

Towards sustainable transport in Ukraine: main obstacles and directions of development

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Received April 15.2014: accepted June 20.2014

Abstract. The paper presents the description of the different definitions of the concept - sustainable development of transport. The analysis of freight and passenger transportation in Ukraine in 2011 and composition of the park and the average age of municipal electric, sea and river vessels is studied. The volume of emissions of pollutants and greenhouse gas emissions from all transport modes in 2011 is analyzed. The framework and priorities of environmental cooperation between Ukraine and EU at the present stage are determined. Based on the concept of sustainable development and European experience the main directions of introduction of the sustainable development policy of transport in Ukraine are offered.

Key words: Ukraine, sustainable development, transport, sustainability, transport strategy

INTRODUCTION

Sustainable development is the “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. This concept rests on two pillars: firstly, equity both between and within generations and, secondly, the equal status of social, economic and environmental goals. This means that it must be possible for the needs of all people to be met both now and in the future. At the same time, the Earth is to be conserved in such a way that life in conditions of dignity and security is possible for all people over the long term. This second pillar is also known as the «three-dimensional» model, as it classifies existing resources into social, economic and environmental dimensions.

Ukraine joined the sustainable development movement in 1997, when the National Commission on Sustainable Development of Ukraine was established under the Cabinet of Ministers with the purpose of ensuring the solution of problems of the social and economic development, environmental protection and rational use of natural resources in Ukraine.

On 24 December 1999 the Verhovnaya Rada of Ukraine (Supreme Council of Ukraine) adopted the Concept of Sustainable Development of Settlements. This Concept defines the basic directions of the state policy on the issues of ensuring of sustainable development of the settlements, legal and economic ways of its realization and.

Ukraine’s environmental challenges are significant and present one of the most complex areas for the country to address given the pressures of continuous economic growth and social transition. The only feasible response to these challenges is transition to sustainable development.

Heavy concentration of agriculture and industry has caused disastrous air, water and soil pollution. Present ecological change scales have created a real hazard to public health and pose a threat to the life of Ukraine citizens [1].

In Ukraine the transport sector plays an important role in the socio- economic development. Transport system determines the conditions for economic growth,

improving competitiveness of the national economy and quality of life.

Transport is one of fundamental sectors of national economy, and its efficient functioning constitutes a necessary condition for ensuring defense potential, protecting economic interests of the state, and improving the lives of its citizens.

Though Ukrainian transport sector meets general transportation needs of national economy, the level of its safety, quality and efficiency of passenger and freight services, energy performance, and production - induced pressure on the environment do not comply with contemporary requirements.

Technical and infrastructure upgrade for railways, airports, and sea ports; expansion of public road network according to the country's car ownership growth rates requires urgent attention.

The length of motorways almost increased for almost twenty years; their density falls considerably behind the developed countries' indicator. The motorway conditions are unsatisfactory, with 51.1% of roads not meeting requirements for smoothness, and 39.2% - for strength. The average traffic speed on the motorways is 2-3 times lower than in the Western European countries.

The system of governance and management in rail, sea, and road transport as well as road infrastructure should be reformed.

The transportation safety rate is low. Road incident rates are much worse comparing to the EU countries. Aircraft of national airlines have been many times black-listed, including a ban to fly to the EU countries. The unsatisfactory shipping safety control has resulted in black-listing of the State Flag of Ukraine, according to the Paris Memorandum (Paris MoU on Port State Control).

On the 20th of October 2010, the Cabinet of Ministers of Ukraine adopted the "Transport Strategy of Ukraine for the period up to 2020" [23] aimed at supporting sustainable and efficient transport sector operation to create conditions for social and economic development of the country, improved competitiveness of the national economy, and transport safety.

Ukraine has not yet prepared its official Strategy of Sustainable Development. However, thousands of Ukrainians have already expressed their opinions about future sustainable development goals for Ukraine by voting for the World They Want after 2015, a global consultation process launched right after "Rio+20."

