

У випуску представлені дослідження актуальних проблем економічної теорії, страхування, управління ризиками, перестрахування, державного управління, міжнародної економіки, економіки підприємства, менеджменту, маркетингу, управління інвестиціями, теорії фінансів, банківської справи, статистики та шляхи й засоби вирішення цих проблем.

Для наукових працівників, практиків, викладачів, аспірантів, студентів.

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Для научных работников, практиков, преподавателей, аспирантов, студентов.

The research results on current problems of economic theory, insurance, risk management, reinsurance, public administration, international economics, business economics, management, marketing, investment management, theory of finance, banking, statistics, the ways and means of solving these problems are released in the issue.

For researchers, practitioners, teachers and students.

**ВІДПОВІДАЛЬНИЙ РЕДАКТОР****РЕДАКЦІЙНА КОЛЕГІЯ****Адреса редколегії****Затверджено****Атестовано****Зареєстровано****Засновник та видавець****Адреса видавця****Журнал входить до наукометричних баз / Abstracted and Indexed:**

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03022, Київ-22, вул. Васильківська, 90-а, економічний факультет  
☎ (38044) 259 71 82; <http://bulletin-econom.univ.kiev.ua>

Вченою радою економічного факультету  
25.06.2014 (протокол № 10)

Вищою атестаційною комісією України.  
Постанова Президії ВАК України №1-05/7 від 10.11.10

Державною реєстраційною службою України.  
Свідоцтво про державну реєстрацію  
КВ № 19866-9666ПР від 29.04.13

Київський національний університет імені Тараса Шевченка,  
Видавничо-поліграфічний центр "Київський університет".  
Свідоцтво внесено до Державного реєстру  
ДК № 1103 від 31.10.02

01601, Київ-601, 6-р Т. Шевченка, 14, кімн. 43  
☎ (38044) 239 31 72, 239 32 22; факс 239 31 28

RINC (E-Library)  
Ulrich's Periodicals Directory  
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# BULLETIN

OF TARAS SHEVCHENKO NATIONAL UNIVERSITY OF KYIV

ISSN 1728-2667

ECONOMICS

6(159)/2014

Established in 1958

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Для научных работников, практиков, преподавателей, аспирантов, студентов.

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<b>Approved by</b>	<b>the Academic Council of the Faculty of Economics, Taras Shevchenko National University of Kyiv (Protocol # 10 of 25th June 2014)</b>
<b>Accreditation</b>	<b>The journal is in the List of specialized scientific publications, which are to publish the main results of dissertations in Economic Sciences (Resolution of the Presidium of HAC of Ukraine №1-05/7 of 10.11.2010)</b>
<b>Registration</b>	<b>SRSU. Registration certificate KV No. 19866-9666PR dated 29.04.13</b>
<b>Publisher</b>	<b>Taras Shevchenko National University of Kyiv Publishing center "Kyiv University". DK №1103 of 31.10.02</b>
<b>Address of publisher</b>	<b>01601, Kyiv-601, Boulevard Shevchenko, 14, room. 43 ☎: +38 044 239-31-72, +38 044 239-32-22; fax: +38 044 239-31-28</b>

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**CLIMATE CHANGE: THE MAJOR THREAT OF THE 21ST CENTURY**

*We consider important aspects of Kyiv climate change because of natural influences (growing population and level of household consumption accompanied with mounting volumes of waste) and anthropogenic factors (shrinking forests and green spaces, inefficient use of natural resources, increased use of fossil fuels, uneconomical use of energy and water for production and business activities, outdated production technology). The study exposes major negative effects of the climate change, examines the dynamics of trends and the relationship among population growth, consumption of energy resources, emissions of substances to air and waste production in Kyiv during 2000-2013. The environmental conditions in the city are under careful examination and compared with the environmental situation in the largest European capitals. The key scientific and methodological, organizational, economic, technological steps are outlined in the context of Ukraine's integration into the European economic space to counteract climate change in Kyiv.*

