

Idea of Sustainable Development of Transport with Special Reference to Air Transportation

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Abstract The idea of sustainable transport is an important aspect with reach beyond countries of the European Union. Opinion of the European Commission defines conditions that should be fulfilled in order to achieve certain goals. Transport should be the same for the current and future generations, safe and without risks to human health or natural environment and provide communication accessibility. Moreover, to guarantee efficient operation, there should be available choice of means of transport and their integration with other options in proximity of an airport. This chapter presents an important matter of air transport integration with other means of transport. It puts a thesis that different means of transport must cooperate to be included in the system of sustainable transportation, with special attention paid to air and railway transport. It was noted that aim includes definition of air transport role in integration with other means of transport.

Keywords Sustainable transport • Integration of transport • Transport policy

Introduction

Sustainable transport is associated with efficiency, meeting the expectations of society, aimed at economically advantageous, at the same time minimizing the harmful impact of transport on the environment. This includes both the control of emissions of harmful compounds present in exhaust gases, and the (long-term) the transition from means of transport based on fossil fuels for vehicles using renewable energy. The assumptions of sustainable transport should also reduce the scale of destruction of space this is particularly the urban space, due to the dominance of individual car transport, whose examples are extensive parking lots or sidewalks and cars occupying a different space for pedestrians [1].

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Until recently, transport references showed trends to present rail and air transport as opposing, competing sectors. It is worth to notice the advantages that are possible to achieve when these two transport sectors work together.

Important aspects of transport development are related to integration of air and railway passenger transport in proximity of airports, defining areas where considered sectors have the potential to complement each other and defining factors that affect the decisions of construction of railways that support airports [2].

Dynamic development of air transport, which could be seen in Poland over recent years, is a part of worldwide trends. Passenger and cargo air transport is the fastest growing transport sector, and predictions on air traffic intensity show that growth dynamic will not change until 2030. Passenger and cargo transport from airports to urban areas require implementation of sustainable transport development. This involves appropriate control, coordination and organization of passenger and cargo flows to and within urban areas via other types of transport. Transport in Poland grows dynamically, and the European Union subsidies allow for modernization of railways and investments in airports [3].

Sustainable Transport

Transport is a very important piece in economic infrastructure puzzle and it greatly affects the dynamic growth of cities and regions. Transport facilitates fast and free movement of people, services and goods, which leads to capital flow [4]. Transport allows for economic growth, influences investment development by improving employment and multiplies income. Mobility is very important for domestic market, and also for quality of life for citizens who have the possibility of free travelling. Mobility of citizens to change workplace may be a factor to equalize the efficiency on the labour market. Bearing challenges in mind, the transport development must be sustainable.

The idea of sustainable transport is connected with the idea of world development thanks to the integration of natural environment with social and economic activities. This means efficient transport that meets social requirements, that is economically favourable, at the same time reduces harmful effect of transport means to environment to minimum. Therefore, actions are taken to reduce social demand for road transport. Idea of sustainable transport concerns all countries of the European Union. The European Commission experts' opinion defined the conditions that should be met. Transport should provide accessibility to route destinations in a way that is equal to current and future generations, safely, without risk to people or environment. Additionally, it should work efficiently, offer possibility to choose means of transport, and sustain economy and regional development [4].

Concept of sustainable development is an idea that originates from UN report of 1969. A sustainable development concept appeared, with integration of striving for prosperity and improvement of natural environment condition at its foundation. Therefore, the concept of sustainable development is based on the following:

- economic efficiency—profit for community, with consideration of social and environmental costs;
- care for environment—protection of natural, non-renewable resources, reduction in negative impact on environment; and
- social balance—creation of new workplaces and actions for improvement of quality of life.

The concept of sustainable development is reflected in the supreme legal act of Poland, the Constitution, whose article 5 states: “*The Republic of Poland shall (...) ensure the protection of the natural environment pursuant to the principles of sustainable development*”. At the same time, Poland accepted statutory obligations of Rio de Janeiro Agenda 21 decisions—Programme for XXI Century in the Act of 27 April, 2001: Environmental Law, which defines term of sustainable development as social and economic development that includes integration of political, economic and social actions with preservation of environmental equilibrium and permanence of basic environmental processes in order to balance environment availability to communities and citizens, for both current and future generations.

In colloquial understanding, sustainable transport includes means that minimize emissions of carbon dioxide and other substances harmful to environment. However, sustainable transport development is a concept that integrates ecologic, social and economic goals as seen from standpoint of transport policies in specific countries as well as by the European Union as a whole.

