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EPIC approach as a tool for comparison of transport infrastructure in Poland and France

Metoda EPIC jako narzędzie oceny infrastruktury transportowej w Polsce i we Francji

Abstract. The EPIC structure allows to know strengths and weaknesses of each part of the world and of several countries in each part. It helps decision-makers, in accordance with their problem, to choose the best option of development and investments. It is a tool to have more information about economy, politics, infrastructure and competence. The goal of the paper is to compare the infrastructure in Poland and France by using of the EPIC approach. Poland is one of very good investment destinations for companies targeting both western and eastern as well as northern and southern parts of Europe. Unfortunately the transportation infrastructure in Poland is still poor if you compare with countries in the Western Europe, even if internationals routes have been developed and modernized. France is a very good investment destination for companies. The French government invests in repairs of the railway, maintenance of all the transports, development of ecological transport and the building of some new roads and new logistics area.

Key words: transport management, EPIC approach, transport infrastructure

Synopsis. Struktura metody EPIC pozwala na określenie mocnych i słabych strony każdej części świata, ale również poszczególnych krajów. Wspomaga to decydentów w wyborze najlepszej opcji rozwoju i realizacji inwestycji. Jest to narzędzie, które pozwala na uzyskanie informacji na temat gospodarki, polityki, infrastruktury i kompetencji. Celem niniejszego artykułu jest porównanie infrastruktury w Polsce i we Francji za pomocą metody EPIC. Polska jest jednym z bardzo dobrych miejsc realizacji inwestycji przez przedsiębiorstwa zainteresowane zarówno zachodnią i wschodnią, jak i północną oraz południową częścią Europy. Infrastruktura transportowa w Polsce jest niestety nadal słabej jakości w porównaniu z istniejącymi w krajami Europy Zachodniej, nawet jeśli weźmie się pod uwagę to, że polskie drogi międzynarodowe zostały rozbudowane i zmodernizowane. Francja jest bar-

dzo dobrym krajem do realizacji inwestycji. Francuski rząd inwestuje w remonty sieci kolejowych, utrzymanie wszystkich typów transportu, rozwój transportu ekologicznego oraz budowę nowych dróg i obszarów o przeznaczeniu logistycznym.

Słowa kluczowe: zarządzanie transportem, metoda EPIC, infrastruktura transportowa

Introduction

All around the world companies need to be in perpetual evolution in order to become more efficient and more competitive. Supply chain and management optimization is nowadays essential in each enterprise to achieve its goals. It covers procurement, manufacturing, warehousing, logistics, distribution and sales. Before taking a decision concerning supply chain activities, the decision-maker must follow a procedure and he needs advices but also tools to help him in the process of decision-making.

The Economy, Politics, Infrastructure and Competence (EPIC) structure is a tool for decision-making. Written by Mandyam Srinivasan, Theodore Stank, Philippe-Pierre Dornier and Kenneth Petersen, the book "Global Supply Chains: Evaluating Regions on an EPIC Framework – Economy, Politics, Infrastructure, and Competence" has been published in 2014 [Srinivasan et al. 2014]. The main goal of this book is the creation of a scoring scale and the assessment of supply chain activities for each region around the world – and lots of countries. It should help companies in the decision taking. Indeed, this book provides some key elements concerning global supply chains activities in different regions and countries. These indications enable to know what the best areas are to make some investments – roads, factories etc. – but also how to manage them – which type of transports, what type of problems etc.

