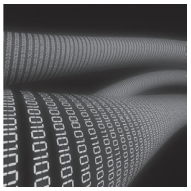

Archives of
Transport System
Telematics

Volume 11

Issue 4

November 2018

Concept of the Sustainable Intelligent Transport System, Iraq Case Study

E.N.A. AL-BISTENCHY (ALSHEMMARY), J. SZPYTKO
AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY, UNESCO AGH CHAIR (IRAQ), Av. A. Mickiewicza 30, 30-059 Krakow, Poland
EMAIL: szpytko@agh.edu.pl

ABSTRACT

Existing definitions for sustainable intelligent transport may vary and promote one particular dimension such as the environment (green transport), society (mass transport) or the economic dimension (effective and competitive transport). However, the sustainable intelligent transport is generally aimed at balancing the economic, social and environmental dimensions of the sector in an integrated manner to ensure synergies, complementarities, and coherence. The sustainable intelligent transport systems require, among other following features: the ability to provide safe means of transport socially inclusive, affordable, reliable, affordable and fuel/ energy efficient, environmentally friendly, low-carbon and resilient to shocks and disturbances, including those caused by climate change and natural disasters. The three basic pillars of a sustainable transport system include economic, social and environmental aspects related to technology. The subject of the paper is the concept of the sustainable intelligent transport system on the Iraq example.

KEYWORDS: intelligent transport system, telematics, sustainable growth

1. Introduction

Asia and the Pacific are becoming increasingly urbanizing, a trend that is reflected in many countries of the developing world. The share of the urban population from its current level in Asia is expected to grow from 48% to 64% by 2050. Long-term economic prospects show that prosperity among urban dwellers will also grow, so the demand for public and individual transport increases. Thus, car ownership is likely to continue to rise rapidly. Iraq alone received 10 million new vehicles in 2015. As a result, road traffic congestion can be expected to be more complex, further exacerbating the high negative environmental, social and economic impacts. Fig. 1 shows the crossing of the social, environmental and economic dimensions of sustainable outgrowth [1].

Information and communications technology can mitigate these impacts. The applications of communication and information technology in the transportation sector have led to the development of so-called "Intelligent Transport Systems" (ITS). Intelligent Transport Systems enhance the competence of safety and traffic, with positive results for sustainable development.

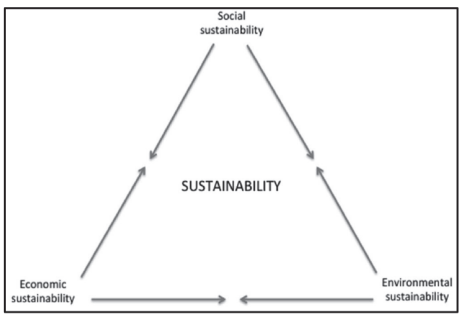

Fig. 1. The three poles of transport system sustainability [1]

ITS are becoming increasingly suited to the special needs of Iraq, and recent developments in information technology and communications such as the analytical capacity provided by open

and large data increase the likelihood of designing a system of ITS in developing countries (for example in Iraq) [2].

"Telematics" is a relatively hot term which is a generic word for systems and protocols that cover the transfer of protracted distances from computerized information. Information technology (often called Intelligent Transport systems) supplies a wide "toolkit" of audio/electronic device that transport planners can be used to instrument their transfer objectives. This includes in its broader context, system software, hardware, operating protocols, and communications. However, there are human and organizational interfaces and relationships that want to be put in place to fulfill sustainable transport systems and sustainable that we wish [3].

In both developing and developed countries within a few decades, urban areas around the world, have become less sustainable and more vehicle-dominated. Particularly in Iraq, cities are rapidly developing skills in transport and congestion challenges, including pollution and the deterioration public transport, climate change, environmental degradation, optical intervention, lack of access to the urban poor and energy depletion. In some of the more developed countries, northern Europe particularly, some cities have seen tendency to restore urban areas of automobiles and to block and/or otherwise confine cars from key parts of the downtown area. Such areas are oftentimes seen as pioneering instances of sustainable urban outgrowth, as cities around the universe seek to achieve the standards urban sustainability through the improvement of public transport, the promotion of non-motorized roads, the establishment of pedestrian zones and the reduction of the use of private vehicles in try to regress cities transformation happened because of cars dominance [4].