RESULTS AND DISCUSSION

Sustainability is a simple concept with complex implications [6]. It reflects a paradigm shift, a fundamental change in the way problems are defined and solutions evaluated. It maintains a distinction between growth (increased quantity) and development (increased quality). It focuses on social welfare outcomes, such as

human health and education attainment, rather than on material wealth, and questions common economic indicators such as Gross Domestic Product (GDP) that measure the quantity but not the quality of market activities. Because sustainability strives to protect natural resources and ecological systems, it emphasizes a conservation ethic, and so favors policies that minimize consumption of resources such as air, water and land.

Sustainability can be evaluated based on a weak standard, which allows natural capital (natural environmental resources and ecological systems) to be replaced by human capital (industrial productive capability), or a strong standard, which rejects such substitutions [18].

A weak sustainability standard allows transport to increase environmental impacts if required for economic development, or if negative impacts can be offset by other sectors, such as pollution reductions by heavy industries. A strong sustainability standard places more emphasis on impact reductions within the transport sector, and so places more emphasis on reducing motor vehicle impacts.

Transportation has significant economic, social and environmental impacts, and so is an important factor in sustainability. Sustainability supports a paradigm shift occurring in transport planning. Previously, transport was evaluated primarily in terms of mobility (physical movement), but increasingly it is evaluated in terms of accessibility (people's ability to obtain desired goods and services). Many factors affect accessibility, including mobility, land use factors (such as the location of activities) and mobility substitutes (such as telecommunications and delivery services). Accessibility-based planning expands the range of solutions that can be applied to transport problems; for example, congestion can be reduced by improving land use accessibility or telecommunications, in addition to accommodating more vehicle traffic.

Sustainable transport refers to the broad subject of transport that is or approaches being sustainable. Transportation sustainability is largely being measured by transportation system effectiveness and efficiency as well as the environmental impacts of the system [2].

Short-term activity often promotes incremental improvement in fuel efficiency and vehicle emissions controls while long-term goals include migrating transportation from fossil-based energy to other alternatives such as renewable energy and use of other renewable resources. The entire life cycle of transport systems is subject to sustainability measurement and optimization [12].

Sustainable transport systems make a positive contribution to the environmental, social and economic sustainability of the communities they serve. Transport systems exist to provide social and economic connections, and people quickly take up the opportunities offered by increased mobility [3]. The advantages of increased mobility need to be weighed against the

environmental, social and economic costs that transport systems pose.

Transport systems have significant impacts on the environment, accounting for between 20% and 25% of world energy consumption and carbon dioxide emissions [24]. Greenhouse gas emissions from transport are increasing at a faster rate than any other energy using sector [13]. Road transport is also a major contributor to local air pollution and smog [14].

The social costs of transport include road crashes, air pollution, physical inactivity, [25] time taken away from the family while commuting and vulnerability to fuel price increases. Many of these negative impacts fall disproportionately on those social groups who are also least likely to own and drive cars [15]. Traffic congestion imposes economic costs by wasting people's time and by slowing the delivery of goods and services.

Traditional transport planning aims to improve mobility, especially for vehicles, and may fail to adequately consider wider impacts. But the real purpose of transport is access - to work, education, goods and services, friends and family - and there are proven techniques to improve access while simultaneously reducing environmental and social impacts, and managing traffic congestion [4]. Communities which are successfully improving the sustainability of their transport networks are doing so as part of a wider program of creating more vibrant, livable, sustainable cities.

There are several definitions for sustainable transportation. Even so, there are common threads in most definitions of sustainable transportation based on sustainable development involving social, environmental, and economic aspects [19].

The Centre for Sustainable Transportation's (CST) definition of a sustainable transportation system is one that:

- allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations,
- is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy,
- limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

The Organization for Economic Cooperation and Development (OECD) [21] defines sustainable transportation as: transportation that does not endanger public health or ecosystems and meets needs for access consistent with:

- the use of renewable resources at below their rates of regeneration,
- the use of non-renewable resources at below the rates of development of renewable substitutes.

Sustainable transportation can be supported by promoting the use of:

- more energy efficient forms of transportation such as public transit,
- alternative transportation to the single occupancy vehicle,
- low emissions vehicles,
- transportation demand management,
- active transportation, and supportive land use practices.

