EcoTown - Режим доступу до публікації: http://ecotown.com.ua/news/Na-Frankivshchyni-planuyut-vidkryty-shche-odyn-biohazovyy-zavod. 19. Українці почали утеплювати житло за рахунок держави [Електронний ресурс] / Новое Время - Режим доступу до публікації: http://nv.ua/ukr/publications/kultura-energospozhivannja-jak-ukrajintsi-gotujutsja-do-zimi-67678.html. 20. Державна служба статистики України [Електронний ресурс] – Режим доступу до публікації: http://www.ukrstat.org.

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GPS У ФОРМУВАННІ ЕКОЛОГІЧНОЇ СВІДОМОСТІ КОРИСТУВАЧІВ

Встановлено можливості використання методу АНР як інструменту стандартизації відбору маршруту перевезення, що є особливо важливим для комерційного транспорту, оскільки на постачальників впливають виробники, які вимагають від перевізників екологічної свідомості. Обґрунтовано використання системи GPS для формування екологічної свідомості користувачів та вибору відповідального сценарію поведінки під час вибору маршруту перевезення.

Ключові слова: GPS, метод АНР, екологічна свідомість, маршрут перевезення

GPS IN THE FORMATION OF ECOLOGICAL CONSCIOUSNESS OF CUSTOMERS

Established the possibility of using ANR method as a tool for standardizing the choice of route for transportation, which is especially important for commercial vehicles, since the suppliers affect manufacturers which are requiring from carriers an environmental awareness. Grounded the use of GPS system for the formation of ecological consciousness of users and selection of responsible scenario behavior in choosing route of transportation.

Key words: GPS, ANR method, environmental consciousness, route of transportation.

Statement of a problem. Recently received the expected effects of climate UN summit in Paris, agreed by all participants, are much stronger tool than those that operated under the Kyoto Protocol, as arising from this obligations are applicable to all countries without exception, not just applicable for the developed. However, from the moment of adoption of relevant obligations concerning prevention of uncontrolled negative climate changes until the moment of their implementation lies the daily routine, titanic work in shaping the country's general development priorities, industries, businesses, people, society. It becomes obvious and extremely difficult using only some tools of coercion (standards, limits, etc.) to achieve the desired results unless will be activated more soft, persuasive instruments relating to the responsible behavior of people: employees, owners, government officials and others. It is primarily about the formation of baseline of environmental consciousness of citizens, their positions on environmental issues and their everyday behavior in this context.

Analysis of recent studies. For several row decades is becoming progressive tendency concerning concept extention of sustainable (balanced) development [7] CSR [6] marketing values [10, p.6] CSR marketing [10], responsible supply chains [9] social Entrepreneurship [8] and so on. The common among these concepts are the violation of the state of absolute dominance of economic (business) purposes above the human objectives, designed to improve the environmental, social life, relationships between society, government and business, to avoid the phenomenon of negative dichotomy in human behavior as a specialist and as part of society, as business owner and as a consumer of products and services as the creator of lethal weapons and like a carrier of humanitarian values. The fresh and typical example of this dichotomy are the developers and installers of manipulation software at some models of VW cars for the purpose (by deception) of circumventing the stringent environmental USA standard, which of them being members of this existing society can not feel the magnitude of the harmful effects of their actions on the environment, do not realize the consequences of their behavior. If not, then there are obvious problems with the consciousness of ecological position.

In the context of the above actualization should covers the equally important category - the category of human capital [2]. The concept of human capital primarily focuses on the core competencies, multiplicativity knowledge, knowledge sharing etc. Instead of that, out of sight remains our own environmental awareness, if we take into account the traditional understanding of it as a combination of skills, knowledge and abilities of man. In particular, needs to be developed, according to the theory of broadening the scope of macroeconomic analysis on human behavior Nobel laureate in economics (1992) Gary Becker modern environmentally oriented definition of human capital at the micro level. This means that in the context of environmental awareness as an important component of social consciousness of human knowledge and skills should include information components and beliefs about the environment in the perception of its relationship with the conditions and quality of life, including the environmental threats [1]. It also indicate that the environmental position as the basic norm of human behavior must always be active on the positive or negative evaluation of people, objects, ideas and solutions.

It also identifies the environmental behavior in the implementation of any property, or direct human actions, or actions which cause the conduct of external entities, including law. Obviously, the most widespread are the daily, routine actions of people, workers, passengers, drivers, consumers, tourists and others. As often exist an alternative:

– Reached by bus or tram;

– Pack purchase in ecological packaging or disposable plastic;

– Used paper, cardboard, glass throw into the trash or allow re-use;

– Throw spent batteries in the trash or provide for disposal;

– Conserve energy, water or not, even if you’re not directly paying for it (in public places: corridors, toilets, staircase, etc.).

It is obvious that environmental awareness and ecological formation position and formation of ecological behavior requires long-scale efforts at the level of society as well as education about patriotism. It is advisable to use the international experience here from the point how to minimize harmful emissions, how to save energy and water, how to separate trash for recycling, etc., combining hard and soft instruments of influence to the behavior of business and society.

