

Ignacy H. Chrzanowski

Transport and sustainability

The issue of sustainable development, since the term was coined in the last quarter of the XX century, has been so widely covered in economic literature that to list even the most important contributions in this field would produce a volume of its own, let alone provide a summary of the most salient points.

Regardless the all-inclusive meaning of *sustainability*, there nevertheless remain a few grey, or not-so-clearly-cut areas which are worth looking at with some detail. Transportation is undoubtedly one of such fields, not only because of its economic, military or social impact but also because of its linkages with all the other components of the world's economic system. Every student of economics, finance or economic geography, including those not specializing in transport and logistics, knows that the world that we are living in would not be possible without an efficient, safe and productive transport system.

This paper is an attempt at bridging the goals of sustainability and transportation. It does not pretend to be comprehensive and all-inclusive. Besides detailed studies of a sustainable transport system are available. The present one is just a modest contribution to this discussion.

What does sustainability in transportation practically mean?

As elsewhere, the scope of the above term is not finite. In fact, sustainability of transport in its mainstream meaning should not much differ, say, from sustainability of industry, agriculture or the environment, that is to say it should aim at the

creation of such a transport system during the lifetime of the present generation that would satisfy its needs without compromising the chances to satisfy the needs of the future generations. But is such a definition satisfactory in technical, economic or organisational terms? Hardly so.

While the above definition of sustainability is universally accepted it also draws criticism. Critics of such universal acceptance of the term point to the fact that its all-inclusive nature contributes to its meaninglessness [Caley, 2017; Adams, 2006]. The concept is holistic, attractive to many scholars but it nevertheless is imprecise.

Due to the special nature of transport, it would be extremely difficult to determine what the "satisfactory" condition of the transport sector really is. With a considerable gap between transport needs, and in particular the lack of access to cheap, reliable and readily available transport services, especially in the less developed parts of the planet, and the provision of these services, much still needs to be done. Thus the concept of "sustainability" of transport still remains rather vague. In the field of material production (consumption, and the like), sustainability puts some limits on the production of these goods (few people would actually need more than one car or a house or more than a few pairs of shoes). In the field of transportation it is much more difficult to determine the boundaries between what is socially and individually desirable and what is economically viable. As the wealth of nations grows, so do their transportation needs. We live in a world where more and more transport is required to guarantee our lifestyles.

Even if we could create a truly sustainable transport system, commensurate with the objectives of the economy-wide sustainability, its economic viability might be questioned. Why would the future generations still need our transport infrastructures, even the “green ones”, if transport technologies did take a drastic turn at some point in the future and rendered these infrastructures obsolete and redundant? Who, besides the advocates of the “green technologies”, still needs the relics of the XIX century “canal mania” other than for recreational or fishing purposes? The same may become with our high-speed railways, fancy motorways, and the like, if our consumption and overall life styles changed dramatically and moved towards some, yet not developed, visionary technologies? The push towards an electrically-powered vehicle can soon with a hydrogen cell becoming economically viable.

Thus the policy-makers have to use all their wisdom to clearly determine what sustainability in transport is or what it should be. That could be neither easy nor very satisfactory and rewarding.

The likely path to sustainable transportation

In the majority of sources and enunciations dealing with sustainability of the transport sector [Evans, 2011], the latter is generally described as a system of environmentally friendly and ecologically sustainable sector of human activity whose main objective is to cut toxic emission, reduce congestion and other external costs. But that is too general a definition to give a satisfactory answer to the crucial question: *will such an environmentally friendly transport sector also be sustainable in economic terms?*

Before any attempt to answer this question is made, the goals and objectives of a sustainable transport must be looked at more specifically. Is the issue of sustainability in the transport sector of the same

nature as all the other fields of economic activity or is it different and apart? Do the same analytical tools apply in transport and elsewhere in-as-much as the paradigm of sustainability is concerned? Can we build a sustainable economic system without first creating a sustainable transport?

