CURRENT CHALLENGES IN THE ECONOMICS OF TRANSPORT SYSTEMS – a stakeholder and club good approach

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In this article, after discussing the concept of transport systems and the importance of its sustainability, stakeholder theory and club good theory are presented as useful instruments for analyzing different challenges for the sustainability of transport systems. This approach goes beyond the traditional discussion on private vs. public ownership or provision, and may better grasp the increasing complexity of transport systems. Stakeholders have different strengths and different priorities which may trade-off. This creates serious challenges for the sustainability of transport systems as well as its influence on the quality of life of different stakeholders. It will be argued that there exists the threat of transport systems to become a kind of club good by excluding parts of society from access and other benefits.
Keywords: economics of transport systems, sustainable urban transport systems, stakeholder theory, club goods, sustainable development

1. INTRODUCTION

Transport systems are elementary for the functioning of markets, people's quality of life (see Rydzkowski and Wojewódzka-Król, 2000) as well as the attractiveness and competitiveness of urban areas in the developing global network society (Castells, 1996). However, its sustainability is threatened due to continuously increasing transport flows (in particular road transport), its environmental impact and huge dependency on fossil fuel (International Energy Agency, 2008; OECD, 1996; Platje and Paradowska, 2011). The aim of this article is to discuss some economic theories which may be helpful in understanding the complexity of current transport systems and challenges for their sustainability. The economics of transport systems should be perceived as a practical science, where economic theory is an instrument for solving existing problems (University of Leeds, 2011). Focus in this article will be on urban transport systems due to their economic significance and increasing complexity. Important challenges in this context are (see Castells, 1996, 1998; Moulaert, 2002; Platje, 2011):

- While economic issues have often directly measurable and short-term effects, social issues have more indirect and difficult to measure effects. This problem becomes even greater in case of environmental challenges. While environmental issues may be crucial for the long-term viability of transport systems and social issues are important for the competitiveness of urban areas (see Paradowska, 2011), they may, when neglected, seriously challenge the sustainability of transport systems.
- An important question is whether the stakeholders not only have access to, but are also able to direct the development of the transport system in a sustainable way. This capacity is limited by, among others, its complexity and public good nature, the influence of higher levels of administration, the local, trans-boundary and global nature of environmental

problems as well as globalization of markets.
- Stakeholders have different strengths and different priorities which may trade-off. This creates serious challenges for the sustainability of transport systems as well as its influence on the quality of life of different stakeholders. There exists the threat of transport systems to become a kind of club good by excluding parts of society from access and other benefits.

In order to achieve the aim of this paper, first the concept of transport systems and the importance of its sustainability is discussed. Then, stakeholder theory and club good theory are presented as a useful instrument for analyzing different challenges for the sustainability of transport systems. This approach goes beyond the traditional discussion on private vs. public ownership or provision, and may better grasp the increasing complexity of transport systems.

2. SUSTAINABLE TRANSPORT SYSTEMS

A transport system may be defined as "a collection of objects (e.g., transport network and infrastructure, transport investment, transport processes in all modes of transport) and the relation between these objects as well as its attributes, using transport policy for the co-ordination of transport systems (Tomala, 1966, 73)." They are characterized by complexity, incomplete information on all processes and their interdependencies as well as a limited ability for self-regulation (Mendyk, 2002, 114). The economics of transport systems, among other things, embraces the efficiency and effectiveness of functioning of such systems, which can only be assessed when including the economic entities and other stakeholders managing and using them in analysis. However, what is efficient depends on the goal of the system. What goals are aimed at depend on laws and regulations, the political and economic power of stakeholders, people's worldviews, etc. (Bromley, 1991; Platje, 2011). Currently, the sustainability of transport systems is becoming more and more important (OECD, 1996), where different economic, social and environmental goals should be achieved. A complicating issue is that current and future developmental aspirations should be supported. As it is impossible to achieve all goals at the same time due to the existence of scarcity, priorities should be established (Lomborg, 2004), while often trade-offs between different goals exist. Then, a question becomes who decides which goals should be achieved. In this context, a transport system should be analyzed as one entity which is coordinated by different stakeholders (discussed in Section 3).