**Keywords:** climate change, ecosystem, air, emissions of substances, greenhouse gases, waste, climate control.

General statement of the problem and its relation to important scientific and practical tasks. Climate change is considered to be the greatest threat to nature and humanity in the twenty-first century. We share the warning made by US Secretary of State John Kerry who called climate change perhaps "the world's most fearsome weapon of mass destruction" and said that it was compelling us to act." [1] The experts assume the average global temperatures to increase by 1.4-6.4°C by the end of the 21st century and that may result in a sharp rise of the sea level, alteration of the rainfall distribution pattern, occurrence of floods and drought, leading to a decline in agricultural production, reduction in crop yields and livestock productivity, and as a result to food shortage. A particularly critical situation may develop in Asia, Africa and Latin America [1]. It threatens extinction and disappearance of more than 25% of rare animal and plant species, and may enhance migration processes. According to UN estimates, in 2008 20 million people were migrants due to climate change, and by 2050 these can be almost ten times more [2], which will exceed the current total number of migrants worldwide [3]. Annual losses because of warming could be expected to reach almost 5% of GDP [4].

Climate change becomes important for Ukraine in connection with its transition to the declared stable (sustainable) development and because of adoption of the Law of Ukraine "On the Fundamental Principles (Strategy) of Ukraine's State Environmental Policy for the Period until 2020," "Energy Strategy of Ukraine till 2030 year." Over the past decade there has been a growing intensity of climate change with anthropogenic and human impacts on environment, economy, welfare, and living. This appears especially true in highly urbanized areas, large cities, large industrial centers with heavy traffic flows, intensive use of natural and other resources, accumulation of waste. A nexus is obvious: the cities influence its environment leading to climate change and similarly the climate change affects the cities' economic, social and ecological systems and standard of living. Any failure to realize importance of these processes and a necessity for efficient management of them threatens the food and environmental security, public health, impedes the implementation of the principles and conditions for sustainable development. The Law of Ukraine "On the Fundamental Principles (Strategy) of Ukraine's State Environmental Policy for the Period until 2020" claims the second strategic goal (after raising public environmental awareness) an improvement of the environmental safety. One of the important tasks is to develop by 2015 the "basic principles of national policy on climate change adaptation, development and phased implementation of a national action plan on climate change mitigation

and prevention of anthropogenic impact on climate change for the period until 2030, including the steps within the mechanism of the Kyoto Protocol to the framework Convention of the United Nations on climate Change and joint implementation projects and projects of the environmental (green) investments" [5].

The analysis of recent research and publications on the issue in question. The crucial issues of climate change has been attracting attention of many renowned scholars. Among the latest research on the formation of an effective environmental policy in terms of possible climate change are comprehensive scientific developments accomplished by O.O. Veklich, S.M. Voloshin, L.V. Zharov, E.V. Khlobystov and other researchers. V.G. Potapenko examined the development of "green" economy and aspects of adaptation to climate change in the context of Ukraine's economic security. S.I. Snizhko and O.G. Shevchenko prepared a study into geographical features and urban-meteorological aspects of air pollution in cities [6-8].

Unresolved parts of the problem the paper deals with. Despite significant research portfolio, dynamics, trends of climate change still require an adequate study; the natural and anthropogenic factors influencing this process, especially in urban areas and major cities like Kyiv are not clearly defined. Comprehensive assessment of the Kyiv environmental condition with the use of internationally recognized social, economic and environmental indicators and criteria has not been done yet and its comparison with leading European capitals is still pending. The priorities of actions to mitigate the Kyiv climate change or strategies to cope with the climatic negative effects require continuous research and scientific reasoning.

Statement of the paper goals.

*The aim* of the paper is to identify the key scientific and methodological, organizational, economic, practical actions to prevent climate change and provide adaptation to the climate change by taking into account the socio-economic development of Kyiv.

To achieve the goal, the following objectives were set:

- identify the adverse effects of climate change and the factors influencing the process.
- assess the environmental situation in Kyiv compliant with the universally recognized international parameters of environmental performance, environmental well-being from the standpoint of sustainable development and to show its ranking among European cities.