One of those mass phenomena suitable for cultivation of ecological behavior is a choice of routes when planning trips for the purposes of business, service or private purposes. Note that demand for transportation services of goods and people movement is steadily increasing, and it’s satisfying carried out by own transport, and by outsourcing, where road transport is developing on exorbitant rates. At the same time has a place a trending increase in the average distance of transportation, which is associated with the internationalization of the routes (Table. 1). A good satisfactory instrument, not even for professional but for domestic route planning is the Global Positioning System.

The formulation of article purposes. To prove mechanism of GPS systems use as a tool for environmental awareness of users and to give the suggestions for developers of appropriate environmental software.

Table 1

The total distance of cargo and passengers transportation by road (bus) transport

Country	Indexes	2010	2012	2013
Ukraine	The volume of traffic, mln. tons	1168	1260	1261
	Cargo turnover, billion thousand km	53,9	57,5	58,17
	The total transportation distance, km	**46,15**	**45,63**	**46,13**
	Passengers turnover, mln. pass. km	3726,00	3450,00	3344,00
	The volume of passenger transportation, mln. people	52,00	50,30	49,00
	The total distance of transportation, km	**71653,85**	**68588,47**	**68244,90**
Poland	The volume of transportation, ths. tons	770126,00	808297,00	857959,00
	Cargo turnover, mln thousand km	214204,00	233310,00	259708,00
	The total transportation distance, km	**278,14**	**288,64**	**302,70**
	Passengers turnover, mln. pass. km	569652,00	497288,00	459947,00
	The volume of passenger transportation, mln. people	21800,00	20012,00	20039,00
	The total distance of transportation, km	**26130,83**	**24849,49**	**22952,59**

Source: at the basis of [5, 11]

The statement of basic material. The Users of GPS (Global Positioning System) in the planning of routes are faced with the problem of their choice, which is typically based at multicriterion application approach. GPS users are individuals who use trips in private or official purposes (business). For example, product version IGO My Way 2009 offers four classes (categories) routes:

– fast,
– light,
– short,
– green.

Each of which can vary by the calculation parameters:

– Distance
– Time
– Fuel consumption,
– CO2 emissions.

Let us illustrate this on the example of planning car trips from Lviv to Poznan (Poland). Route options are summarized in Table 2.

Table 2

Characteristics of the possible routes of travel by car from Lviv to Poznan

The route class / Settings	Green				Quick		Light			Short			
	1	2	3	4	1	2	1	2	3	1	2	3	4
Distance, km	694	662	719	789	694	702	699	698	781	657	685	707	686
Time, hour.: min.	10:00	10:55	10:28	11:32	10:00	10:24	9:48	10:25	11:05	11:35	13:04	14:32	12:27
Fuel consump-tion, liters	46,8	46,2	48,5	53,8	46,8	47,6	46,8	47,5	52,9	45,5	49,02	51,4	48,4
CO_2 emissions	109	107,6	113	125,4	109	110,9	109	110,7	123,3	106,9	114,6	119,8	112,8
CO_2 emissions / Fuel consumption	2,329	2,329	2,330	2,331	2,329	2,330	2,329	2,331	2,331	2,349	2,338	2,331	2,331
	ß				ß		ß						

** Marked ß selected travel routes by car from Lviv to Poznan in terms of formation users environmental consciousness.*

We can identify three scenarios of user behavior:

1. Rational (effective): selects the fast, short and easy.

2. Environmental: choose green (beyond all rational).

3. Responsible: trying to reconcile with the environmental management (between economy and low emissions).

GPS users usually acts, depending on the gained experience thus:

a) trust on the software, choosing the fast, easy or short class, rarely green class, which he will be offered as priority route in the selected class;

б) the user can attach to choosing process his own additional priorities, including restrictions on road sections (repair, payment, ferries, etc.);

в) the user can consider the possibility of routes choice between classes and class options, ie consciously based on predefined selection procedure make this choice.

Among these three approaches we assume that third approach (analytical, conscious) is the most characteristic, or would this be for professional carriers, who are regularly faced with the problem of choice that enables small benefits to accumulate a significant effect during the year for many vehicles and so on. Obviously, these advantages may relate to:

a) smaller distances;

b) short time;

c) low fuel consumption;

d) low CO2 emissions;

d) drivers work is less strenuous and so on.

Given the presence of a certain, relatively high dependence between these parameters (direct or inverse) like following:

- Less distance - less time;
- Less distance - less fuel consumption;
- Lower fuel consumption - lower CO2 emissions;
- Easy route - less intensity of work, etc.

We can classify typical target conflicts according to sustainable development concepts and Marketing 3.0:

I. – economic goals (short time, low fuel consumption) contra social goals (hard work driver, the load on the local logistics infrastructure);

II. – economic objectives contra environmental objectives (pollution, noise, stench);

III. – social goals (workplaces, local development of infrastructure) contra environmental goals.

Prioritization and resolution of conflict between the economic, social and environmental objectives are in the three-dimensional space, consciousness (awareness) x attitude (position) x behavior.