Sustainable development aims at intra- and intergenerational equity (WCED, 1987). It concerns the achievement of a good life for current and future generations. While it is often underemphasized that large inequalities exist (Rao, 2000), what makes up a good life is a controversial issue. What is development for one person or group, may be regress for others (Borys, 2005). Furthermore, developmental aims may change through time due to, e.g., economic, technological and cultural changes (North, 1990). Keeping this in mind, the sustainability of transport systems should be considered as a process where some elements are necessary conditions for its long-term functioning (e.g., energy), while the system itself is a determinant of the quality of human life.

When discussing the sustainability of transport systems, the fundamental question is to what extent the transport network and its use can expand without the system collapsing. The bottom-line is the availability of physical resources, space and access to energy. When increased mobility is the aim, these limited resources have to be used more efficiently.

Following the OECD (1996), sustainable development of transport systems can be defined as such development that:

- does not threaten human health,
- does not threaten ecosystems,
- uses renewable resources below their regeneration capacity,
- uses non-renewable resources at a lower rate than they are replaced by renewable substitutes,
- assures access to transport for current and future generations.

When looking at current developments, transport systems are far from sustainable. While huge efforts are undertaken in the EU in order to reduce damage to human health and loss of life,

statistics show a sad picture for many countries.[1] Construction of roads is a process taking place in countries with less developed as well as with highly developed infrastructure and transport systems. This leads to increased land use, in turn threatening different ecosystems. It can be expected that these processes will be much stronger in quickly developing countries like China (see WBCSD, 2004). As transport still relies mainly on fossil fuels (see Energy Information Administration, 2007), conditions regarding resource renewability or substitutability are not fulfilled. In combination with increased problems with congestion (Szołtysek, 2009, 35-36), this makes similar access to transport systems for future generations questionable.

An interesting approach towards policy for sustainable transport systems is analyzing the economic and social impact from the point of view of positive externalities, while the environmental impact, in accordance with theories of environmental economics, are considered to be negative externalities (Paradowska, 2011).[2] Then, the aim of policy becomes to create such a transport system that stimulates the positive externalities as much as possible, while reducing the negative externalities to a minimum.[3] This approach does not question the aim of growth of wealth, consumption and consumption. The question becomes whether transport systems can be managed in such a way that technological development, logistic solutions, development of multimodal transport systems, etc., are able to keep up with the increasing demand for transport systems, reducing environmental impacts and resource use.

The idea that technological development will solve appearing problems is based on the so-called techno-centric paradigm (Gladwin et al., 1995). It is assumed that ecosystems are resilient, while being optimistic about human innovativeness and managerial capacities. When adhering to such a paradigm, it may be that solutions are sought which, in reality, may solve a problem only to a certain extent, while the dynamics in systems and different feedback loops may lead to a deterioration of the situation in the future. Like with the construction of roads, technological solutions leading to an increase road capacity. An example is Intelligent Transport Systems (ITS) (ITS Polska, 2008). Its aim is to increase road capacity, improve safety and lower environmental damage caused by transport systems with help of ICT and improvements in management. In this sense, it is an instrument supporting the sustainability of transport systems. As economic theory predicts, an increase in supply (in this case, an increase in the quality or quantitative features of a transport system) leads to increased demand for road transport (see Sterman, 2000). The improved market function of the transport system may lead to increased production and trade as well as increased employment. As a consequence, the demand for transport services is likely to increase, putting more pressure on transport systems. Without fundamental change in production and consumption patterns, there may be a never-ending pressure to increase the road capacity in order to solve problems with road congestion.