- formulate proposals to prevent or eliminate the negative effects of climate change in the city of Kyiv taking into consideration the European integration course of Ukraine.

The object of the study is climate change in the city of Kyiv.

A detailed account of the research with a discussion of its findings. The study ascertained that the impact of climate change affected many aspects of life of individuals and society as a whole, specifically the state of ecosystems, quality of life, financial, material and labor costs. Among some of the possible negative effects of climate change we need to consider the ecosystem destruction, extinction of animal and plant species; an increase in frequency and intensity of natural disasters, industrial accidents, deterioration in the quality of life and reduction in life expectancy (Fig. 1).

Climate change and its adverse effects are especially evident as regards the increasing level of urbanization, the concentration of urban population, the production of goods and services in urban areas. Climate change and global warming affect mostly the metropolitan areas, because of the concentration of substances in emissions and discharges and especially due to the greenhouse gas emissions from mobile and stationary sources, from the landfills

overloaded with the accumulated unprocessed wastes, and because of the heat emissions rising in the air from buildings and structures. UN-Habitat's Global Report on Human Settlements 2011 *Cities and Climate Change* alleges that the contribution of the greenhouse gas emissions from human activities has the greatest impact on climate change. The share can constitute from 40 to 70 percent of the emissions estimated on the base of the production data (totaling the greenhouse gas from the facilities located in the cities.) If the estimate is based on the consumption database (totaling the greenhouse gas released at production of the products and services consumed by urban residents regardless of the location of the production sites), the amount of the greenhouse gas share can be as high as 60-70% [2, p. 3]. This is due to the use of extractive fuels (mainly coal, oil, gas) to generate electricity, energy at the public utilities, manufacture, transport, waste recycling at landfills.

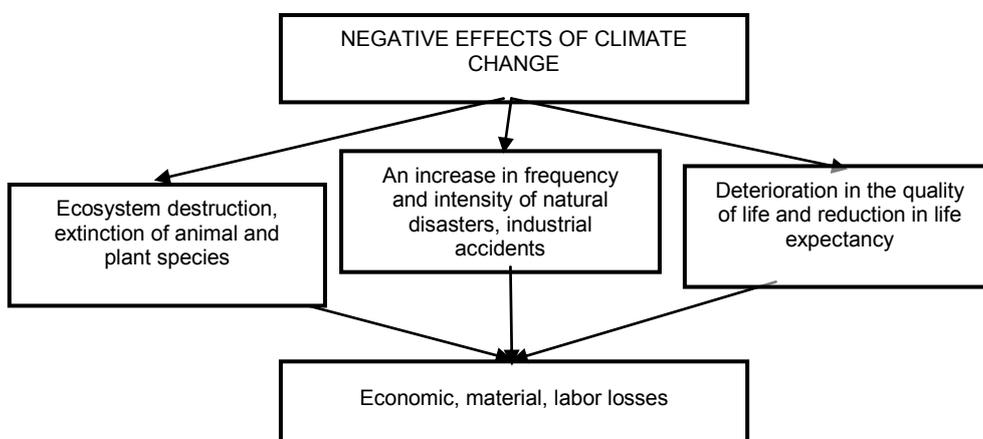


Fig. 1. Major negative effects of climate change

Source: compiled by the authors.

The above trends are universal for all countries, including Ukraine. The statistics of the USSR and Ukrainian censuses show that from 1926 to 2014 the number of urban

dwellers has grown from 5 373 600 to 31 378 600 or by 26 005 000 people that is 5.8 times as much, and their share increased from 18.5% to 69.0%, or by 50.5% (Table 1.)