At its most basic, sustainability reflects a concern for indirect and long-term impacts. The concepts of sustainability and sustainable development originally focused on certain long-term environmental concerns, such as natural resource depletion and ecological degradation (including climate change), but have expanded to include other issues. Most current definitions recognize three main categories of sustainable development issues: economic, social and environmental (or ecological), and some incorporate other issues such as governance and fiscal sustainability [5, 10].

The term sustainable transport came into use as a logical follow-on from sustainable development, and is used to describe modes of transport, and systems of transport planning, which are consistent with wider concerns of sustainability. There are many definitions of the sustainable transport, and of the related terms sustainable transportation and sustainable mobility [7]. One such definition, from the European Union Council of Ministers of Transport, 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 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.

Sustainability extends beyond just the operating efficiency and emissions. A Life-cycle assessment involves production and post-use considerations. A cradle-to-cradle design is more important than a focus on a single factor such as energy efficiency [11, 17].

The transport sector faces crucial challenges, i.e. a significant wear and tear of plant and equipment, in particular fleet; insufficient volume of investment required for renewing and developing innovatively the sector physical infrastructure; shortage of budget funding and depreciation payments; imperfect leasing procedure; a low level of the state's transit potential utilization.

The share of the transport sector in the gross domestic product of Ukraine is over 9 %, the value of fixed assets - more than 17 % of the productive capacity of the country, the number of employed workers - about 7%. Ukraine has a transportation network, which includes over 21.64 thsd. km main tracks, 169.6 thsd. km of roads, 2.1 thsd. km of inland waterways, 18 maritime trade and 10 river ports, 28 airports [16].

All kinds of vehicles annually carried 1.8 billion tons of cargo and about 7.0 billion passengers. Data on shipments by mode of transport in 2011 are shown in Table. 1. Indices of cargo volume and departure (transport) of passengers by public transport, compared to previous years, we are graphically depicted in Fig. 1.

Composition of the park and the average age of vehicles as of the end of 2011 in Ukraine there were nearly 9.3 million motor vehicles, among them: cars - 6.9 million units, cargo - 1.2 million units, buses - 249 thousand units, motorcycles - 840.9 thousand units. Over 50% of the vehicle has been in operation for over 10 years, less than 20 % of the cars are in operation for 3 years.

The park and the average age of railways, according to the Ministry of Infrastructure of Ukraine [20], are:

- 2457 diesel vehicles (28 years),
- 1853 electric vehicles (36 years),
- 320 diesel trains units (about 26 years),
- 1521 electric vehicles (over 29 years),
- passenger cars from 6959 (over 27 years),
- freight cars of all types 187,339 units (22 years).

To replace the park traction rolling stock, which worked normative lifespan, Ukrainian Railways (Ukrzaliznytsia) developed a comprehensive upgrade of railway rolling stock in Ukraine 2008-2020 years. In recent years, Ukraine has tended to increase in the average age of cars in use, due to the crisis of 2009-

2010, when sales of new cars fell sharply. These two trends have led to an increase in the average age of cars.

Rejuvenation of vehicles on the road going from 2005 to 2008 year when sales of new cars each year exceeded the realization of old cars. But the supply of "strength", which was the result of active sales in the pre-crisis years, is over.

Road transport causes the largest share (91%) of pollutant emissions from mobile sources, accounting for over one third of the total amount of pollutants in the atmosphere Ukraine. However, the biggest environmental threat is that transportation provides 70-90 % of the total emissions of pollutants to the air quality of most cities.

On average in Ukraine on 1 sq. km area accounts for nearly 4 tons of harmful air emissions from cars, and per capita - more than 50 kg. In Kiev, for example, vehicle emissions account for 213 tons, or nearly 96% of the total amount of pollutants in the atmosphere of the city. On 1 sq. km area in Kyiv falls 254 tons of harmful air emissions from cars, and per capita - nearly 76 kg. According to expert estimates, the total annual economic losses in the country due to the negative environmental impact of vehicles account for more than 20 billion.