The paper reviews the extent to which intelligent transport system applications are linked to transport facilitation from a sustainable development perspective.

2. Issues and strategy

This part concentrates on the issue "What is now imaginable is the use of information technologies and any of these implementations can contribute in a cost-successful way to the specific elements of the local transport plan strategy?" The local transport plan recognizes a number of issues that must be addressed in the gross strategy; These elements are gathered into our main strategy elements, Table 1.

Table 1. Problems should be addressed under the overall strategy [3]

Strategy	Description	Telematics contribution
Expanding travel options	The legacy of previous car-driven transport policies is that the layouts and traffic levels on many roads the streets prevent their use by vulnerable modes, thus pushing many people to pay when they prefer not to.	It can help improve the safety and comfort of pedestrians and cyclists through: • Allow new crossings of a pelican, puffin, and toucan. • Modification of traffic signal facilities, including pedestrian and cycling phases and crossings. • Provision of all pedestrian crossings controlled by additional infantry facilities with physical and/or sensory impairment.
Production of a more integrated transport system	Systems should be able to integrate with other communication systems, to transfer information to the home, workplaces, transport exchanges, public buildings, and shopping malls. Central government support for integration provides an opportunity, in conjunction with operators, to promote and introduce integrated ticket systems.	For public transport users, it can help to provide integrated tickets using smart card technology, rail and bus concessions, and improve public transport information.
Managing traffic, restricting travel request	There are opportunities to reallocate the road space to provide priority for walking, cycling, and public transportation through: • Install bus priority in urban traffic control (UTC) and isolated traffic signals sites. • Provide priority of emergency vehicle (Green Wave) in UTC and non-UTC sites. • Implementation of pedestrian priority access control schemes in city centers. • operation of buses responding to demand • use of bus enforcement systems (e.g. "guardianship" system).	Information technologies provide the greatest opportunity to stabilize at least, but hopefully reduce the maintenance burden. Specific areas include: • Data Connections • Electricity (developments in optical technology and hand-held energy) • Specifications of urban traffic management and control systems (UTMC).
Meeting transport needs in rural areas	Demand-driven bus services can be expanded and further improved by speeding up response times by passing through rural villages and reducing the impact of trucks in rural areas.	New developments in information technology provide an opportunity to develop some appropriate solutions for rural areas with dispersed populations and diverse travel patterns
Making freight distribution more sustainable	One option is to allow bus lanes to be used for cargo traffic at certain times of the day. The implementation of bus lanes enforcement cameras such as the "guardian" system can be developed more to give the "Selected car priority".	It "will provide the value of the ability to handle different categories of the vehicle.

The telematics strategy is based on the provision of tools that can be used in the implementation phase to achieve lot targets and measure performance against the objectives of the local transport plan. Some information technology applications have been used until recently to make life easier for private motorists and maximize composite productivity in crowded urban areas. This information technology strategy will revise the outlook and priorities that serve public transport, transport safety, air quality and noise reduction. It will start to develop traffic tuning applications. Current traffic management applications will be reviewed to ensure that they support the objectives of the local transport plan and do not inadvertently generate a traffic demand. There are five main elements of the strategy [5]:

1. Transport and travel information.
2. Route directions.
3. Manage and control traffic.
4. Monitoring and control.
5. Enforcement.

It is clear that the launch of the telematics program can be seen as interference with personal privacy and civil and confidential freedom. It is suggested that these issues be treated with the greatest respect and sensitivity and be subject to careful public debate and scrutiny.

The telematics tools fund consists of equipment, techniques, and methodologies that can contribute to the successful integration of all the strategies of the subject. Table 2 sets out the key elements of this strategy and how it relates to the full program of thematic strategies.