The EPIC structure owns four dimensions and each of them assesses specifics fields [Srinivasan et al. 2014]. First, the economy dimension evaluates the economic situation. It means it assesses if the economic output and economic growth is good and enough attractive for foreign direct investments. It shows opportunities for companies if they want to begin supply chain activities. Secondly, the politics dimension assesses how the politicians support the supply chain activities. Indeed it checks the political stability, the protection of intellectual rights, the ease of doing business and the barriers before the creation of activities. Thirdly, the infrastructure dimension assesses the physical, energy and telecommunications infrastructures. It means it examines how the supply chain activities use these infrastructures and what quality they are. Finally, the last dimension is the competence dimension which evaluates the labor relations, labor productivity, logistics competence, education level of line staff and management, availability of skilled labor, and the speed with which a supply chain can be organized. The several dimensions have different weights for the EPIC measure, they take values 30% for economy and infrastructure and 20% for politics and competence.

Each dimension cited previously is made up several variables. To calculate the "maturity level" of a specific area, each variable is evaluated and receives a score between A – the best – and F – the worse. Depending on the importance of the dimension and the

variable, a weight enables to moderate the result. The picture below sums up the weight of each dimension – the total is equal to 100% – and the different variables with their weight too.
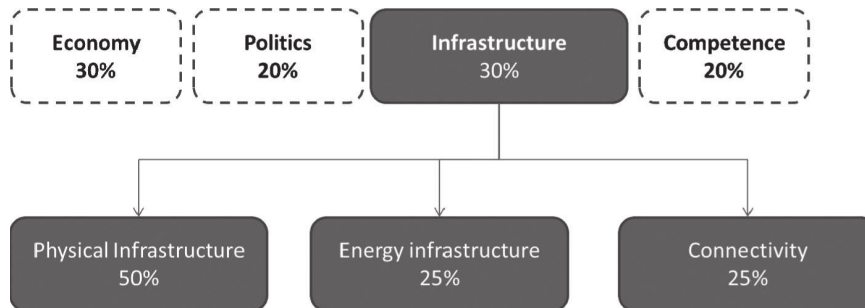

Figure 1. The structure of the EPIC
Rysunek 1. Struktura metody EPIC
Source: own work based on Srinivasan et al. [2014].

As this paper is focused on transport management, only the infrastructure dimension will be developed. It means the other variables will not be explained but it is important to keep in mind the EPIC structure is made up lots of variables.

All types of infrastructures within a country are indispensable for several reasons. First they ensure the transportation of people and goods in good conditions – in a timely and secure manner – and they create networks to connect distant areas. Secondly, they allow the communication between two organizations or more in order to have a good and rapid flow of information. Finally they provide different sources of energy which enable the functioning of equipment and means of transport. Good infrastructures are essential to ensure a proper working and an efficient management of the global supply chain. This dimension shows the potential for leveraging the supply chain and describes the different types of infrastructures or activities available.

The infrastructure dimension is divided in three parts which are transportation, utility and telecommunications and connectivity infrastructure [Srinivasan et al. 2014].
• The transportation infrastructure, judged as the most important, gathers the roadways, the railroad network and water and air transportation. The data comes from the World Economic Forum (WEF) – international organization for public-private cooperation – which provides a report named Global Competitiveness Index (GCI). This variable assesses, for instance, the quality of airports, seaports, roads and railroads. Another example is the assessment of the number of ports and their accessibility.
• The utility infrastructure assesses the generation and transmission of electricity. It means this dimension evaluates the infrastructures used for the production and the distribution of sources which enable to generate energy. The data also comes from WEF GCI and is used to evaluate, for instance, the quality of networks thanks to the absence or presence of interruptions – or voltage fluctuations – to power supply.

- The telecommunications and connectivity infrastructure assesses how the communications and the flows of information are. It is evaluated thanks to two types of data: the absolute value which corresponds to the number of Internet and mobile phone subscribers and the per capita value which corresponds to the previous numbers divided by the population size.

This report will make a comparison of the infrastructure between Central and Eastern Europe and Western Europe with the help of the EPIC structure. However, it is important to remember this method provides a score for a country which it is not an absolute measure of the global supply chain quality.