Table 1. Population in Ukraine and a share of urban dwellers from 1926 to 2014

Year	The entire population (thousand people)	Ratio		The entire population (%)	Ratio	
		Urban	Rural		Urban	Rural
1926	29018.2	5373.6	23644.6	100.0	18.5	81.5
1939	30946.2	11190.4	19755.8	100.0	36.2	63.8
1959	41869.0	19147.4	22721.6	100.0	45.7	54.3
1970	47126.5	25688.6	21437.9	100.0	54.5	45.5
1979	49609.3	30168.9	19440.4	100.0	60.8	39.2
1989	51452.0	34297.2	17154.8	100.0	66.7	33.3
2001	48457.0	32574.0	15883.0	100.0	67.2	32.8
2014*	45553.0	31378.6	14174.4	100.0	69.0	31.0
2014 as regards 1926, %; +,- percentage points (pp)	157.0	5.8 times greater	59.9	X	+50.5 pp	-50.5 pp

\* As of 1 January 2014

Source: compiled by the authors from statistics of the USSR and Ukrainian censuses (1939-2001) and the data of the State Statistics Service of Ukraine [9-11.]

Kyiv climate changes because of natural influences (growing population, increasing level of household consumption, mounting volumes of waste, etc.) and anthropogenic factors (shrinking forests and green spaces, inefficient use of natural resources, increased use of fossil fuels, uneconomical use of energy and water for production and business activities, outdated production technology, low level public environmental awareness) – see in detail [12,13.]

The city of Kyiv is one of Europe's largest natural landscape, business, financial, commercial and industrial centers. One can observe a rapidly swelling number of its residents with the increasing industrial production and transportation in the city. There is an excessive consumption of

energy and other resources with disproportionate accumulation of domestic and industrial waste. In 1927 there were 494 thousand people in Kyiv while in May 2014 the capital's population reached 2.87 million of residents. It is an increment of 2.117 million city dwellers. In other words, the capital's population increased 5.8 times. Power over-consuming production and energy uneconomical households are characteristic features of Kyiv. The consumption of fuel and energy resources are increasing from year to year, and with them emissions of substances to provoke increased temperature and change of climate. Some researchers as S.I. Snizhko, A.G. Shevchenko think that these emissions are harmful [14, p. 20.] See: Table 2.

**Table 2. The dynamics of population growth and consumption of certain types of energy resources and of waste generation in Kyiv from 2000 to 2013**

	2000	2005	2010	2013	2013 vs 2000 (%)
Overall city dwellers (at the beginning of the year), thousand of people	2631.9	2666.4	2785.1	2845.0	108.1
Consumption of energy materials and oil processing products:					
coal (thousand tones)	180.6	185.4	319.1	464.6	257.3
natural gas, mln. m <sup>3</sup>	3910.1	4641.5	4534.0	4072.3	104.1
gasoline engine (thousand tones) <sup>1/</sup>	154.5	296.0	550.4	458.6	296.8
gas oil (diesel fuel, thousand tones)	143.3	227.3	340.1	361.3	252.1
liquefied propane and butane (thousand tones)	1.9	5.7	16.5	45.7	24.1 times greater
firewood for heating (thousand m <sup>3</sup> )	39.1	40.7	47.4	30.2	77.2
Energy consumption (million KWh)	2852.7	3887.4	3710.4	4193.7	147.0
Emissions into the atmosphere (thousand tones)	170.4	220.5	265.3	247.7	145.4
including:					
stationary sources	32.6	33.6	28.6	31.9	97.9
mobile sources <sup>2/</sup>	137.8	186.9	236.7	215.8	156.6
Emissions of carbon dioxide:	...	7.9	9.7	9.2	116.5 <sup>3/</sup>
including:					
stationary sources	...	7.9	7.0	6.5	82.3
mobile sources <sup>2/</sup>	...	...	2.7	2.7	100.0 <sup>4/</sup>
Waste (thousand tones at the end of the year)	171.4	3.1	3553.8	10038.4	2.9 times bigger <sup>3/</sup>

## Notes:

<sup>1/</sup> Excluding sales to public through filling stations.

<sup>2/</sup> 1990-2002 data refer to road transport; the data starting from 2003 refer to the road, rail, aviation, and water transport; the data starting from 2007 refer to the road, rail, aviation, water transport and production facilities.

<sup>3/</sup> 2013 vs 2005 (%)

<sup>4/</sup> 2013 vs 2010 (%). Taking into account that the State Statistics Service of Ukraine changed its technique for assessing the volume and composition of waste, the data of 2000 vs 2005 are not comparable and not considered.