The positive externalities created by transport systems are related to the functioning of markets. Theoretically, a competitive market is accessible to everyone, not only leading to increased product quality and reduced prices, but also creating opportunities for people to achieve a high quality of life (see Friedman, 1962). It can be argued that its positive effects are in fact a pure public good. However, even when markets function properly and are capability enhancing, human characteristics differ (e.g., age, sex, health, education, physical and intellectual features), seriously impeding the development of human capabilities (Sen, 1999). For this reason, transport systems should be developed to assure easy access to hospitals, educational institutions, administrative units, services, etc. The development of Information Technology, creating opportunities for e-government, work at home for handicapped,

[1] It is estimated that in 2004 there were 1.2 million lethal casualties in traffic in the world, while this number is expected to increase to 2 million in 2020 (WHO, 2004).

[2] In case of a negative externality, social costs of production or consumption exceed its private costs. A positive externality exists when social benefits of production or consumption exceed its private benefits. While in the first case markets produce too much, in the second case it is socially desirable to produce more (see Begg et al., 1994; Fiedor et al., 2002).

[3] The discussion on positive and negative externalities of transport systems is based on Begg et al. (1994), Boehme et al. (1998) and Rydzkowski and Wojewódzka-Król (2000).

people raising small children, etc., stimulates these positive effects, while reducing pressure on transport systems.[4] Development of e-business, creating opportunities for virtual companies to offer their services, may cause serious competition for local shops. Thus, it is not only the possibility for (potential) customers to visit different suppliers of a product that determines the level of competition. It is also the functioning of distribution systems that supports competitive markets. An issue for deeper research remains to what extent investment in and knowledge on Information Technology may create new barriers to entry.

The negative externalities generated by transport systems include air pollution, noise, traffic jams, accidents and contribution to global warming. These costs are difficult to calculate and are dispersed among the population. As the individual loss is often too small compared to individual costs of action, rational individuals do not feel strong incentives to change the status quo. This is related to the so-called problem of collective action (see Olson, 1965).[5] Another challenge is that while traditional economic theory argues that the polluter should take the full consequences of its activity, and pay for the damage or stop polluting (see Fiedor et al., 2002), this may have negative consequences for economic activity in case of taxes, regulations, etc. Eco-innovation may be a solution reducing the environmental impact of transport systems while supporting its social and economic positive externalities. A problem remains that the whole production chain as well as the life cycle of products should be taken into consideration in order to prevent "unexpected" side-effects from appearing (compare Sterman, 2000).

Let's take the example of biofuel, which may be an instrument to assure access to renewable energy resources while reducing air pollution and CO_2 emissions. Large scale production of biofuels raises the following issues:

- When using sugar, corn, etc., as a source of biofuels, the production of these sources itself absorbs energy (Lewis Research Group, 2011).
- In order to reduce economic costs, large scale agricultural production may be required, which in turn may cause many negative environmental effects.
- Increased use of agricultural produce reduces supply on world markets. This may lead to an increase in food prices, which in particular hits the poor.

Another issue is incentive effects in production systems. Suppose we start to use pig manure for energy provision for urban transport systems. This may help to solve the problem with the excess pig manure produced by large scale pig farming, a problem which is probably the biggest in the Netherlands "where over 50 pigs are kept per hectare of utilized agricultural land … in pig farming (OECD, 2003, 48).". However, this may support a type of large scale farming which may push more and more small scale production out of the market, possibly causing different negative social and environmental effects.

3. MANAGEMENT OF TRANSPORT SYSTEMS – A STAKEHOLDER APPROACH

While urban transport systems are an important element for urban competitiveness with specific individual characteristics, they are important nodes in regional, national and / or international transport networks (Rudnicki and Starowicz, 2005). In order to function properly, use of economic and fiscal instruments may be required, in combination with spatial planning, organization and traffic management (Platje and

[4] It should be emphasized that this argument is open to serious discussion. While technological development may create many new opportunities, it also fundamentally changes the functioning of society. Reliance on Information and Communication Technology (ICT) may reduce the need for face-to-face contacts and lead to social exclusion of groups not having access to ICT (Castells, 1996), different types of "civilization diseases", etc. Furthermore, it may increase the reliance on energy use for the production, maintenance and use of ICT equipment and infrastructure, which makes long-run sustainability questionable.