Integrated Transport System

Current actions for people and goods movement are aimed to create a system that will optimally satisfy transport needs and will connect functioning of all transport sectors into one entity, internally and externally. This concerns inter-sector actions and whole economy with branches that rely on transport. Those goals are covered by the term of integrated transport system. Great benefits may be achieved from cooperation of railway with other means of transport, in particular with air transport in global transport system. It is important to integrate them spatially to the greatest extent possible, which will allow fully free movement in collective transport. The integration brings the need for organizational improvements that reduce waiting time for passengers when changing means of transport it must allow for planning whole travel at its beginning and allow to purchase tickets for the whole route between starting point and destination. Railway transport should be oriented towards clients’ needs in order to take over part of road transport capacity and to cooperate with other sectors, e.g. air transport. It should include offer of intermodal services [5], while being a positive response to the needs of those who consider factors such as punctuality, reliability and use of new media in gathering information and helpful to organize a travel.

Support of railway transport within strategy of sustainable transport seems to be the right idea because of low environmental footprint and thus generation of the lowest external costs. Cooperation of railway with other transport means shows a great potential. However, it must be noted that careful consideration is necessary in decision-making when defining tasks, where railway should play a crucial role, as well as consistent politic actions in European and worldwide scale and systematic financial investments. Railway transport proves perfectly in crowded cities. Rolling stock travels along a separate track. One specific feature of railway traffic is earlier planning, and the time schedules define its functioning. Another important factor is small susceptibility to weather conditions. This advantage is important in comparison with air transport. Both rail and road transport play a crucial role in integration of urbanized areas with air transport. However, goods movement to and within urban areas is mostly carried out via road transport. Surveys carried out in UK capital showed that approximately 18% of vehicle traffic in the city is cars for enterprise provisioning [6]. Another 22% of city road traffic is vehicles for delivery services and of parcel companies that render services to individual clients by delivering ordered items to addressees. Surveys in Germany showed that 80% of all the city areas transport is done via road transport [7]. The reason lies in relatively short travel distances due to use of road network and possibility to deliver goods directly to recipient (which is usually impossible for railway or air transport). Therefore, trucks and delivery vans play a crucial role in functioning of cities by supplying goods to citizens.

It is necessary to notice problems and difficulties that appear when transporting cargo via road transport in urban areas. There are various problems, and they have different origins. They include the following [8]:

- problem of crowded cities and throughput,
- bad condition of transport infrastructure,
- aspects of city transport policy, e.g. restrictions for entry into city area for certain time periods, for vehicle size or weight, or excluding road lanes only for city passenger transport,
- problems with vehicle parking at loading and unloading space, no regulations for these aspects, tickets and fees, no parking lots,
- problems with queues to delivery acceptance points, finding addressees, determination of delivery time at addressee or client's premises.

Delivery of goods from air cargo terminals and organization of cargo transport in cities requires to establish proper cooperation between governors of the cities, carriers, shippers and other entities. The cooperation should allow to supply urban areas and at the same time observe ecology requirements, reduce operations and city traffic to minimum and create transport system that is economic, efficient, prompt, reliable, rational, safe and environmentally friendly [9].

Importance of Air Transport

Air transport is one of the most advanced and dynamically growing branches of transport. Aircraft move along airways and the movement itself requires ongoing coordination; therefore, appropriate airport infrastructure equipped with ground handling systems is necessary. Operation requires high capital investments and well qualified, selectively employed personnel.

Compared to other transport sectors, air transport features high safety, where safe transport process is defined as a process undisturbed by dangerous situations (events, accidents). In aircraft traffic, it is usually based on ensuring appropriate separation distances around a plane [10]. Considering mobility, air transport features easy accessibility of European and world regions and is important to fully benefit from economic potential and unify world markets. Airports and air carriers are the most important air transport entities, but it is the location and development of airports that have great impact on surrounding regions [2].

Development of air transport, which could be seen in Poland over recent years, is a part of worldwide trends. Air transport is the fastest growing transport sector and one of the important sectors in the world economy that generates great income yearly [11]. Additionally, using the air transport allows for short flying times. However, it does not mean short travel time in general, because it is necessary to include earlier presence at the airport to pass safety procedures. Nowadays, on short and medium distance routes between city centres, direct railway connections compete with air transport. Proper infrastructure, railway lines and rolling stock that exceeds speed of 200 km/h allow for fast travels to cities.

Reduction in airport access time and minimizing time of stay at the airport are factors that influence the perception of the transport as one entity. Moving by plane on long distances and getting from conurbation to the airport efficiently is an important factor for passengers.

Until recently, using air transport has been a sign of luxury. Air tickets were priced beyond acceptable levels for most people. Low-cost carriers brought revolution to the market and offer cheap tickets while meeting rigorous safety requirements.

Lower prices of passenger transport result from few factors that reduce costs of flight operations. Low-cost carriers use airports that offer cheaper operation, located at considerably inconvenient distance from destination cities. There are unavailable services, usually offered by other carriers, such as free meals and beverages on board, access to entertainment system, full attendance and luggage options.