Table 2. Communication between telematics and other topic strategies [6]

Other topic strategies	Topic strategies				
	Information	Guidance	Control	Monitoring	Enforcement
Bridge management	*	*	*	*	*
Highway maintenance	*	*		*	
Passenger transport	*		*	*	*
Road safety		*	*		*
Traffic management		*	*	*	*
Speed management			*	*	*
School travel	*		*		
Walking	*		*		*
Cycling	*		*		*
Travel awareness	*	*			
Parking	*	*	*	*	*

3. Traffic information system in Iraq

Establishment of the National Traffic Information System NTIS is necessary to achieve a significant reduction in the rate of traffic accidents. The main objective is to ensure the most time and regional extent of road network traffic and improve safety and traffic flow through a reliable, functional, efficient and secure road transport system [5, 7]. National Traffic Information System: a complex system environment for collecting, processing, exchanging, disseminating and distributing traffic data and traffic information on:

1. Present traffic state on the road network.
2. Road network, component and equipment intelligence.
3. Environment for the management and process of systems and applications on traffic information and traffic for a standardized geographical model of the road network.

The main objectives are to provide the road network service; to increase the continuity of road traffic and safety, and to minimize road traffic negative impacts. Ensuring road network traffic means that traffic data and traffic information are constantly updated for all phenomena or events that are, restricted passage or negotiability of the network in some areas or departments, directly or indirectly affecting the safety or continuity of the road traffic. It is important to provide the areas of the national traffic Information system: generating and collecting information, ITS from large concentrations, and it's from major roads. The National traffic information system has many of the benefits it needs in Iraq. We can categorize it to the general benefits, which are [8]:

1. Traffic accidents reduction and their consequences.
2. Road safety global increasing.
3. Low road users delays, travel time reduction and traffic fluency increasing.
4. Direct impact on the road user behaviors, and encouragement for responsibility.
5. Supporting the efficient diffusion of information technologies, information and communication systems and remote information systems in the transport sector.
6. Establishment of international, national, regional and local interoperability in the field of information and data on traffic, exchange information on the present status of the movement, traffic control, sharing of road network information and so on.
7. Conditions establishment for enhance traffic and for the development of the Iraqi road network.

4. Sustainable transportation in Iraq

Many researchers, institutes, and government organizations are working to reduce traffic congestion and build a sustainable transport system around the world. The common finding of this problem is that resources cannot continue to be consumed at current rates and that time is limited to action. These findings lead to the idea of implementing sustainable development processes in transport systems.

The definition of sustainable development "in the United Nations report in 1987" was "Generating development that applies the needs of the present without compromising the future generations' ability to satisfy their own needs ". This transport systems definition can be reformulated to ensure that future generations need mobility and transport will not be jeopardized. Researchers, governors, decision makers and so on are still working to build a sustainable world and sustainable transport systems, but the results of these efforts do not indicate significant improvements [9].

The concept of sustainable development is not straightforward, as it has different indicators. For example, transport impacts on fossil fuel reserves (oil), the global atmosphere and air quality local, noise contamination, mobility, congestion rate and mortality rates (deaths and failures).

The world has used nearly a trillion barrels of oil [9]. This fact can shed light on the very severity of this problem. Given the increasing rate of population growth and the number of vehicles on the road, the question is whether the oil reserves will be able to meet the needs of future generations or not. Congestion and the level of mobility are directly affected by the increased tendency of the car to travel and a number of vehicles. Today, in most urban areas, traffic congestion is one of the main concerns of the population. Even local government agencies invest huge sums of money to expand roads and reduce congestion; however, the results of these investments do not indicate significant benefits, as current roads cannot be extended indefinitely. In addition, congestion is the main cause of low urban air quality, due to vehicle emissions.

Transport is one of the main factors influencing air quality and significantly affects the global atmosphere.

4.1. Transport and environment

An effective transport sector is important for the well-being of people and economic development. However, transport activities can generate different negative environmental impacts.