[5] As Olson writes, „unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, rational self-interested individuals will not act to achieve their common or group interest (Olson, 1965, 2)."

Paradowska, 2011). The integration in a larger transport system as well as the discussed importance of transport systems for markets and the trans-boundary nature of many environmental problems imply that the development or urban transport systems requires interaction between local, regional and national governments as well as, in the case of the EU, European administration. As a consequence, the management of urban transport systems may be discussed in the context of multilevel governance and the importance of different stakeholders. Stakeholder analysis may be a useful instrument for analyzing challenges for the sustainability of transport systems. It facilitates the identification of priorities which not necessarily are in accordance with principles of sustainable development, as well as issues which, although necessary for the sustainability of transport systems, receive less attention in the management of such systems. Marks sees multilevel governance as a kind of policy network with "continuous negotiation among nested governments at several territorial tiers – supranational, national, regional, local (Marks, 1993, 292)." However, governments at different administrative and territorial levels consist of different units, citizens have different types of democratic rights, while interest groups often try to influence policy in accordance with their own interest. Taking this into consideration, it may be useful to define a policy network as "a cluster of actors, each of which has an interest, or "stake" in a given … policy sector and the capacity to help determine policy success or failure (Peterson, 2003, 1; quoted in Van den Brande, 2008, 4)." Following Van den Brande and Marks, using Freeman's (1984) definition of stakeholders, multilevel governance of transport systems can be defined as follows:

"A system of continuous negotiation among nested governance systems (Marks, 1993, 292)" of transport systems at different territorial and administrative levels. The governance of transport systems "are enmeshed in territorial overarching policy networks (Van den Brande, 2005, 5)" including a wide range of stakeholders at different territorial and administrative levels being influenced by or having different levels of salience in influencing the development and functioning of transport systems.

The management of urban transport systems is complicated by the fact that there is no single directly identifiable owner, while there are different stages in the provision of such systems: design, finance, construction, operation, maintenance and use (Ostrom et al., 1993; see also Cornes and Sandler, 1996). In each step, different levels of government administration, government agencies, private enterprises, civil society associations and non-governmental organizations are involved, while different types of property rights and ownership structures may exist. Public-private partnerships are becoming more and more popular for operation and maintenance of infrastructure and provision of transport services, in order to reduce pressure on government budgets related to the problem of finance (Delmon, 2009). The inclusion of private enterprises in operation of infrastructure and, in particular, individual transport services aims at improving financial efficiency. However, the direct aims of private enterprises are related to their own economic benefit, while, as discussed, the functioning of transport systems may create huge positive externalities and is elementary in developing peoples' capabilities to achieve a high quality of life. When using public-private partnerships, the art of policy making is to reconcile the public interest with the goals of the private company.

While it may argued that the government should stimulate the economic positive externalities created by efficient transport systems, it should not forget about social and environmental issues as economic entities have more sources to represent their interest than, e.g., the poor, while the environment by definition has to be indirectly represented. A stakeholder analysis may facilitate the inclusion of social and environmental issues in management of urban transport systems (Harrison and Freeman, 1999; Steurer et al., 2005, 273).

Stakeholder theory traditionally focuses on who can influence or is influenced by the functioning of a company (Freeman, 1984). Here the question becomes not only who is important for management of urban transport systems, but also who factually manages and who can influence the management structures. In practice, it is the functioning of state and urban political and administrative structures that determine the salience of different stakeholders, being characterized by power, legitimacy and urgency (Mitchell et al., 1997). A typology of stakeholders

and the relation with management of urban transport systems is presented in Tables 1 and 2.

In the context of this paper, stakeholders are defined as groups or individuals that are influenced by the functioning or transport systems and / or able / willing to influence management structures and engage in policy making for developing these systems (adapted from freeman, 1984; Platje, 2011). As identified in Table 1, power is not only related to military strength, but also to resources being of interest to decision-makers. As decisions on development of transport systems are rather taken in different levels of government administration being dependent on the size of their budgets, stakeholders influencing budget revenues are likely to be most salient.