Another thing to note is reduction in on-board staff to absolute minimum required by regulations, reduction in aircraft presence on the airport or using selected services from ground handling companies.

Evident disadvantage of air transport is high susceptibility to atmospheric conditions. Heavy rain or fog prevents air traffic. In spite of many attempts and advancements in technology, it is still impossible to create algorithm or a device that could present fully reliable weather forecasts.

Passenger or cargo air transport is not profitable on short distances. Aircraft offers advantages of achieving high flight speeds. Benefits of such features are noticeable on long distances. Aircraft has significantly smaller capacity than rail vehicles, and in cargo transport, it determines profitability of transport services. High cost is a disadvantage of cargo transport via aircraft, and this results from high fuel consumption during a flight.

Factor that enforces maintaining a high safety level is high susceptibility to terrorist attacks. In spite of high standards of safety procedures, it is impossible to fully eliminate the risk of such event occurrence.

Transport in Conurbation

All transport means have their strong and weak points. High speeds achieved by vehicles are connected with unprofitable conditions for short distance services. Air transport on such distances is expensive, which reflects in small interest shown by passengers. Railway transport can offer lower prices, but it requires proper infrastructure and satisfactory level of rolling stock reliability.

Therefore, it is worth to search for ways to integrate these two means of transport, using their strong points. System worth considering would include air traffic that runs transport services on long-distance routes, e.g. international and railway that runs domestic movement on medium distance routes, linking conurbations and inter-conurbation areas. Another thing to take into account would be ways to connect airports with city centres using railways, expected to be the future of transport.

Conurbation is a specific system that contains one large city surrounded by smaller cities and it needs an efficient interconnecting system that meets the needs of the passengers. From the traveller standpoint, apart from satisfactory level of transport options it is also important to provide information to allow travel planning.

Airport operation is defined by close relationship with conurbation it operates for, and which creates demand for air transport services. Determination of proper size of the airport and other transport branches in context of conurbation must be supported with studies, which should include the following conurbation parameters: population in the neighbouring city of the airport under examination and the population of the conurbation. Parameters important for airport evaluation should include communication accessibility in the scale of the city and the conurbation. Considering connection between airport and conurbation, good connection network inside the city and conurbation is important. Such analyses may be helpful in reasonable use of existing infrastructure and development of new airports in Poland —by improvements in coordination of airport infrastructure planning.

Approach to communication of an airport with conurbation requires consideration of anti-noise procedures. The consideration is necessary and may prove to be an important issue when defining guidelines for development plans for existing airports and construction of new airports.

Well-developed network of airports significantly impacts region economy, improves economic activities and facilitates cooperation in terms of economy, politics, science and technology. Many international corporations use aircraft in their activities and this may be important in decision-making process when considering locations of potential economy investments in a voivodship. Additionally, no access to airport may be a decisive factor against specific location for a company seat. Small distance from the airport is important in particular to foreign investors and international companies, since it allows for fast and direct connection with many places in Europe and around the world. In business trips, it allows to achieve one of the most valuable resources in the world of today, which is time. Air transport role is especially important in the most advanced economy sectors.

Good connection network between airports via suburban railway and long distance railway may improve transport network of the country. However, it is difficult to clearly identify the factors that make a good railway connection between airport and the city centre. Decision about railway line construction may bring unforeseen consequences, adversely affecting business activities of the airport. Car park near the airport can be used as an example. Let us assume that most of the passengers use railway connection, and this will reduce income from parking fees, and in the worst case, there will be no return of construction costs of parking lots.

Due to high costs of railway infrastructure construction, it is important that the airport generates large passenger flow. Now the questions arises whether to create direct connection between airport and the city centre, or include airport station into system of the conurbation railway network. Idea of fast urban railway seems reasonable, because it provides high capacity for passenger movement. It is worth to consider if conurbation citizen and a traveller heading to the airport have the same transport needs. If the needs are not equal, then what is similar and what are the differences. Short travel time and time schedules adjusted to flight schedules will be important to a passenger who wants to get to the airport. Therefore, it is very unlikely to create a transport line that meets the needs of commuters living in the conurbation area and airport passengers at the same time.

Airport accessibility is one of the factors that define quantity of people who want to use services available at the airport, and this is the type of passengers that bring income to the airport. Railway suited to the needs of workers or conurbation citizens will not be profitable to the airport, thus reducing number of people who use the airport.

High-speed railway is now successful in Europe and around the world. Initial assumptions that defined high-speed railway as a way to take over passengers who use air and road transport turned out to be true [12]. This type of transport is advantageous in areas such as reduction in travel time, reduction in traffic crowd, better safety in transport, reduction in energy consumption and pollutions, and—which is very important factor nowadays—improves attractiveness of cities and regions it supports, which contributes to social and economic development of the countries. It brings high values of public procurement, which improves economic

condition, greatly affects modernization of railway system as a whole, leading to greater efficiency in maintaining railway services and enhances income of infrastructure managing entities and operators.