Urban air quality data are an example of the extreme transport impact on the environment. Transport is the main cause of air pollution in which atmospheric exposure to chemicals and compounds physical or biological damage to human beings and organisms, or cause damage to the natural environment [10]. There are main contaminants like plants, volcanoes, and exhausts. Auto and other, secondary contaminants that have no direct effect. Pollution begins to increase natural concentrations of such materials (NOx, SOx, carbon monoxide, hydrocarbons, etc.), where these substances are ordinarily found in low quantities in the ambience but when the damage caused to the environment and humans increases [11]. Today air pollution is an essential problem related to governments, scientists, and people that have a direct impact especially in urban areas, land transport is known to play a significant role in pollution, causing public health problems [12].

Table 3 illustrates the magnitude of pollution in the Arab region, where there is often a great deal of interest in global pollution standards and found, causing pollution in multiple sources, but often by transport (HC and CO).

Table 3. The Arab States and the Middle East and North Africa region have estimated pollution loads (1,000 tons) in key sectors [10].

	NOx	SO2	TSP	HC	CO
Power	1000 (34%)	1600 (39%)	200 (17%)	50 (>1%)	150 (>1%)
Refineries	80 (>5%)	1100 (27%)	50 (>5 %)	300 (10%)	10 (>1%)
Cement / steel	300 (10%)	150 (>5%)	600 (50 %)		
Road transport	1100 (37%)	200 (5%)	120 (10%)	3000 (<80%)	16000 (<90%)
Residential	100 (>5%)	300 (7%)	100 (8%)	10 (<1%)	20 (>1%)
Industry*	400 (13%)	750 (18%)	120 (10 %)	30 (>1%)	50 (>1%)
Completely industry	780 (26%)	2000 (49%)	770 (65 %)	330 (10%)	60 (>1%)

(*) other than references, metal smelters, and cement/steel.

Fig. 2 shows the output of pollution due to transport in Iraq and the increased focusing of CO2 in air from 1971 to 2013, which represents less than 2.44 in 1971 and increase of 34.22 in 2013. This is due to the increase in population that has caused increased transport, which relies mainly on road traffic.

Poor air quality not only threatens human life but also affects the lives of all species on the planet. In addition, emissions and the global average temperature are increasing because the compounds burn fossil fuels. Finally, traffic accidents are another issue that should be included as part of sustainable development.

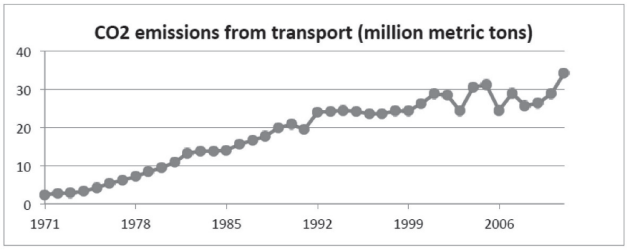

Fig. 2. Emissions of carbon dioxide in Iraq from transport [13]

The Iraqi Ministry of Health is monitoring possible routine injuries in eight of Iraqi governorates: Baghdad, Karbala, Maysan, Basrah, Al-Anbar , Erbil, Sulaymaniyah, and Ninewa by collecting information on all lethal injuries in these governorates, Fig. 3. Of total deaths due to injuries documented in the pathologist's office, we have analyzed only those assigned to road traffic that happened between 1 January 2010 and 31 December 2013 [14]. Criminal investigation officers confirm information from family members, physical examinations and police reports.

Fig. 3. Map of selected governorates that contribute to casualty control data in Iraq [14]

According to the analysis, the fatalities of road traffic were included (7,976). Totally, it was 2,272 (28,5%) of children under the age of 18 and 6,238 (78,2%) of male. The highest number of deaths due to traffic accidents occurred between the ages of 15 and 34 for the males and under five years of age for the children of both sexes, (49.2%) of the deaths happened among the pedestrians. Most of the deaths of women and children were from the pedestrian traffic accident (56.6%) and (69.0%), respectively. The mortality among motorcycle drivers (3.7%) and cyclists (0.4%) were less rife. Deaths rates from road traffic accidents ranged from 8.6 to 10.7 per 100,000 of the people, Table 4, Fig. 4. An evaluated 1.2 million people around the world pass away through injuries of road traffic every year [15]. The eighth leading cause of death globally is road traffic, before malaria, diabetes, tuberculosis, and all other classes of infections [16].

