports in towns, is transforming them into towns-airports. In the aerotropolis concept, the airport is in the central part of the city, and its particular zones are developing concentrically around the airport.

Keywords: urbanization, air transport, enterprises location, working places.

1. Introduction

For many centuries, city development was related to the transportation network. Already in ancient times the cities developed on communication tracks, both terrestrial and marine. Primarily the cities were established at a distance possible to be covered on horseback. After the invention of the train in the 18th century, cities started to spread around railway stations. Nowadays, the airplane has become the most popular means of transportation. According to the International Civil Aviation Organization (ICAO) report, air traffic increased from 1640 million passengers in 2001 to 2563 million of transported persons in 2010. Because more and more people are using planes, air transportation is becoming the main driving force of urban development. This is well illustrated by the concept of aerotropolis, created by Professor John D. Kasarda from North Carolina University in Chapel Hill. The main scope of this paper is to present, using chosen examples, the currently operating large airports and their surroundings, which attempt to turn into actual aerotropolis, and the prospects for their development.

2. The concept of aerotropolis

The concept of aerotropolis is completely changing the way of the airport space is perceived. In the past, the word "airport" was understood as a place where planes simply landed and took off. Runways, control towers, terminals and other objects serving directly for passengers' and cargo handling are the parts of the airport. Together with the rise of this concept, the airport is not only a place to start or end the journey, but also a place to spend spare time, to organize conferences and do shopping. The airport, along with the basic infrastructure and services, is also a place hosting exclusive boutiques, restaurants, entertainment centers, galleries, chapels, banks, enterprises in the surroundings and the whole system of driveways.

Many of the airports that include in their sales offer trade and entertainment activities, receive more income from those two fields than from air-traffic sources, like landing fares and passenger services. The extra-aviation revenue has become the key source for airports' development all over the world. It is used for modernization of airports, developing the infrastructure and attracting and keeping airlines. This development of non-aviation activities influences not only airport finances, but most of all is transforming them into innovation, entertainment, relaxation and business meetings' places. They become not only a stage of, but a final journey destination. All this is making airports blend into the cities' fabric, and from airports in towns it is transforming them into towns-airports. "[…] The airport is not only the part of transportation infrastructure, and is not more the airport of the city, but is the city itself, city-airport […]" [Kasarda, Lindsay 2011, p. 129].

In the aerotropolis concept, the airport is the central part of the city. Particular zones are developing concentrically around the airport, the closest are industrial zones with those enterprises that are most frequently using the airport facilities, the most distant are housing zones. Particular zones should be divided with green belts and appropriately communicated.

There are ten main features that should be taken into account while thinking about the project of aerotropolis, or its critique [e.g. Charles et al. 2007; Freestone 2009; Kasarda 2010; Kasarda, Lindsay 2011]:

1. airport-dedicated express highways (aerolanes) and express trains (aerotrains), effectively connecting the airport with places of the highest business concentration and housing zone;

2. special lanes dedicated for trucks, located along express roads leading to the airport, to unload the heavy traffic;

3. time and sea coast accessibility between main hubs, not the distance between them, should be a priority in planning the aerotropolis;

4. companies should be located in the vicinity of the airport according to the rule of how frequently they need access to it;

5. industrial airport activity (production, storage, route transport) should be spatially diversified from the places of office work and passenger traffic;

    6. housing zones should be placed outside high intensity flight paths;

    7. houses around the airport, pavements, traffic lanes, landscape and public space should be arranged according to certain accepted standards;

    8. street architecture and public art should make the aerotropolis a pleasant place;

    9. the mixed service-housing zones inhabited by airport staff should be arranged in the way to ensure easy access to local services and give the sense of neighborhood;

    10. aerotropolis' development should be based on the rule of sustainability.

The aerotropolis has to meet all the features mentioned above. According to this it will not be only an airport but a well-planned city, a city in which the space will be friendly to the inhabitants. The aerotropolis aspires to improving the competitiveness of the town, the life quality and decrease the number of unemployed. The airport and the city coexist, both are very tightly linked one to another and cannot exist separately.

The new approach of the airport, the city and transportation integration needs an innovative strategy to plan the infrastructure and urban studies. The city-airport creation process demands joint planning on the level of the airport, city, region and included in this, the enterprises located in the neighborhood. Cities and regions need well paid work places, though it is essential to organize niches for many branches. In one place, particular enterprise departments could coexist (projecting, sales, research and development). The aerotropolis needs to be an economically effective creation, esthetic and sustainable both ecologically and socially.