Table 1. Types of stakeholders and their relation to management of urban transport systems – dangerous, dependent, definitive and non-stakeholders

No.	Type of stakeholder	Attributes	Description	Relation to management of urban transport systems
1.	Dormant	Power	Power is based on physical or military force, economic resources (money, possession of physical resources, etc.) and access to media (Mitchell et al., 1997, 875).	It is most likely that economic interests receive priority in the management and development of transport systems.
2.	Discretionary	Legitimacy	Examples are "non-profit organisations, such as schools, soup kitchens, and hospitals, who receive donations and volunteer labour from ... companies (Mitchell et al., 1997, 875)."	Access to transport systems in order to increase human capabilities and quality of life is a legitimate issue. However, in particular the aged, poor and handicapped may lack power. Schools and hospitals' representatives may have some more power. E.g., hospitals can claim urgency due to the importance for saving human life, which is more likely to be supported by strong stakeholders.
3.	Demanding	Urgency	Demanding stakeholders "are the "mosquitoes buzzing in the ears" of managers: irksome but not dangerous, bothersome but not warranting more than passing management attention, if any at all (Mitchell et al., 1997, 875)."	Environmental issues may be urgent, while not being recognized by policy makers. The development of bicycle lanes may be urgent for cyclists in the face of increasing car traffic. Sustainable energy supply may be an urgent issue not completely recognized at the moment by powerful stakeholders. It may be that powerful lobbies having an interest in fossil fuels and related technology prevent the issue from becoming legitimate. However, EU and national policies may increase legitimacy. Scientific research, freedom of press and NGOs may increase the legitimacy of urgent problems.

4.	Dominant	Power + Legitimacy	Dominant stakeholders have most of the time formal ties with the management of transport systems. Examples are government administration (e.g., politicians, civil servants), public transport companies, large private transport and logistics operators, large enterprises, etc. These stakeholders may become definitive when being directly involved in decision-making processes.	The military (historically) and large economic investments heavily influenced transport systems because of arguments of national safety and economic development.

Source: Mitchell et al., 1997, 874-79 (first three columns). Third column – adapted from Platje and Paradowska, 2011, 46-47. Last column author's own elaboration.

Table 2. Types of stakeholders and their relation to management of urban transport systems – dangerous, dependent, definitive and non-stakeholders

No.	Type of stakeholder	Attributes	Description	Relation to management of urban transport systems
5.	Dangerous	Power + Urgency	Dangerous stakeholders do not have legitimacy, but can significantly influence the company's functioning. This may range from terrorist attacks, kidnappings and bombings to environmentalists blocking roads. Legitimacy depends often on moral viewpoints (Mitchell et al., 1997, 869, 877-8).	Dangerous stakeholders may threaten the functioning of urban transport systems. Examples are terrorist attacks in the London metro (2005) and Madrid (2004). Piracy, hijacking and wars may seriously threaten air and sea transport systems.
6.	Dependent	Urgency + Legitimacy	The interest of dependent stakeholders should be represented by more powerful stakeholders (Mitchell et al., 1997, 877).	Urgent issues may become legitimate when more stakeholders see their importance. Visibility of problems (e.g., traffic jams, pollution) and increased numbers of cyclists make the stakeholders representing these issues more legitimate.
7.	Definitive	Power + Urgency + Legitimacy	Definitive stakeholders are most salient in their influence on the management of transport systems. They not only possess financial and political resources and instruments (power), the will (urgency) but also moral support (legitimacy) to influence policy.	Large companies are most likely to be definitive external stakeholders. Development of passengers' organizations and associations, NGOs, etc., may support stakeholders with other interests to become definitive.
8.	Non-stakeholder	None of the attributes present	No interaction with the transport system.	As everyone living within the area of a transport system is in one or the other way influenced directly or indirectly by its negative externalities, even when enjoying little positive externalities, it is unlikely that non-stakeholders exist.