High-speed railway is not only proper infrastructure, but also rolling stock. Requirements that define these elements are set out in respective documents: Council Directive 96/48/EC of 23 July 1996 on the interoperability of the trans-European high-speed rail system [13] and Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the community.

Each of the aspects such as railway connection between city centre and the closest airport and connections between centres of the cities requires a plan that defines the greatest chances to meet the transport needs of people. Construction of railway line to the airport is an important step towards improvement of transport within the region, which translates to connection system in the country. It is important to offer appropriate frequency of vehicle runs. When considering connection with the airport, train schedules must be coordinated with flight schedules, so the departing/arriving passengers do not have to wait too long. It is not a simple task, but it is necessary to aim for the best possible coordination between train and flight schedules. Equally important issue is appropriate promotion of the connection.

Combined ticket is a widely discussed idea, which allows to plan whole travel route at its beginning and includes travel using different means of transport. The idea seems very interesting from the traveller point of view, but it is a complicated issue for companies that offer transport services. The problem is obviously a material issue. Matters of argument are as follows: who should earn income and at what percentage, who should bear the costs and at what percentage and which is the most important, should the control lie within a central authority, regional authority or a private company.

Summary

Efficient connection system in the country serves to satisfy the transport needs of inhabitants. Requirements for modern systems of passenger transport are as follows: short travel time, safety and reliability of transport means, independence from weather conditions, high throughput capacity, travel comfort and use of environmentally friendly technologies.

Air transport is the perfect sector for international services, wherever other means of transport would not allow for the connection at all, or would imply time of the travel that is unacceptable for passengers. Air transport services on short distances are profitable only with the use of private jet aircraft that can carry a dozen passengers or so. Scheduled aircraft flights using short distance jets require substantial flow of passengers that Poland cannot create in the nearest future. Therefore, it is worth to consider air taxis that carry out transport services with business aircraft with capacity of slightly over ten people.

Establishment of proper communication between airport and other means of transport is a good and necessary idea. Ease of access from the conurbation centre is one of the factors that impact airport competitiveness. Availability and close distance to parking lots for people who reach airport by individual transport have similar importance.

Evaluation of transport process quality in conurbation is defined by timeliness (carrying out services in defined time), short time of carrying out, reliability (regarding time and cost) and safety. These are the main criteria when passengers choose certain means of transport over the others. Airport surrounding and connection with conurbation are key aspects to its development.

References

1. Europe 2020. A strategy for smart, sustainable, and inclusive growth. European Commission, Brussels, March 2010, COM (2010) 2020 final version
2. Kwasiborska, A.: *Rozwój lotnisk w Polsce. Systemy Transportowe*, Zeszyty Naukowe Politechniki Śląskiej, Katowice (2006)
3. Miłaszewicz, D., Ostapowicz, B.: *Warunki zrównoważonego rozwoju transportu w świetle dokumentów UE*, Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania No 24 Uniwersytet Szczeciński
4. Pawłowska, B.: *Zrównoważony rozwój transportu na tle współczesnych procesów społeczno-transportowych*, Wyd. Uniwersytetu Gdańskiego, Gdańsk (2013)
5. Tundys, B.: *Logistyka miejska*. Difin, Warszawa (2008)
6. Browne, M., Baybars, M.: *Development in urban distribution in London [w:]*. In: Taniguchi, E., Thompson, R.G. (eds.) *Logistics System for Sustainable Cities*. Elsevier, Oxford (2004)
7. BESTUFS, *Best practice handbook for urban freight transport*. www.bestufs.net (2013). Accessed date 27 Nov 2013
8. Rydzkowski, W., Wojewódzka-Król, K., Babis, E.L., *Transport*. PWN, Warszawa (2008)
9. WHITE PAPER—Roadmap to a single european transport area—Towards a competitive and resource efficient transport system. EUROPEAN COMMISSION, Brussels (28 Mar 2011)
10. Skorupski, J.: *Hierarchiczny system zarządzania ruchem lotniczym—aspekty oceny bezpieczeństwa*, *Logistyka* NO 6. Instytut Logistyki i Magazynowania, Poznań (2008)
11. IATA: “Fact sheet. Industry statistics” 2013. <http://www.iata.org> dostęp data 27 Nov 2014
12. Wróbel, I.: *Analiza oferty przewozowej i badania marketingowe przy projekcie “Kierunkowy program rozwoju kolei dużych prędkości w Polsce do roku 2040”*. *Problemy kolejnictwa* No 153 (2008)
13. Council Directive 96/48/EC of 23 July 1996 on the interoperability of the trans-European high-speed rail system