To answer these questions we have to look at the overall nature of *sustainability*. This term has been thoroughly clarified ever since the concept of *sustainable development* was first introduced by the Brundtland Commission in 1980s. The Official Agenda for Sustainable Development (OASD) was developed in the fall of 2015, replacing the Millennium Development Goals (MDGs) which expired at the end of 2015. They included the following eight goals:

1. to eradicate poverty and hunger;
2. to achieve universal primary education;
3. to promote gender equality and empower women;
4. to reduce child mortality;
5. to improve maternal health;
6. to combat HIV/AIDS, malaria and other diseases;
7. to ensure environmental sustainability (one of the targets in this goal focuses on increasing sustainable access to safe drinking water and basic sanitation);
8. to develop a global partnership for development.

Seventeen Sustainable Development Goals (SDGs) had been identified and detailed into 169 targets. The 17 SDGs are the following: • Poverty • Food • Health • Education • Women • Water • Energy • Economy • Infrastructure • Inequality • Habitation • Consumption • Climate • Marine ecosystems • Ecosystems • Institutions • Sustainability.

Needless to say it would be rather impractical to analyse these goals on an individual basis. We shall try therefore to organize them into several similar groups within which the targets bear some degree of similarity. None-the-less it would be worthwhile

to provide a few clarifications with respect to selected targets that have or will have substantial impact on transportation.

Starting with the issues of *hunger* and *poverty*, and the two are invariably interconnected, the role of the transport sector cannot be over-estimated. Some parts of the world are among the poorest, where hunger is a common occurrence simply because of the unavailability of transport services. Areas stricken by natural disasters (earthquakes, floods, volcano eruptions, and the like) often suffer more than necessary because relief operations cannot proceed smoothly due to either a total lack of transport or its inadequacy or insufficiency.

Environment is another good example of the role of transportation for the attainment of sustainability goals. It is estimated that worldwide some 20-25% of the Planet's air pollution is generated by the transport activities (World Energy Council, 2009).

In short almost every SDG depends on transport, directly or indirectly. Consequently, one could claim that these goals will not be achievable without transportation, that is to say *sustainable transportation*.

In their feature article on sustainability, C. Mihyeon and A. Amekuzi [2005] attempt at providing a clearer definition of what sustainability of transportation really means. For that purpose they reviewed sixteen practitioners and research initiatives in the U.S., Canada and Europe in order to develop criteria to define sustainability in transportation. While admitting the lack of a universally accepted definition of sustainability in transport, they provide some interesting proposals relative to this issue, e.g. the Sustainable Transportation Performance Indicator a project sponsored by the Canadian Centre for the Sustainable Transportation.

Nevertheless, there seems to exist a certain level of consensus that in order to attain progress in this field (sustainability), three distinct areas have to be consid-

ered: *economic development*, *environmental preservation* and *social development*. These three salient points of sustainability in transportation do not conflict with the list of seventeen goals presented earlier.

In more popular approaches to transport sustainability, emphasis is being put on the *green transport* solutions. In this context *sustainable usually* means "green". Unless new technologies are green they are not regarded as *sustainable*.

Needless to say such a perception of sustainability in transport may be counterproductive since green (or clean) technologies will not always be economically viable, to say the least, and some can actually never be totally green, while still being indispensable. Take for example air transport. It is hard to imagine at this moment other propulsion for aircraft than those run by derivatives of hydrocarbons.

While greenness of transport as a whole is unquestionably welcome, it is limited in its applicability. Being unable to render the system totally green we should nevertheless aim at rendering it the greenest possible.

Reverting to the three goals of a sustainable transport, i.e. economic viability, environmental and social friendliness, transport policy makers should press for the goal of adapting transport infrastructure, vehicle and institutional set-up to the overall goals of sustainability. Economic viability is crucial within this paradigm because technologies would allow even today to build green transport systems if their opportunity costs were not an obstacle. It is technologically possible to build skating rings in Riyadh or Addis Abba and skiing track in Dubai, but are they economically viable?