Source: Mitchell et al., 1997, 874-79 (first two columns). Third columns – adapted from Platje and Paradowska, 2011, 48-49. Last two column author's own elaboration.

Investment in transport systems may be strongly influenced by large companies for different reasons. First of all, they may contribute financially to the local government budget through local taxes. This element is much less visible in case of Small and Medium-sized Enterprises (SME). Furthermore, large companies may directly contribute to infrastructural development in the direct surrounding of a production unit or store.

Investment by large production companies, depending on the capital intensity of production, may lead to visible job creation. This, in turn, may cause important multiplier effects in the local economy. The strength of the multiplier effect depends on the extent in which locally-produced intermediate goods are used. This effect is likely to be smaller in case of companies investing because of low wages, while highly depending on international or global supply chains and networks. While this increases transport flows and pressure on the transport system, a question is to what extent SMEs are pushed out of the market. An example which requires deeper research is the development of shopping centres, large supermarkets and discount stores chains in and around Polish cities. While creating many jobs, they are developed by large investors and contain shops belonging to international concerns. They are likely to push small, often family-owned, retail stores out of the market. While small shops attract more clients in their direct neighbourhood, large shops are likely to attract more customers from a wider area, increasing transport flows. Small companies often create income and employment not only for the formal owner, but for whole families. Furthermore, suppose SMEs sell locally produced products distributed by small vans, trucks or cars, while maintenance and repair of factors of production of small companies may be carried out by other locally based companies. In this case, large investments not only lead to an increase in traffic and demand for logistic solutions, but may also lead to negative economic and employment effects when relying on the sale of products from other areas. However, the mentioned impact should be assessed against increased attractiveness of urban areas due to, e.g., the wide range of products sold in shopping centres and large supermarkets, which may positive spill-over effects for cafes, restaurants and different other services. Furthermore, in case of large metropolitan areas, large companies may rely on local firms for the supply of a wide range of products (Jacobs, 1996).

In order to be a salient stakeholder, power is a necessary condition. It implicates the ability to influence the management and, in turn, development of urban transport systems. Power is also an important determinant of deciding what is urgent, i.e., what are priorities in the development of urban transport systems, as well as what is legitimate, i.e., "desirable, proper or appropriate within some socially constructed system of norms, values, beliefs, definitions (Mitchell et al., 1997, 869)." It may be the worldviews of the powerful stakeholders with the willingness to influence transport systems that decide what is legitimate (Platje, 2011).

Weaker stakeholders, in particular those representing social and environmental interests, can be empowered when applying principles of good governance – participation, transparency (access to information), accountability and responsibility, policy coherence and effectiveness, political stability, rule of law, etc. (Commission …, 2001; Kaufmann et al., 2009). The moment local governments are corrupt, unwilling to provide information on planned investments in transport systems, do not consult plans with stakeholders affected by the investment, courts are weak and inefficient, etc., such investment is likely to have negative social and environmental consequences. In this context, there is an important role for independent and objective media being able to make social and environmental issues visible, while being an instrument in preventing policy to be developed behind closed doors and, in combination with the existence of political freedom, facilitates the replacement of inefficient leaders (compare Colombatto and Macey, 1999; Sen, 1999). It may be argued that good governance is a necessary condition for creating sustainable transport systems. However, without a change in worldviews of the powerful stakeholders, it is unlikely to be sufficient. It seems sometimes to be forgotten that mobility means more than individual car transport. It is also the old and the handicapped being able to reach, for example, the closest shop or a doctor, or cyclists going to school or work. It is about satisfying individual transport needs, without continuously expanding the transport

system and increasing reliance on the use of fossil fuels. This may require serious changes in the logistics and localization of production, as well as consumption patterns.

While local government is a definitive stakeholder in managing and developing urban transport systems, their capacity and capability to do so is limited by national and EU policy, regulation and funds. Local stakeholders can apply, among other things, logistic solutions to solve locally-specific problems such as traffic jams and pollution (see Szołtysek, 2009). However, the internationalization and globalization of supply and distribution chains, processes of suburbanization and increased demand for individual car transport are other factors seriously reducing the power of local governance in managing urban transport systems. Thus, local policy for transport systems should be developed in a multilevel governance framework.