The largest impact of road transport on the environment depends on the level of environmental safety design of wheeled vehicles, according to requirements of national legislation and standards and efficiency of technical regulations for admission to the operation of the vehicle.

The average age of cars in Ukraine today is the same as in 2005-2006, whereas the average age of cars sold in the secondary market of Ukraine this year was 15 years old. The park and the average age of municipal electric and sea and river vessels built in the Table. 2.

Table 1. Transportation of goods and passengers by mode of transport in 2011

	Freight transportation				Passenger transportation			
	Volume		Freight turnover		Volume		Passenger turnover	
	mln. tons	%	billion t-km	%	mln.	%	billion passenger-km	%
Railway	469,3	24,9	243,9	54,7	429,8	6,2	50,6	37,7
Motor vehicles	1252,4	66,4	57,3	12,9	3611,8	51,7	51,5	38,4
Water	9,9	0,5	7,3	1,6	8,0	0,1	0,1	0,1
Air	0,1	0,0	0,4	0,1	7,5	0,1	13,8	10,3
Electric	-	-	-	-	2922,7	41,9	18,1	13,5

Table 2. Composition of the park and the average age of municipal electric and sea and river vessels

Transport modes	Total	Time of operation			
		till 5 years	from 5 to 10 years	from 10 to 15 years	more than 15 years
Sea and river vessels					
Sea vessels	910	28	24	66	792
River vessels	2040	140	23	136	1741
Municipal electric transport					
Trolleybuses	3714	703	430	238	2343
Tram trains	2412	45	75	53	2239
Subway trains	1128	108	95	46	879

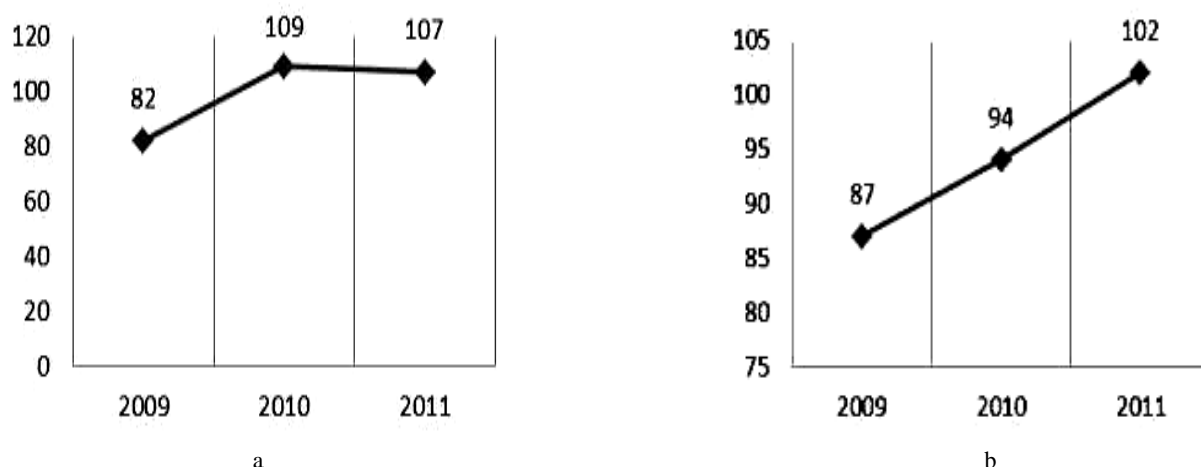


Fig. 1. Indices of the volumes of transportation

a – freight (to the corresponding period of the previous year, %),
b – passengers (to the corresponding period of the previous year, %).