Transport infrastructure of Poland and France

An efficient transport system affects the economic activation and increases social mobility. The development of new routes contributes to the increase in production, trade, tourism, services [Logistyka… 2008][1]. Overall in every country, the transport infrastructures are composed of roads, railways, airports, seaports and inland waterways. We will compare all these types of infrastructures between Poland and France. In the next part, sources are more varied and don't come from EPIC Structure.

Roads

In Poland the quality of roads is not very good even if international roads have been developed and modernized. Indeed, four European routes cross Poland: E40 from Calais (France) to Leninogorsk (Kazakhstan); E67 from Helsinki (Finland) to Prague (Czech Republic); E75 from Vardo (Norway) to Sitia (Greece) and E30 from Cork (Ireland) to Omsk (Russia). Those roads are essential in Europe to carry goods in every country so Poland has a good geographic position [Jarzebowski, Bezat-Jarzebowska 2014]. Moreover the government put money into the building of new motorways like A1 (between Gdańsk and Gorzyczki), A2 (between Świecko and Kukuryki) and A4 (between Jędrzychowice and Korczowa). Thus, the Polish network are getting better thanks to lots of investments. Currently, it is composed of 19,296 km of national roads, 28,480 km of regional roads, 125 308 km of district roads and 240,447 km of communal roads so a total of 413,531 km of public roads Turek et al. [2015].

In France, the road networks are of good quality, well-developed and well-maintained. Few new roads are building but the government and the private companies invest mostly in the maintenance and repairs of roads. The French network is composed of 11,300 km of motorways, 9 768 km of national roads, 377,984 km of regional roads and 642,254 km of communal roads so a total length of 1,041,309 km of roads[2]. The longest motorways in France are A4 (between Paris and Strasbourg – 480 km), A6 (between Paris and Bordeaux – 455 km) and A10 (between Paris and Bordeaux – 557 km).

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[1] More on the perspectives of transport development and its influence on the economic growth in Klepacki and Rokicki [2010].

[2] http://www.developpement-durable.gouv.fr/Consistance-et-cartes-du-reseau.html, http://routes.wikia.com/wiki/Longueur_du_r%C3%A9seau_routier_fran%C3%A7ais.

By comparing Poland and France, the French road networks are more developed than the Polish networks, but a lot of money is invested in the building of new roads in Poland. Thus both French and Polish roads are well-equipped for the transportation of goods and people without problems.

Railways

It exists two values to evaluate the railway network: its total length and the total length of electrified railway lines, it means the lines on which trains can run thanks to electrical power.

In Poland in 2014, the length of the railway network amounts to 19,200 km and 61.5% of these railway lines are electrified that being around 11,800 km. There are 1,423 train stations and 631 active stations [Turek et al. 2015]. The railway transport is developed – mostly in the West of Poland – but the government is improving it because there are still lots of enhancement to do. Polish trains are generally comfortable, quick and on time [Logistics 2006]. Transport companies offer good services and they are making them better. The national railway is Polish State Railways (PKP) which are separated in several subsidiaries of whom the most known is PKP Intercity because it allows long-distance passenger traffic. It exists also other local railways like, for instance, Koleje Mazowieckie (KM) which operates around Warsaw or Chem Trans Logistic (CTL) which operates open-access freight trains throughout Poland [Logistics 2006].

In France the total length of railways amounts to 30 000 km and there are 15,687 km which are equipped with power lines[3]. Like in Poland, it exists only one national railway company named Société Nationale des Chemins de fer Français (SNCF) – National society of French railroad. It belongs to France – French government – because the railway transport market doesn't open to competition yet. It means this company has the monopoly but the European Parliament is talking about the liberalization of the market. The railway network is also well equipped and the trains are comfortable and quick with the TGV – French high-speed trains. However some people complain that SNCF trains are often late. Another negative point is the ageing of freight rail network.

In conclusion, the total length of French network is more important than Polish network but the total area is also bigger so it is logical. Otherwise both French and Polish networks are developed but sometimes ageing. Both French and Polish national railways are good and in constant evolution to improve networks and services.