If the three objectives of sustainability in transportation are to be equitably shared, then there must exist strong interactions between them. I. Skinner and M. Fergusson drew a table with a list of items in each of the three categories of sustain-

ability objectives state that there are no immediate negative interactions between the objectives as the attainment of all objectives would contribute to attaining sustainability. They admit, however, that the use of an instrument or measure can have a positive contribution to the attainment of some objectives, but be detrimental to others.

Incremental approach to transport sustainability

It follows that transport sustainability will not be attained at once, but in a phased (incremental) way. So what would such an approach mean in practice? One way of answering the above question is provided by the European Union Council of Ministers of Transport who defines a sustainable transportation system as one that:

- allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.
- is affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as a balanced regional development.
- limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.

While quite comprehensive the above definition needs some more detailing. Firstly, the notion of linkages between *environment* and *development* has to be further expanded. In our opinion these links are self-explanatory and one just needs to quote from Brundtland Commission to make the point [Kates, et al., 2017]:

The environment does not exist as a sphere separate from human actions, am-

bitions, and needs, and attempts to defend it in isolation from human concerns have given the very word "environment" a connotation of naivety in some political circles. The word "development" has also been narrowed by some into a very limited focus, along the lines of "what poor nations should do to become richer," and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of "development assistance." But the "environment" is where we live; and "development" is what we all do in attempting to improve our lot within that abode. The two are inseparable.

Tables 1 and 2 throw some extra light on the precise linkages between transport, society and environment and are in line with the Brundtland Report. In particular Table 2 is more specific regarding the economic sphere of transport sustainability, putting emphasis on the operating aspects of the transport sector, such as traffic congestion and road accident costs and the user costs. It is noted that issues listed in table 1 overlap and complement each other; for instance prevention of pollution is primarily an environmental concern, but is also a health issue (social aspects). Simultaneously, pollution caused by vehicles (cars, trucks), agricultural machines or ships, is also an economic issue that impacts the economics of this field of economic activity.

As it has already been mentioned in this paper, sustainability of transport will be achieved in stages or incrementally. In the *short-run* the push towards cleaner fuels will gain momentum. In the *long-run* the existing fleets will be replaced by ecological technologies, such as hydrogen cells or totally electric vehicles to make progress toward sustainability objectives.

Transportation impact on sustainability

Regardless of the scope of coverage or the definition of sustainability in trans-

Table 1 Sustainability Issues

Economic	Social	Environmental
Affordability Resource efficiency Cost internalization Trade and business activity Employment Productivity Tax burden	Equity Human health Education Community Quality of life Public Participation	Pollution prevention Climate protection Biodiversity Precautionary action Avoidance of irreversibility Habitat preservation Aesthetics

Source: Sustainable Transportation and TDM. *Planning That Balances Economic, Social and Ecological Objectives. TDM Encyclopedia*. Transport Policy Institute. Updated 2 January 2017.

portation, there are several areas which will invariably shape the road to a sustainable transport system. The author(s) of a comprehensive article on the implications of the sustainability objectives on transport planning [Sustainable Transport and TDM, 2017] have well identified several critical areas in this respect. Below is a short list of these issues:

Transportation decision-making

The planning of the sustainable transport system will require a major shift in the rationale (paradigm) behind transport decision-making. One of the issues to be dealt with will be the prioritization of transport, primarily aiming at giving priority to modes with higher value trips and lower cost over those with lower value and higher cost trips.

Automobile dependency

It is defined as high levels of car use, automobile-oriented land use, and a lack of travel alternatives in the form of adequate urban transit services. Automobile dependency, particularly visible in North American cities (U.S. and Canada) imposes a number of socio-economic and environmental costs that distort the markets. To reduce these distortion will be the main focus of sustainable transportation in the middle- and long-term

perspectives, with necessary structural system reforms.