Nowadays the large functioning airports have become key hubs in global production and corporate systems, offering them speed, agility and connections. They are also huge engines of local economic development, attracting different kinds of enterprises connected not only with aviation. These are, among others, distributive enterprises, retail trade, hotels, entertainment centers, showroom complexes, exhibition and conference space, office buildings.

Having sufficient communication facilities, high budget and super computers, companies can locate their managing branches in any place in the world. Factories, R&D sectors and call centers can be located elsewhere. SAP (international IT company) is an example of such an enterprise, with factories and offices in different places.

SAP is the second, behind Microsoft, largest IT company in the world. Its main seat is located in Walldorf, Germany, a small town 40 minutes' drive from the Lufthansa transportation hub in Frankfurt/Main. The American SAP branch is located in the suburbs of Philadelphia, marketing in New York and the laboratories in Palo Alto, Israel, Shanghai and Bangalore (India). The fast development of airports and the connected trade infrastructure is nowadays creating gateways to the development of the 21st century metropolis. Drawing a circle of a five-mile diameter around the airport, and another of the same size around the town center, allows us to find a rising aerotropolis. "[…] It is an ideal distance for passengers and

inhabitants to do shopping, meet each other, exchange knowledge, do business, eat, sleep and enjoy at a time-span not greater than fifteen minutes from the airport […]" [Kasarda, Lindsay 2011, p. 234]. This function-space evolution aims to transform many airports into cities-airports. More and more aviation oriented companies are located in airports' vicinities and along transportation corridors radiating from the airport. The new city form, called aerotropolis, spreads up to 20 miles outside some of the airports. Analogically to the shape of traditional cities, it consists of the main town and the surrounding rings. An aerotropolis is composed of the city-airport, neighboring transportation corridors and enterprise clusters of the connected companies and adjoining housing.

The basic benefit from the erection of an aerotropolis in the region is the creation of new work places. In aerotropolis' centers, the increase of new work places is seven times higher than in the centers of other cities. DFW airport (Dallas) has 400 000 work places in the radius of five miles around terminals, O'Hare (Chicago) 500 000 and Dulles (Washington) 200 000. One fifth of the IT, financial, consulting, scientific and technical branches of companies are located in 25 aerotropolis [Kasarda, Lindsay 2011]. The latest results of international routes investigations, related to Los Angeles airport, show that flights across the Pacific to Europe create 3126 new work places, costing 156 million USD, but generating an income of 623 million USD.

Other elaborations concerning flights between the United States and Japan showed that the Japanese were more prone to open shops in American cities supported by Japanese airlines, because it meant easier access to these towns and better control of their activities. That is why more Japanese shops can be found in Chicago and Los Angeles than in Houston. The money follows the flights.

The analysis of the multiplication effect of European flights to 41 American cities showed that a simple increase of the number of flights from the "Old Continent" – from three to four per day – generates about three thousand new work places. What is even more important, every thousand of passengers crossing the Atlantic creates between 44 and 73 new work places within the transportation center. The position of the metropolitan area in airline connections determines whether employment is rising or not, contrary to previous views that the city causes the airport's growth of importance. In fact, the airport development causes a rise in the metropolis' significance.

An effective transportation system is to be planned first, to create a sustainable and integrated aviation hub, that will became a city. "The basic thing to be done while thinking about aerotropolis is to build a transportation lane from the city center to the airport, then to plan how it all should be developed and what will be placed there. The creation of a transit center allows more applications" [Kasarda, Lindsay 2011]. Thanks to such a transportation system, the availability of access to places outside the airport area is increasing. The more the airport is integrated with the city, the more it is possible that it will turn into the city.

The main hurdle in aerotropolis construction now is the economic crisis. To create sustainable aerotropolis, large financial outlays are needed. Many countries will not be able to cover such extensive investment to build a huge airport with the whole surrounding infrastructure.

Another problem is also whether high technology companies and people would like to settle around the airport. The loud noise generated by planes might effectively put off potential aerotropolis inhabitants. Nobody wants the jets to fly above their property. It is also not without importance that air transportation generates the highest amounts of carbon dioxide emissions to the atmosphere, more than any other means of transportation. There is a huge conflict between the attempt to limit CO_2 emissions and people's relocation needs around the world.