Air transport

Poland improved its air transportation few years ago. Thus in 2014, there were 103 regular routes from Polish airports, of which 91 are international routes and 12 are national connections [Turek et al. 2015]. The Polish airports communicated with 41 countries. Most of them are located in Europe with cities like Brussels, Paris, Geneva, Vienna, Amsterdam etc., but some destinations are outside Europe like Chicago, Toronto or Tel Aviv. The total number of air passenger transport amounted to 25,714,000

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[3] http://www.sncf-reseau.fr/fr/a-propos/presentation/reseau-ferroviaire.

in 2014 divided for the most part between Frederic Chopin Airport in Warsaw – the biggest airport – and the airports in Kraków, Katowice and Gdańsk [Bourgeais, Bialas-Motyl 2015]. The number of passengers increased with a growth of 10.5% even though travelling by plane is usually the most expensive way [Bourgeais, Bialas-Motyl 2015]. This tendency can be explained by the arrival of some low-cost airlines like Ryanair or EasyJet which offer some air routes between Poland and another country. The largest Polish airline is LOT Polish Airlines which owns 43% of Polish air transport services market [Logistics 2006].

In France air transportation is very active. Indeed, both Paris Charles De Gaulle (CDG) airport and Paris Orly airport are in the top 10 European airports in terms of total passengers. The total air passenger transport in 2014 amounted to 141,742,000 [Bourgeais, Bialas-Motyl 2015]. The French airports communicate with countries all around the world. For instance from Paris Charles De Gaulle airport there are 34 countries and 106 destinations in Europe; 11 countries in North America and 34 destinations of whom 21 in the United States – Atlanta, New-York, Miami, Washington, etc. – or again 31 countries in Asia and 53 destinations.[4] Many airlines have routes between France and another country like Air France, – which now belongs to Air France-KLM – the national airline created in 1993.

French air transportation is more developed and more used than Polish air transportation. Indeed the total number of passengers in France is almost six times higher than in Poland (table 1).

Table 1. Air passenger transport in France and in Poland in 2014
Tabela 1. Pasażerski transport lotniczy we Francji i w Polsce w 2014 roku

Country	Total air passenger transport		National	Intra-EU	Extra-eu
	passengers (in 1000)	growth 2014/2013	passengers (in 1000)	passengers (in 1000)	passengers (in 1000)
France	141 742	2.6%	29 207	110 885	25 263
Poland	25 714	10.5%	1 477	18 659	5 557

Source: own work based on Bourgeais and Bialas-Motyl [2015].

The reasons are Paris owns two big airports – Paris CDG and Paris Orly – which welcomed respectively 63.6and 28.8 million passengers in 2014 [Bourgeais, Bialas-Motyl 2015] and Paris supplies most of destinations all around the world (Table 2).

By comparison with France, Poland is less developed and needs to improve its airports just as its destinations to become more attractive. However, the growth between 2013 and 2014 concerning the total air passenger transport amounted to 10.5% in Poland. It is a considerable growth for the airports expect for Chopin in Warsaw which had a small decrease –0.9% [Bourgeais, Bialas-Motyl 2015].

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[4] http://www.aeroportsdeparis.fr/passagers/les-vols/destinations.

Table 2. Top airports in the EU in terms of total passengers carried in 2014
Tabela 2. Główne lotniska w Unii Europejskie pod względem liczby pasażerów w 2014 roku

Rank	Airport	Total air passenger transport		National	Intra-EU	Extra-eu
		passengers (in 1000)	growth 2014/2013	passengers (in 1000)	passengers (in 1000)	passengers (in 1000)
2	Paris / Charles de Gaulle	63 654	2.8%	5 779	24 953	32 922
10	Paris / Orly	28 843	2.1%	14 017	8 699	6 127
27	Nice / Côte d'Azur	11 656	1%	4 394	5 236	2 026
29	Warszawa / Chopina	10 598	−0.9%	1 216	6 392	2 989

Source: own work based on Bourgeais and Bialas-Motyl [2015].