Also, every accident costs a great deal of money to the community. As a result of these unsustainable aspects of transport, there is an urgent need to devise new strategies to slow down the current trend. The use of the word "slowdown" is more accurate to the current issue because stopping or becoming sustainable cannot exceed the point of utopia. Studies in this era include extensive changes in views such as technological improvements, passenger behavior, alternative fuels, etc. These

changes may have an interesting impact on society as well as on common concerns: economic and environmental. For example, the study of Frank et al. [17] indicates that the chance of obesity increases by 6% with every additional hour wasted in traffic.

Table 4. Breakdown of mortality by type of road users, Iraq, 2010 to 2013 [14]

	Motorcycle Number (Row%)	Car Number (Row%)	Pedestrian Number (Row%)	Other/ Unknown Number (Row %)	Total Number
Total fatalities	292 (3.7)	3,695 (46.3)	3,925 (49.2)	64 (0.8)	7,976
Gender					
Male	277 (4.4)	2,963 (47.5)	2,940 (47.1)	58 (0.9)	6,238
Female	15 (0.9)	730 (42.1)	981 (56.6)	6 (0.3)	1,732
Unknown	0	2 (33.3)	4 (66.7)	0	6
Age					
Adult	236 (4.4)	3,019 (56.1)	2,089 (38.8)	34 (0.6)	5,378
Child (under 18 years)	54 (2.4)	621 (27.3)	1,567 (69.0)	30 (1.3)	2,272
Unknown	2 (0.6)	55 (16.9)	269 (82.5)	0	326
Governorate					
Basrah	9 (3.8)	116 (48.9)	110 (46.4)	2 (0.8)	237
Al-Anbar	19 (2.4)	561 (72.2)	191 (24.6)	6 (0.8)	777
Baghdad	46 (1.9)	333 (13.5)	2090 (84.5)	5 (0.2)	2,474
Erbil	62 (5.0)	919 (73.6)	257 (20.6)	11 (0.9)	1,249
Kerbala	61 (9.3)	228 (34.7)	354 (53.9)	14 (2.1)	657
Maysan	15 (2.5)	457 (74.9)	130 (21.3)	8 (1.3)	610
Ninewa	11 (1.2)	528 (57.9)	363 (39.8)	10 (1.1)	912
Sulaimaniya	69 (6.5)	553 (52.2)	430 (40.6)	8 (0.8)	1,060
Year					
2013	60 (3.3)	903 (49.8)	830 (45.8)	19 (1.0)	1,812
2012	68 (3.1)	891 (40.8)	1213 (55.5)	14 (0.6)	2,186
2011	59 (2.8)	1036 (49.5)	988 (47.2)	10 (0.5)	2,093
2010	105 (5.6)	865 (45.9)	894 (47.4)	21 (1.1)	1,885

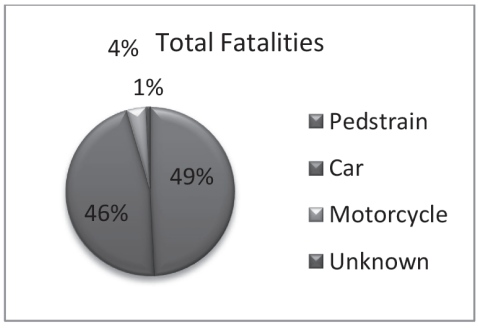

Fig. 4. Total fatalities by road traffic accident [14]

4.2. Expeditions of awareness-raising

Developing and developed countries have used education, information and advocacy campaigns and awareness-raising for sustainable urban transport with varying degrees of success, albeit generally limited. Usually, the more effective the measure, the greater the resistance it attends. Social techniques and operations, like the status search (i.e. vehicles as example of status), or the pursuit of freedom, are often mistrust of cooperation between others, often, in the developing world particularly, and continuing problems of urban transport. Furthermore, the ads produced by the automobile industry is much ahead of the promotion of urban transport sustainability. In mass awareness, special motor cars have long been connected with convenience, rests and speed, energy, pleasure, protection, individuality, tranquility, freedom, superiority [18].