4. TRANSPORT SYSTEMS AS A CLUB GOOD

Transport systems should create as much positive externalities as possible, while reducing negative externalities to a minimum. In accordance with principles of sustainable development, it should enable current and future generations in making use of developmental opportunities. In other words, it should enlarge human capabilities by ensuring access, and be a factor stimulating the functioning of markets which, when efficient, may lead to poverty reduction. From this point of view, the effects of efficient transport systems, the reduction of poverty and the improved functioning of markets, can be considered a pure public good (Cornes and Sandler, 1996; Sandler, 2001). However, this argument is weakened because financial means are needed to use means of transport. Handicapped, ill and old people may require more resources for similar travel opportunities compared to healthy and young people (see Sen, 1992). The first groups, due to their personal characteristics, are more likely to belong to lower income groups. Without additional regulation, tax and financial instruments to reduce traffic (e.g., payment for parking, payment for entering the city centre) are likely to reduce the travel opportunities for these disadvantaged groups even more. Furthermore, better functioning of urban transport systems improve the attractiveness of the area as well as its market function. As a consequence, in particular smaller cities and rural areas may lose attractiveness and have disadvantages regarding access to different types of services (e.g., schools, hospitals, cultural centres, shops). It may be that through financial markets, logistics services and networks, global transport systems, etc. different large urban areas, in particular global cities, are better connected with other urban areas than the cities and rural areas in their surrounding (see Castells, 1996). Such a global city can be defined as

> a process that connects advanced services, producer centres, and markets in a global network, with different intensity and at different scale depending upon the relative importance of the activities located in each area *vis-à-vis* the global network. Inside each country, the network architecture reproduces itself into regional and local centres, so that the whole system becomes interconnected at the global level (Castells, 1996, 380).

Traditionally, it is argued that the government should produce public goods because of the so-called free-rider problem (Begg et al., 1994). The idea is that, opposed to private goods, public goods are characterized by non-rivalry as well as non-excludability of use. The moment that, say, a water protection system is constructed, it is impossible to require a direct payment by the people protected. As many people may free-ride, the government should collect taxes to provide such goods. As discussed, transport systems produce public goods in the form of positive externalities. In this sense, negative externalities may be interpreted as non-excludable and non-rival public “wrongs”.

However, in reality transport systems themselves are not pure public goods. The discussion below is based on the distinction between different types of goods in Table 3. Like with any system with a maximum capacity, congestion may appear (partial rivalry) and (over) use may lead to depreciation (Cornes and Sandler, 1996), leading to the issue how to reduce congestion and how to finance maintenance. When introducing a fee for using highways, an exclusion mechanism is created, making these highways factually a club good. Pioneers on this issue were A.C. Pigou (1920) and Frank Knight (1924)

discussing how toll could reduce congestion on roads (see Cornes and Sandler, 1996, 351-52). The issue is even more easy to observe in the case of railways, trams and buses. The cost of exclusion is relatively low, as a conductor can prevent use by people not having a valid ticket. As a consequence, means of transport themselves can be considered private goods, facilitating private provision of transport services.

Table 3. Different types of goods

Production and use characteristics of goods			
Perfect rivalry	Open access (Tragedy of the Commons)	Private good featuring high control costs	Private good
Partial rivalry	Impure public good with some rivalry, but no exclusion	Congestion good	Club good
No rivalry	Pure public good	Impure public good with some exclusion	Excludable public good
	Non excludability	**Partial excludability**	**Excludability**

Source: Adapted from Bieger, 2008, 244 (based on Oakland, 1972) and Cornes and Sandler, 1996.