Maritime transport and inland water transport

Poland has a good geographic position for the water transport because it has an access to the Baltic Sea with four large ports which are Gdańsk, Gdynia, Szczecin and Świnoujście. These seaports have connections with other international seaports in Sweden, Germany and Denmark and they can receive big merchant ships. They carried 6.8 million t of cargo in 2014, it is 2.7% less than the previous year, but it represented 13,621.4 million t-km. Concerning the transport of people, they carried 611.3 thousand passengers [Turek et al. 2015]. Regarding the inland water transport, it is an important way to carry goods but it is unfortunately not very well-used. For instance, the length of navigable ways is 3,983 km but 40% are exploited, which represents only 1,600 km [Logistics 2006]. Another example is the Vistula, which are the longest river in Poland – 1,047 km between Kraków and Gdańsk – and which haven't got freight navigation. Otherwise the other rivers like the Odra and the Wkra have good stock squares, lifts and warehouses. Thus in 2014, the different inland waterways conveyed 7.6 million t of goods and the transport performance amounted to 778.5 million ton-kilometers [Turek et al. 2015]. Table 3 includes the numbers for water transport for Poland including transportation of goods and passengers.

France has also a very good geographic position thanks to the Atlantic Ocean, the Mediterranean Sea, the English Channel and 5 long rivers including the Rhine and the Rhône. There are seven large maritime ports like the seaport of Marseille with 57,626,239 t of goods carried in 2014, Le Havre with 46,729,699 t of goods carried, Dunkerque with 31,737,226 t

Table 3. Water transport in Poland in 2014
Tabela 3. Transport wodny w Polsce w 2014 roku

Factor	inland waterways transport		maritime transport	
	goods (ton)	passengers (capita)	goods (ton)	passengers (capita)
Total	7 628 800	1 038 200	6 781 000	611 300
National	4 832 700	×	×	×
International	2 796 200	×	×	×

Source: own work based on Turek et al. [2015].

of goods carried and Calais with 20,183,003 t of goods carried[5]. Concerning the inland water transport, 60,000,000 t of goods circulated on 4,100 km of rivers in 2014[6].

Each country has its own specific features. In general, the water transport is well-used but it could be better organized in Poland. There are more goods which pass through by French seaports because the accesses to different seas are more important and there are much trades between African countries but also with Great Britain and the Nordic countries.

Transport of goods and passengers in France and Poland

These days, with the globalization of exchanges, all types of transport are essential to insure the travel of goods and people. In 2014, hundreds of millions people and goods used a transport. Table 4 below sums up the number of passengers who used a mean of transport in 2013 in France and in 2014 in Poland. Table 5 below sums up the number of goods for each type of transport in 2013 in France and in 2014 in Poland.

Table 4. Number of passengers in 2013 in France and in 2014 in Poland
Tabela 4. Liczba pasażerów we Francji w 2013 roku i w Polsce w 2014 roku

Passengers	France	Poland
Railway transport (passenger-km × 1 000 000)	103 000	16 014.9
Road transport (passenger-km × 1 000 000)	989 000	21 449
Maritime transport (passenger × 1 000)	29 588	611.2
Inland waterway transport (passenger)	×	1 038 200
Air transport ((passenger-km × 1 000)	141 742 000	25 714 000

Source: own work based on Turek et al. [2015], http://www.statistiques.developpement-durable.gouv.fr/fileadmin/documents/Produits_editoriaux/Publications/Reperes/2015/reperes-transport-ed2015-b.pdf.

In general, the number of passengers in France is higher than in Poland. Indeed, the infrastructures are more developed, the networks are well-organized like the air transport. But also French population is twice higher than in Poland. Thus it is logical that there are less people on the road and in the trains. In both cases, the train and the car are the main types of transport for people because it is less expensive than the air transport and easier for short distances. Moreover thanks to motorways and high-speed trains, people can be quickly in a specific place.