Various public strategies to promote consciousness of sustainability of transport policy could be used [19]:

1. Information, learning, and connecting on peril-related hazards, levels, and types of risk producing from profiles of individual transport, risk reduction and, perceptions.
2. Social support and social modeling, that is, manifestation of cooperative attitudes and the effectiveness of others
3. Morals and values changing (i.e., encouraging altruism for others and the future generations, decreasing egoism, and challenging conscience).

Some specific techniques that seek to limit car uses have also been tested and developed, but only in the developed countries, in general. These mechanisms include savings in feedback planned for families and individuals on existing alternatives to behavior, costs and travel patterns. The motivation of people to consider the consequences of their travel behavior was the main objective of these exercises. However, the flying results are made hopefully (up to 10% less in car travel) and these impacts cannot be quite popular yet. Although they are cost-effective, they often need big initial exploitation [20].

Low-price actions are likely to be more constructive and meaningful in the developing countries, (for example, search days for a free car, cycling days to work and car-free days, bicycles festivals film, days for car-sharing, media attention, days for free-public transport). New approaches are required for effective public awareness-raising activities that are necessary to attract public attention. Campaigns must also provide specific ideas (such as the creation of cycling paths) rather than vague ideas (such as the overall sustainability of transport). Practice proposes that the public consciousness expedition must be targeted and "unified" (all imperative urban transport is presented as interlinked and interconnected). The policy of car-parking must be properly framed and not just a case of audience demand, but as a critical tool in limiting car travel demand and increasing revenue. The activities for audience consciousness should support the transformation existent models. For instance, bikes should be displayed as futuristic sound vehicles (i.e. a modern case code instead of a car for non-money). It is significant to identify pertinent advocacy activities and the reasonable context of the local populations that may not be able to communicate with examples of best practices from the advanced metropolises. Campaign organizers must provide a professional picture, experience, foresight, innovative, and perseverance. Amateur group messages are often ignored, whether the regime and/or civil society arranges expeditions of

awareness-raising, the assistance of charismatic government rulers is mostly final [21]. The concepts of sustainability must be included in the curricula of university education because many problems of urban transportation are committed and perpetuated by higher education persons. Prosperous sustainability internships lead to the involvement of participants (knowledge; transport sustainability comprehensive and academic study), and hands (the psychological field; theoretical learning age by the real-life practice of transport sustainability), hearts (emotional sphere; and the empowerment of attitudes that are translated into behaviors in travel).

The drivers are very conscious of the negative effects of urban driving, even in context, style choosing is distorted in favor of ground transportation, especially individual cars if drivers aren't loaded full costs of engines. Free available or low-cost parking also prop car using and ownership, as well traffic increasing (search for parking) [20, 21]. Artificially maintaining fuel prices-low by control price, exported quantity restrictions or governmental tension on the oil companies introduce other sets of negative effects, especially in the developing countries. These involve thriving black markets, contraband, fuel fraud, illegal transfer of support funds and significant financial losses incurred by fuel providers, degradation of the refining and other infrastructure, and damage to the entire economy due to severe fuel shortages [22].

5. Conclusion

In order to improve the transport situation in cities, it is necessary to take measures of payment and withdrawal that make private transport more energy-intensive, less attractive, and at the same time increase the attractiveness of public transport systems and non-motorized transport infrastructure. Intelligent transport is on the sustainable development essence where it provides growth of economic, trade promotion, access improving, and linking communities and societies. Smart, peaceful, affordable, dependable and little-carbon transport systems contribute to the affordability of energy environmentally friendly, climate-resistant and rule-based development for efficient economic, socially fair and sound environmental development. Thus, intelligent transport has a crucial role to achieve a sustainable development agenda that is effective and implementable beyond 2015. In view of the many stakeholders found in intelligent transportation in all roads and supply chains, better harmony and deliberation within and among regimes as well as with main stakeholders like business community and smart transport industry, as well as financial partners and lenders, are necessary for pushing the sustainable development agenda forward.