Using the method of ANR (Analytic hierarchy process) to select the route involves the following steps:

a) establishing a hierarchy of selection criteria and quantification of their estimates;

b) establishment of a hierarchy of routes regarding certain criteria and quantification of their estimates;

c) the calculation of scores for each multi-route and construction of number of usage (hierarchy of routes).

In order to implement the first stage we will accept the following assessment:

1 – no benefits;

2 – unsignificant advantage;

3 – a significant advantage;

4 – a distinct advantage;

5 – absolute advantage.

Taking as a basis an identified set of criteria: time, fuel consumption, CO2 emissions, we will build the matrix.

The criteria	Time / distance		Fuel consumption		CO2 emissions		The intensity of the route (kilometers of motorways)	
	Importan-ce	Normalized value	Importan-ce	Normalized value	Importan-ce	Normalized value	Importan-ce	Normalized value
Time / distance	1	$\frac{15}{38}$	1	$\frac{15}{38}$	5	$\frac{5}{13}$	3	$\frac{6}{15}$
Fuel consumption (tariff)	1	$\frac{15}{38}$	1	$\frac{15}{38}$	5	$\frac{5}{13}$	3	$\frac{6}{15}$
CO2 emissions	$\frac{1}{5}$	$\frac{3}{38}$	$\frac{1}{5}$	$\frac{3}{38}$	1	$\frac{1}{13}$	$\frac{1}{2}$	$\frac{1}{15}$
The intensity of the route (km at the highway)	$\frac{1}{3}$	$\frac{5}{38}$	$\frac{1}{3}$	$\frac{5}{38}$	2	$\frac{2}{13}$	1	$\frac{2}{15}$
Total	$2\frac{8}{15}$	1	$2\frac{8}{15}$	1	13	1	$7\frac{1}{2}$	1

Fig.1. The matrix of system evaluation criteria for identifiable ANR method
Source: own development on the basis [4]

As a result of conducted analysis we get the following options for selecting routes from Lviv to Poznan.

Table 3

General description of selected routes from Lviv to Poznan

Criterion \ The route Class	Green1	Quick and green	Light
Distance km	694	694	699
Time, h .: min.	10:00	10:00	9:48
Fuel consumption, l	46,8	46,8	46,8
CO2 emissions	109,0	109,0	109,0
Highways, km	171	245	245
Toll roads	132	149	149

Source: own development

Actually the ANR method makes it possible to implement a compliance scenario. This is especially important for commercial vehicles for which such an approach should be mandatory. This can be done through standardization of routes selection, including through the expansion of the supply chain impact on operators as well as suppliers affect manufacturers that require them to be “green”.

Our research showed that: i) almost no one pays attention to the green mode, but only on distance, fuel consumption, travel time; b) among those who pay attention only a small portion is aware that may affect their actions on the environment, climate, etc.

Conclusions and recommendations for further research. 1. Possible to allocate three scenarios for the behavior of GPS users (rational, ecological, responsible - compromise between the rational and environmental). 2. Using the ANR method allows you to standardize the choice of route and justify the use of GPS systems as a tool for environmental users awareness. 3. The survey results indicate a small

proportion of GPS users, which are trying to reconcile on environmental management (efficiency with low emissions).

In prospect of further research for the formation of a responsible supply chain can be - development of standardized procedures to other processes, primarily in the area of supply, such as standardization of choosing a supplier in the implementation of responsible scenario.

1. Гері_Беккер [Електронний ресурс]. – Режим доступу: https://uk.wikipedia.org/wiki/. *2. Крикавський Є.В. Людський потенціал машинобудівного підприємства: аспекти ідентифікації та оцінювання / С. В. Леонова, Є.В. Крикавський // Вісник Національного університету "Львівська політехніка" "Логістика".– Львів, 2010. – № 669. – С.275–282. 3. Представництво ООН в Україні / Ініціатива Глобального договору в Україні* http://www.un.org.ua /, http://www.globalcompact.org.ua/. *4. Метод парных сравнений или АНР-метод. [Електронний ресурс]. – Режим доступу:* http://studopedia.org/13-102740.html. *5. Статистичний щорічник України за 2014 р.* http://library.oneu.edu.ua/. *6. Соціальна відповідальність бізнесу: розуміння та впровадження [Електронний ресурс]. – Режим доступу:* http:// http://www.un.org.ua/files/Concept_Paper.pdf. *7. Упровадження принципів сталого розвитку [Електронний ресурс]. – Режим доступу:* http://www.unilever.ua/sustainable-living-2014/embedding-sustainability/. *8. Цілі розвитку тисячоліття [Електронний ресурс]. – Режим доступу:* http: // uk.wikipedia.org/wiki/ *Цілі_розвитку_тисячоліття. 9. Carroll A. B. The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders, Business Horizons, July-August 1991. http://bas.sagepub.com/cgi/content /refs/38/3/268. 10. Kotler P., Kartajaya H., Setiawan I. (2010). Marketing 3.0. From Products to Customers to Human Spirit. Hoboken: John Willey & Sons. 11. Rocznik statystyczny rp 2014 [Електронний ресурс]. – Режим доступу:* stat.gov.pl /download/gfx/.../pl/ *./rocznik_statystyczny _rp_2014.pdf*