Otherwise it is not a problem whether large airports will turn into aerotropolis, because if they do not want to be passed over in the global economic race, they will certainly need to make such a transformation. The question is: will they develop in a sustainable and clever way, minimizing the problems and serving well the neighboring companies, counties and airport users?

The aerotropolis vision might be a bit utopian, but as will be shown by the examples below, it is not impossible and, appropriately realized, may become a saviour for the state in these times of crisis.

Twenty four airports all over the world qualified as a functioning aerotropolis in 2011. Nine of them are in North America, seven in Asia, five in Europe and one in South America. During the next decade the development of the next 30 aerotropolis is expected.

3. The cases of aerotropolis

Three airports functioning as aerotropolis are described below. They are: Helsinki International Airport, Kuala Lumpur International Airport and Dallas/Fort Worth International Airport.

One of the world's largest airline hubs is Dallas/ Fort Worth (DFW) International Airport. The airport was built and opened in 1974. The FAA (Federal Aviation Administration) refused funds for two separate airports for both cities, forcing them into collaboration and thinking as one coherent region. DFW was to be a compromise for Dallas and Forth Worth. The arising agglomeration was called "Metroplex" (i.e. large scale city), inhabited by about six million people. DFW is actually located right in the center of the Metroplex.

The area of the airport is 7315 hectares, on its territory are located five half-circle terminals, 174 gates and 40 000 parking places. All the terminals are connected with a fast "Skyline" train. There are a dozen or so storage houses of private companies on the territory of DFW and their distribution centers, 150 ha of area International Commerce Park, two 18-hole golf courses and two five-star hotels: Grand Hyatt DFW and Hyatt regency DFW. In the first of these hotels there are 298 rooms and

about 500 m² of conference area, the other, next to Terminal C, offers 811 guest rooms and about 8300 m² of conference area. In 2006, part of the airport's land was hired by Chesapeake Energy, the second largest producer of natural gas in the United States. American Airlines hangars and cargo centers of UPS and FedEx are located within DFW.

Moreover, the airport has at its disposal 2428 ha of vacant land allocated for further investment. Constant development of DWF will allow local economy growth through the increase of non-aviation activities. Handling about 60 million passengers per year is the priority of the airport development. To fulfill this aim, a complex spatial management plan is being implemented. It is proposed to build a center of entertainment, retail trade, restaurants and the development of a railway to connect particular parts of the airport. On the opposite side of the center, car rental and catering facilities equipped with flight information screens will be erected. An important airport communication network is the Dallas Area Rapid Transport (DART), the system connecting buses, trains and light railway, of a total length of 115 km.

The Metroplex spatial management plan is not supposedly the only DFW development, but also includes other cities within the aerotropolis, which are: Dallas, Fort Worth, Grapevine, Coppell, Euless and Irwing. The joint effort and integration of all these cities have caused the sustainable and complementary airport evolution.

Kuala Lumpur International Airport (KLIA) is one of the main aviation centers in Asia. Since its opening in 1998, it has been awarded many prestigious prizes by international aviation organizations. It is located in the southern part of the Malay Peninsula, about 50 km from Malaysia's capital. The airport lies between four main cities – Kuala Lumpur, Shah Alam, Seremban and Malakka. It covers 10 000 ha of terrain. In the airport itself 2513 persons are employed, however the whole region generates about 22 thousand of work places. The airport is a part of the Multimedia Super Corridor (MSC), that is a special economy zone, delimited by the Malaysian government, to enable the country a fast economy development based on knowledge and information access. MSC covers an area of 42 ha, where two shipping terminals are also located, with a total loading capacity of 1.2 million of tons per year.

KLIA is not only an ordinary airport, but also a major destination point for people: a place of international meetings and a center of business and entertainment. It is a perfect example of an aerotropolis. Within the airport borders an international trade and business center, shopping center, many offices, a hotel and cinema are located. At a distance of 10 km from the airport, the Formula 1 race track is located, where every year in March the Malaysia Grand Prix is organized.

The airport is composed of three terminals – Main Terminal, Satellite Terminal and Low Cost Carrier Terminal. The Main Terminal building was designed with the use of the method "airport in the forest, the forest in the airport", meaning the creation of green areas inside and around the terminal. In the Satellite building, connected with the main building by an aerotrain, the Airside Hotel Transit is located, with

80 rooms for KLIA transit passengers. Moreover, a five-minute walk from the Main Terminal, there is a five-star hotel, offering 411 rooms. Airstrips and terminals cover an area of 2429 ha, while 6477 ha have been reserved for commercial constructions, recreational terrains, plant communities and a 10 km wide uninhabited buffer zone.