Acknowledgement

The work has been financially supported by the Polish Ministry of Science and Higher Education in the year 2018.

Bibliography

[1] ARNDT M.: Automotive Intelligent Transport Systems, ETSI. Available: http://www.etsi.org/technologies-clusters/technologies/automotive-intelligent-transport. [date of access: 12.02.2018]
[2] 'Mobility – UN-Habitat'.
[3] MIKULSKI J.: The Possibility of Using Telematics in Urban Transportation, in Mikulski J. (ed) Modern Transport Telematics, Springer Verlag, Berlin Heidelberg, CCIS 239 (2011), pp. 54–69
[4] WIEDERKEHR P., GILBERT R., CRIST P., CAÏD N.: Environmentally Sustainable Transport (EST): Concept, Goal, and Strategy–The OECD's EST Project, EJTIR, vol. 4, no. 1, pp. 11–25, 2004
[5] HRUDKAY K.: National system of traffic information and benefits for SMEs, Seventh Framew. Programme Balt. Balk. Netw. Logist. Competence Opatia Croat, 2011
[6] KOS-LABĘDOWICZ J.: Telematics in sustainability of urban mobility. European perspective, Archives of Transport System Telematics, vol. 10, 2017
[7] EICHLER S., SCHROTH C., EBERSPÄCHER J.: Car-to-car communication, Proceedings of the VDE-Kongress - Innovations for Europe 2006
[8] MBIYDZENYUY G.: Blekinge Tekniska Högskola, and Sektionen för datavetenskap och kommunikation, Assessment of telematic systems for road freight transport, Blekinge Institute of Technology, Karlskrona, 2010
[9] BLACK R.W.: Sustainable Transportation: Problems and Solutions. The Guilford Press. 2010
[10] EL RAEY M.: Air quality and atmospheric pollution in the Arab region, United Natl. Environ. Programme Reg. Off. West Asia Httpwww Un Orgesasustdevcsdcsd14escwaRIMbp1 Pdf, 2006
[11] ADMASSU M., WUBESHET M.: M. Ethiopia public health training initiative, Air Pollut., pp. 5–6, 2006
[12] HITCHCOCK G., et al.: 'Air quality and road transport: impacts and solutions', 2014
[13] W. H. ORGANIZATION: Atlas: substance use in the Eastern Mediterranean Region 2015, 2017
[14] LEIDMAN E., et al.: Road traffic fatalities in selected governorates of Iraq from 2010 to 2013: prospective surveillance, Confl. Health, vol. 10, Feb. 2016
[15] W. H. ORGANIZATION: Global status report on road safety 2013: supporting a decade of action: summary, 2013
[16] LOZANO R., et al.: Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010, The lancet, vol. 380, no. 9859, pp. 2095–2128, 2012
[17] FRANK L.D., ANDRESEN M.A., SCHMID T.L.: Obesity relationships with community design, physical activity, and time spent in cars, Am. J. Prev. Med., vol. 27, no. 2, pp. 87–96, 2004
[18] STEAD D.: Effectiveness and acceptability of urban transport policies in Europe, Int. J. Sustain. Transp., vol. 2, no. 1, pp. 3–18, 2008

[19] VLEK C.: Essential psychology for environmental policy making, Int. J. Psychol., vol. 35, no. 2, pp. 153–167, 2000
[20] BRÖG W., ERL E., MENSE N.: Individualised marketing changing travel behaviour for a better environment', in Paper presented at the OECD Workshop: Environmentally Sustainable Transport, 2002, vol. 5, pp. 06–12
[21] SIPOS Y., BATTISTI B., GRIMM K.: Achieving transformative sustainability learning: engaging head, hands and heart, Int. J. Sustain. High. Educ., vol. 9, no. 1, pp. 68–86, 2008
[22] KOJIMA M.: Petroleum product pricing and complementary policies: experience of 65 developing countries since 2009, 2013, Policy research working paper no. WPS 6396. Washington, DC: World Bank