With railways there is a similar problem as with highways – the cost of construction are often too high for private entities, while operation is not attractive as, among other things, return on investment is lower than in case of other economic ventures (Rydzkowski and Wojewódzka-Król, 2000). Furthermore, the indivisibility of the infrastructure and large returns to scale in use cause that railways may be considered a natural monopoly (Begg et al., 1994). However, exclusion is relatively easy. This creates the basis for current developments in the railroad market, where in many countries private companies are allowed to operate different connections.

However, the issue is more complicated in urban transport systems, as it consist of a network of roads, tramlines and railroads, etc. Excludability is financially unattractive and would not only create managerial but also technologically difficulties. It would be difficult to imagine to pay a toll when entering another street in a city. This would probably not only be too expensive compared to the expected revenues, but also hamper traffic immensely, leading to significant reduction of positive externalities. As a consequence, it can be argued that urban road infrastructure is non-excludable. However, fees to enter the city centre, as in the case of London (Szołtysek, 2009, 122-124) show that some excludability is possible. Furthermore the development of ICT increases the opportunity for governments to charge for use of roads, of which the Dutch idea of *rekeningrijden* is an example.[6] Thus, urban transport systems can be characterized as congestion goods due to partial rivalry and partial excludability. However, the mentioned technological development as well as lack of means by the poor part of society may lead to factual exclusion, making urban transport systems a kind of club good. The task of policy, then, is to stimulate access for these groups.

In the discussion on public-private partnerships, it should be taken into consideration that transport networks and infrastructure are by nature club goods or congestion goods. Transport activities carried out by private and public entities are influenced by or influence the transport network and infrastructure. An aim of privatization policy regarding the provision of transport services, in particular in public passenger transport, is to increase competition and strengthen incentives for economic efficiency and quality improvement. Theoretically, competition is

[6] Although technological problems are not solved yet, *rekeningrijden*, making use of a kind of GPS technology, "was envisaged as a cordon pricing system based on toll points on ring roads surrounding the four big cities of the Randstad (Amsterdam, The Hague, Utrecht and Rotterdam)" in order to "alleviate particularly severe peak-hour traffic congestion (OECD, 2001, 43)."

supposed to be supported when products are homogeneous. For example, more companies can provide airline services, train cargo services and road cargo services. However, the urban passenger transport system needs to cover a large part of the transport network and has a larger density in order to ensure access. The more entities offer transport services, the higher the co-ordination costs of establishing the optimal number of connections, agreeing on the use of one ticket for public transport, establishing prices of tickets, etc. As the urban transport system is a complex system with strong interdependencies and a complementary character of privately and publicly provided transport services, the product provided is rather heterogeneous. For this reason, monopolistic or oligopolistic market structures are likely to prevail in urban passenger transport, even when public companies are privatized. As a consequence, government regulation remains important.

A challenge in the development of urban transport systems is that, due to its network structure, efficient provision is determined by so-called weakest link technology. It is the smallest effort that determines "the integrity of the network (Sandler, 2001, 46)." This can be observed when bottlenecks appear, significantly reducing the efficiency of functioning of the system. Weakest link arguments can also apply to a certain extent to transport services. It may be that the provider of the lowest quality service decides whether we talk about transport or a transport system.

5. CONCLUDING REMARKS

As was discussed in this paper, challenges in the economics of transport systems cannot be assessed without taking the sustainability of such systems into consideration. The discussion should go beyond the traditional argument that the extent of the transport system decides about the extent of the market (Smith, 1998 (1776)). Currently, transport systems, in particular urban ones, are becoming more and more complex, while challenges in land use, energy supply, environmental quality assurance and congestion pose serious threats to its sustainability.

In this paper, a stakeholder and club good approach was used to identify a theoretical basis useful for the management of transport systems, going beyond the simplified "private vs. public" discussion. Individual contributions may decide about the efficiency of the whole system due to its network structure. In order to support its sustainability, as well as its short-term economic and social functions, weaker stakeholders should be empowered. It is argued that good governance is a necessary condition for this. However, it is not sufficient, as sustainability is likely only to be achieved when people's world views as well as production and production structures change. Otherwise, transport systems will have a tendency to expand, a process which cannot continue indefinitely.

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