Table 3. Volume of emissions of pollutants and greenhouse gas emissions from all transport modes in 2011

	Volume of emissions, tons	Increase (+), decrease (-) compared with 2010	The volume of emissions in 2011 to 2010, %	The distribution of emissions in 2011, %
Non-methane volatile organic compounds (NMLOS)	285580.4	-7684.0	97.4	11.4
Methane	8000.6	-174.1	97.9	0.3
Benzopyrone	174.4	10.3	106.3	0.0
Soot	34356.5	1941.6	106.0	1.4
Nitrous oxide [N ₂ O]	2143.2	-11.2	99.5	0.1
Ammonia	20.6	-1.1	94.7	0.0
Sulfur dioxide	30276.5	1367.6	104.7	1.2
Carbon monoxide	1842093.0	-45,957.2	97.6	73.6
Carbon dioxide	33749346.0	560476.6	101.7	-

Overall in 2011, emissions of pollutants as a result of transport and communication activities of Ukraine decreased by 0.6% compared to 2010 and reached the mark of 195.4 thousand tons, but there was a slight increase in carbon dioxide emissions to 5711 0 tons , which is 102% similar to the previous year.

The volume of polluting emissions substances and greenhouse gas emissions from all transport modes in 2011 are shown in Table. 3. According to the State Aviation Administration data [22], the number of aircraft and helicopters by the end of 2011 was 350 units. In taking measures to reduce the impact on the environment and human health from the operation of railway transport, compliance with environmental legislation, environmental security and prudent use of natural resources railroad industry in 2011 were directed more than 1 billion capital investment and current expenditure: protection of air, water, land, mineral resources, mineral and vegetable resources, waste management, industrial control implementation of the environment and so on, which is three times higher than the costs in 2010.

On the 20th of October 2010, the Cabinet of Ministers of Ukraine adopted the “Transport Strategy of

Ukraine for the period up to 2020” aimed at supporting sustainable and efficient transport sector operation to create conditions for social and economic development of the country, improved competitiveness of the national economy, and transport safety.

The transport strategy covers all transport sub-sectors, including cross-sector issues such as environment, border crossing, safety, etc. The strategy aims at facilitating the integration of the domestic transport system into the European and international transport systems, and maximizing the transit potential of Ukraine. The strategy is aligned with the President’s economic reform program adopted in summer of 2010.

The strategy provides a framework for the implementation of necessary transport sector reforms. It also sets out the foundation for government-led donor coordination to develop and implement a comprehensive and prioritized investment program in the sector.

This is a positive development as it provides opportunities for mobilizing the efforts of both Government and external partners for this highly important objective.

Currently, action programs for the execution of the strategy are under preparation. The transport strategy

refers to a number of other strategic documents that will be elaborated upon, such as road safety strategy, aviation safety program, etc. It is intended that the various sub-sectoral strategies under preparation will address the shortcomings of the overall transport strategy document.

Legal grounds of EU-Ukraine relationship are based on the Ukraine-EU Partnership and Cooperation Agreement (PCA) concluded by the Parties in 1998 [8].

At the present stage the framework and priorities of environmental cooperation between Ukraine and EU are determined by a number of documents of various levels to introduce the European Neighbourhood Policy (ENP) and Eastern Partnership.

In particular, the Country Strategy Paper for Ukraine for 2007–2013 within ENP Instrument (ENPI) for sectors of infrastructure development, including environment, prioritizes strengthening of administrative capacities to formulate and implement sectoral strategies and policies, which are approximated to EU policies and legislation, and emphasizes that in environment a specific attention should be paid to support implementation of multilateral environmental agreements (MEAs).

In March 2007 the negotiations with regard to new EU-Ukraine Association Agreement commenced; they were finalized in December 2011. Since the negotiations of Ukraine-EU Association Agreement and its ratification will require several years until the full Agreement comes into force, the Parties agreed to approve Ukraine-EU Association Agenda. With changes adopted by the EU-Ukraine Cooperation Council of 15.05.2012 it contains the following tasks related to environment and climate change:

The Parties cooperate with regard to preparation to implementation of EU acquis specified in the respective annexes to the Association Agreement and to support Ukraine in:

The Parties cooperate to support Ukraine in, and to prepare for implementation of EU acquis mentioned in relevant annexes of the Association Agreement [9]:

- implementation by Ukraine of the National Environment Strategy for the period till 2020 and the National Environment Action Plan for 2009–2012 in order to be able to take measures to implement budgetary support,
- strengthening of the administrative capacity at national, regional and local levels, including through development of effective inspection and enforcement capacities,
- further development and implementation of Ukrainian environmental legislation, strategies and plans, in particular on environmental impact assessment, strategic environmental assessment, access to environmental information, and public participation,
- development of national implementation instruments in line with multilateral environment agreements

signed and ratified by Ukraine and the EU, as enlisted listed in the Annex,

- implementing the Kyoto Protocol through a dialogue within the Joint EU-Ukraine Working Group on Climate Change on a new post 2012 agreement on climate change, on eligibility criteria for using the Kyoto mechanisms, and on developing measures to mitigate and adapt to climate change,
- promoting sustainable development and greening economy,
- promoting the implementation of the Bucharest Convention and its Protocols and working together with the Parties of this Convention to promote the accession of the European Union to the Convention,
- maintain a dialogue on Ukraine's participation in selected Environment Agency activities on information collection and dissemination such in the activities aiming at establishing the Shared Environmental Information System.

On 23 July 2012 the meeting of Ministers of EU Member-States and Eastern Partnership partner countries approved the Eastern Partnership Road Map that contains bilateral and multilateral dimensions.

As for Ukraine itself, through the EU Environmental Sector Budget Support (2011–2013) as well as other ENPI instruments (for instance, twinnings) to implement the environmental objectives of the Eastern Partnership Road Map the country will keep working towards approximation of environmental legislation, especially that specified in the Association Agreement.

To support implementation of the National Environmental Policy Strategy of Ukraine the Government of Ukraine and the European Union concluded in 2010 the Agreement on Financing of the Sector Budget Support Program for a total value of EUR 35 mln.

CONCLUSIONS

Given the above, we can say that Ukraine is still on indicators of sustainable development does not comply with the relevant indicators and indices. Current social and economic situation in Ukraine proves that the country hasn't succeeded in sustainable development yet. This is mostly caused by a number of obstacles the country is facing on the way to development and introduction of the sustainable development policy:

Ukraine is still behind the developed countries in living standards indicators, level of investment attractiveness, competitiveness and sophistication of innovation environment. This challenge is explained not only by external factors but the internal Ukrainian problems as well.

Another obstacle is lack of funding for regional development. Public funding, which could promote the economic potential of regions is almost absent.

Moreover, ecological culture of the citizens of Ukraine is still rather low.

Nowadays social, economic and ecological situation in Ukraine confirms that the country has failed to change significantly the extensive type of economic development and to ensure successful transition to sustainable development. The public health crisis, extremely high material and energy consumption per unit of gross domestic product, waste generation and environmental health indicators, e.g., air, water and land pollution have very risky and systematically stable interrelated trends.

Transition of Ukraine to sustainable development in transport is complex and time consuming. Its essence is to achieve a balance between society and environment, which includes the problems of long-term development of the country, issues of changing of the consumption structure, protection, rational use and restoration of the natural resources, economic and ecological security, social, scientific-technical and regional policy, as well as the aspects of external policy.

Studying the literature about sustainable transport sector enabled us to determine the main directions of introduction of the sustainable development policy in transport are as follows:

- development of the strategy of sustainable development of Ukraine,
- ensuring of the political support to the sustainable development transport strategy,
- ensuring of the informational support to the sustainable development strategy and training of the new transport staffing potential,
- integration of the sustainable development transport strategy into another strategy of economy,
- integration of the sustainable development transport strategy into the strategy of social-economic reforms at all levels (national, regional and local),
- introduction of the mechanisms and elements of sustainable development into other sector of Ukraine economy,
- publishing of the manual on introduction of the sustainable development transport strategy oriented on the representatives of the government of all levels and the manual oriented on a wide mass of public,
- realization of the demonstrational projects of sustainable development in transport sector of economy with the purpose of demonstration of the economic effect due to the implementation of the sustainable development strategy,
- introduction of the new methodology, drafting the transport activity plans on environmental protection and rational use of natural resources, oriented on ensuring of the principles of sustainable development.
- creation of the legal base in transport sphere for transition to sustainable development,
- formation of the effective structure of environmental protection transport management,

- creation and implementation the Energy and resource saving policy in transport,
- formation of the ecological culture of personnel in transport branch.

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