The quantity of goods conveyed by railway is more important in Poland. Indeed, the trades between Western Europe and Russia or Asia allow this number. Moreover, Poland

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[5] http://www.developpement-durable.gouv.fr/Trafics-des-principaux-ports.html Année 2014 - Trafics_des_ports_maritimes.xlsx (XLSX - 313 Ko)

[6] http://www.planetoscope.com/Mobilite/1397-marchandises-transportees-sur-les-voies-fluviales-francaises.html

Table 5. Transport of goods in 2013 in France and in 2014 in Poland
Tabela 5. Transport towarów we Francji w 2013 roku i w Polsce w 2014 roku

Goods	France	Poland
Railway transport (goods-km × 1 000 000)	32 000	52 073
Road transport(goods-km × 1 000 000)	289 000	262 860
Inland waterway transport (goods-km × 1 000 000)	7 900	779
Maritime transport (goods × 1 000 000)	340	6,78
Air transport (goods × 1 000)	2 000	37.6

Source: own work based on Turek et al. [2015], http://www.statistiques.developpement-durable.gouv.fr/fileadmin/documents/Produits_editoriaux/Publications/Reperes/2015/reperes-transport-ed2015-b.pdf..

has more land borders than maritime borders so many goods are carried by railway or road transport. Unlike France which has a lot of maritime borders so the maritime transport is more important than in Poland. The infrastructures of airports can explain the difference of number of goods between both France and Poland. The number of goods which travels on the road is similar in the both France and Poland. Finally concerning the inland waterway transport, there are more goods in France than in Poland because the inland waterway in the second country has to be optimized.

Using an EPIC approach for assessing of infrastructure dimension

Assessment of elements of infrastructure dimension includes transportation utilities, energy infrastructure and telecommunications flows. The influence on the transportation aspects of whole Europe including France had the expansion of the UE in 2004, which brought changes in in trade patterns. The hub for trade flows moved to central Europe to countries like Hungary, Czech Republic or Poland.

A results of Infrastructure dimension for France and Poland are presented in Table 6.

Table 6. Evaluation of Infrastructure dimension using EPIC approach for France and Poland
Tabela 6. Ocena infrastruktury przy wykorzystaniu metody EPIC we Francji i w Polsce

Infrastructure	Transportation infrastructure	Energy infrastructure	Connectivity	Overall Grade
30%	50%	25%	25%	100%
France	A	A	B–	A–
Poland	D	B	B+	C

Source: own work based on Srinivasan et al. [2014].

The overall grade achieved for France was A–, which consists of A grade for both transportation infrastructure and energy infrastructure and B– for connectivity. The overall grade for Poland is C. It consists of D grade for transportation infrastructure, B grade for energy infrastructure and B+ grade for connectivity.

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Conclusion

The EPIC structure allows to know strengths and weaknesses of each part of the world and of several countries in each part. It helps decision makers, in accordance with their problem, to choose the best option. It is a tool to have more information about economy, politics, infrastructure and competence of a country.

Poland is one of very good investment destinations for companies targeting both western and eastern as well as northern and southern parts of Europe. Unfortunately the transportation infrastructure in Poland is still poor if you compare with countries in the Western Europe, even if internationals routes have been developed and modernized. The Polish transport infrastructure requires much more investment in order to make Poland more attractive for foreign capital. For some years, the development of road infrastructures is one of the Polish administration's top priorities. Some transport investments are possible thanks to cooperation between the national road's directorates, governments of neighboring countries and some financial supports from the UE.

France is a very good investment destination for companies. According to the EPIC structure the final mark of France is A– and only the connectivity infrastructure has to be improved. The French government invests in repairs of the railway, maintenance of all the transports, development of ecological transport and the building of some new roads and new logistics area.

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