During the coming decade further development of KLIA is expected. The building of the Commercial Business District (CBD) will include a complex of office buildings, shopping, conference and congress centers. Within the CBD area there will be restaurants, hotels, car rental companies, even a hospital. A technology park is also planned 20 km from the airport.

Helsinki Airport International (HAI) is located about half an hour's drive from the city center, that is 19 km. It effectively links Asia and Europe, Western and Eastern Europe, through close connections and frequent flights. Every week there are about 1100 international and domestic flights from HAI. HAI was built as the main economy growth engine of Finland, and is a particular culture, science and business center. Finnish airlines "Finnair" located their main offices at the airport. The city growing around the airport, with the area of 42 km², the "Aviapolis", is a strategic element for the development of the Finnish city-airport.

Contrary to other, crowded European cities, HAI carefully planned the distribution of terminals and space around them, to ensure an appropriate atmosphere and possibility of fast relocation within the airport to the passengers. According to this concept, in December 2009, the airport invested 150 million EUR to enlarge the long-distance terminal, providing it with a spa and fitness.

Helsinki Airport and Aviapolis are well communicated with a transit route connecting the Scandinavian countries and Russia by the E18 Highway. The Vuosaari marine port also has a direct connection with the airport. A new railway, the Rail Ring Line, will also open in 2014, connecting HAI with the city center and the region. The total investment cost will amount to 605 million EUR. The main aim of Helsinki Airport is the development of passenger transport between Europe and Asia.

The Helsinki Airport management board allocated about 2 billion EUR for further investment to increase the airport's attractiveness.

4. Concluding remarks

It is worth recalling that not every big and rich city is able to become an aerotropolis. Only the cities that are important communication hubs can be considered. In the United States these are, among others, Memphis and Louisville; in Europe: Dublin, Amsterdam, Paris and Stockholm. Every one of this cities has grown due to large, modern companies and supplies. Aerotropolis is not created in a natural and spontaneous way, from the existing city fabric. It is an artificial product that needs to be planned and erected. Aviation transport centers are located in the most central places of the world, concentrating people in one point, as it is not possible anywhere

else. In Poland the cities that have a chance to turn into aerotropolis are Warszawa, Poznań, Wrocław, Kraków and Trójmiasto. However, it is not prejudged that all of these cities will become aerotropolis in the future. To achieve that aim, it is necessary to have the appropriate collaboration between the city authorities and the airport, as well as a suitable social and economic climate. As was shown above, in the case of large airports, trying to become aerotropolis cores, first good investment agreements were made between the authorities and the business sector, facilitating real estate market and taxation, despite the problems of airport location and transportation (roads, railroads, public transport etc.). This way of thinking is not yet the main aim of the appropriate authorities in Poland.

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AEROTROPOLIS – MIASTO PRZYSZŁOŚCI

Streszczenie: Koncepcja aerotropolis zupełnie zmienia sposób postrzegania przestrzeni, jaką jest port lotniczy. W przeszłości słowo „lotnisko" rozumiane było jako miejsce, gdzie po prostu lądowały samoloty. Wraz z pojawieniem się tej koncepcji, port lotniczy staje się nie tylko miejscem, gdzie rozpoczyna się i kończy podróż, lecz także miejscem, w którym spędza się czas wolny, organizuje konferencje i robi zakupy. Te pozalotnicze źródła dochodów stały się kluczowe dla rozwoju portów lotniczych na całym świecie. Przeznaczane są na modernizację lotniska, rozwój infrastruktury oraz przyciąganie i utrzymanie różnych linii lotniczych.

Rozwój nielotniczej działalności wpływa nie tylko na finanse lotniska, ale przede wszystkim przeobraża porty lotnicze w miejsca rozwoju innowacji, rozrywki, wypoczynku czy spotkań biznesowych. Stają się one miejscem docelowym podróży, a nie tylko pośrednim. To wszystko sprawia, że lotniska wrastają w tkankę miejską i z lotniska w mieście przekształcają się w miasta-lotniska. W koncepcji aerotropolis lotnisko znajduje się w centralnej części miasta. Wokół portu lotniczego koncentrycznie rozwijają się poszczególne strefy.

Słowa kluczowe: urbanizacja, transport lotniczy, lokalizacja przedsiębiorstw, miejsca pracy.