Transportation equity

Equity is a main goal of sustainable development, not the least in the area of transportation. The current decisions in transportation will produce a definite effect on future generations, usually referred to as *intergenerational equity*. Its nature and scope broadly coincide with the general objectives of sustainability.

Facility design and operations

Transport infrastructure is a major consumer of space. It is recognized that sustainable transport facilities, be it roads, sea-ports, pipelines, etc., should be designed, built and operated in a way that encourages sustainability, in line with its fundamental objectives that include both preservation of resources and operational efficiency.

Land use

Availability and land use patterns are crucial for sustainable transportation. Issues such as city planning, road capacities, substitution and complementarity of modes, all play a crucial role in this area. The major problem here is the lack of coordination between transport planning and land use planning, in all but a few major cities around the world that leads to disastrous transport problems.

Table 2 Transportation Impacts on Sustainability

Economic	Social	Environmental
Traffic congestion Mobility barriers Crash damages Transportation facility costs Consumer transportation costs Depletion of non-renewable resources	Inequity of impacts Mobility disadvantaged Human health impacts Community cohesion Community livability Aesthetics	Air pollution Climate change Habitat loss Water pollution Hydrologic impacts Noise pollution

Source: as in table 1.

Regional development

Availability of transport is crucial for regional development, particularly for the less advanced regions. This has been well documented in literature and reporting by the international development institutions, such as the UN, World Bank and many others. Coordination of development projects is the principle means to secure the attainment of sustainability of transport objectives in the field of regional development.

Needless to say the above list of the likely effects of sustainable transport is by no means complete. Issues such as social inclusiveness, fight against poverty and disease, social and gender equity, and many others, should be added to it. But it shows beyond doubt that sustainability in transport and its implications is a multifaceted problem that requires an interdisciplinary analytical approach before making decisions that will affect future generations.

Some conclusions

This short essay was intended to stir some academic and professional discussion with respect to the role the transport sector would play for the strategy of sustainable development and its objectives during the next 20-30 years. It stems from various contributions to the subject of transport sustainability that it evolves among three main areas, also called *pillars of sustainability*, i.e. *economy*, *society* and *environment*. They interweave to create what is known in literature as the *Venn diagram of sustainability* [Adams, 2017]. The three pillars of sustainability, when combined with each other, generate what can be termed the “qualitatives” of sustainability. Sustainability must be: *bearable*, *equitable* and *viable*. Rather than elaborating on each and every of these terms one should quote H. Daly’s famous saying: ... *what is a sawmill without a forest* [Daily, Cobb 2017].

References:

1. Adams W.M. [2006], *The Future of Sustainability. Re-thinking Environment and Development in the Twenty-first Century*, IUCN-The World Conservation Unit, January, www.iucn.org. Last revised in May 2006. Retrieved February 2017.
2. Cayley M. [2017], *The Brundtland Report: A Short Critique*, Ponemon Open Source Collaboration Study, Zimbra.
3. Daly H.E., Cobb J.B. [1989], *For the Common Good: Redirecting the Economy Toward Community, the Environment and a Sustainable*. Retrieved February 2017.
4. Kates R.W., Parris Th.M. and Leiserowitz A.A. [2017], *Editorial: What Is Sustainable Development. Indicators, Values, and Practice*, “Environment, Science and Policy for Sustainable Development”, Retrieved February.
5. Skinner I., Fergusson M. [1999], *Instruments for Sustainable Transport in Europe. Potential, Contributions and Possible Effects*. A report from the Swedish Euro-Est project Nr. 4977, London, Institute for European Environmental Policy.
6. Sustainable Transportation and TDM [2017], *Planning That Balances Economic, Social and Ecological Objectives. TDM Encyclopedia*, Transport Policy Institute. Updated 2 January 2017.
7. World Commission on Environment and Development [1987], *Our Common Future*. New York: Oxford University Press
8. World Energy Council [2007], *Transport Technologies and Policy Scenarios*, October.