The source: compiled by the authors from statistics [15-18.]

In 2013 the population of Kyiv increased by 8.1% as compared to 2000 and that was accompanied with growth of used: coal 2.6 times for production and communal needs (including coal sales to the households and allowing for the coal losses at production, transportation, distribution and storage), gasoline engine almost 3 times, diesel fuel 2.5 times, liquefied propane and butane 24.1 times, power 1.5 times. During this period, emissions into the atmosphere especially those from the mobile sources increased nearly half as much again (56.6%). A similar trend is observed with regard to waste. The volume of waste in 2013 as compared to that in 2010 increased from 3553.8 to 10.0384 million tons, or 2.9 times. All this proves inefficient, ineffective use of non-renewable resources, and operation of resource-intensive economy.

The increasing concentration of substances released into the air, in addition to greenhouse gases and heat cause warming and intensify extreme natural (weather) events and enhances the pressure on the environment, people, flora and fauna. Green areas of cities and of residential suburbs

are incapable of "neutralizing" completely the negative impact of the human activity. The result is an imbalance of the ecosystem accompanied with social and economic losses. According to the World Health Organization, each year an average of 27 thousand people die in the cities of Ukraine due to diseases caused by dusty air [19, c. 20].

Although Ukraine is among the countries that have an average level of moderate sensitivity to climate change (the 75th position among 123 countries), nevertheless *Maplecroft*, which is the world's leading global risk analytics, research and strategic forecasting company, ranks Kyiv by its environmental status as one of the critical places in Europe. Kyiv is on the last 30th position by the index of environmental performance that reflects the individual indicators of the environment in urban areas (CO<sub>2</sub> emissions, clean air and water, waste, condition of housing, energy consumption, transport and environmental governance.) The index of environmental performance of the capital of Ukraine was only 32.33% in 2010. This index is almost three times lower than that of other European countries (Table 3).

**Table 3. Green city index in 2010 (%)**

Rank	City	Green City Index	Rank	City	Green City Index
1	Copenhagen	87.31	16.	Warsaw	59.04
2	Stockholm	86.65	17	Budapest	57.55
3	Oslo	83.98	18	Lisbon	57.25
4	Vienna	83.34	19	Ljubljana	56.39
5	Amsterdam	83.03	20	Bratislava	56.09
6	Zurich	82.31	21	Dublin	53.98
7	Helsinki	79.29	22	Athens	53.09
8	Berlin	79.01	23	Tallinn	52.98
9	Brussels	78.01	24	Prague	49.78
10	Paris	73.21	25	Istanbul	45.20
11	London	71.56	26	Zagreb	42.36
12	Madrid	67.08	27	Belgrade	40.03
13	Vilnius	62.77	28	Bucharest	39.14
14	Rome	62.58	29	Sofia	36.85
15	Riga	59.57	30	Kyiv	32.33

The source: compiled by the authors from data [20]

Kyiv is in last place among the top 30 European cities in terms of environmental performance from the standpoint of sustainability. This is because of an extremely inefficient use of resources, technological backwardness,

low levels of corporate social and environmental responsibility of business, culture and environmental awareness of citizens, etc. (Table. 4).

**Table 4.** Index of environmental performance of Kyiv in its sustainability among 30 cities of Europe in 2009

	Kyiv	Copenhagen	Stockholm	Helsinki	Berlin	London	Istanbul	Moscow
Population, mln.	2.7	0.5	0.8	0.6	3.4	7.6	12.6	10.5
GDP per capita, thousand. Euros	5.0	43.6	39.4	52.8	21.6	44.9	14.6	14.5
Annual greenhouse emissions per head (CO <sub>2</sub> -equivalent, tones)	4.1	5.4	3.6	6.0	6.6	5.8	3.3	6.4
Energy consumption per head	87.2	80.6	104.9	88.6	77.7	78.0	36.2	117.2
Percentage of renewable energy consumed by the city	0.5	18.8	20.1	3.5	1.8	1.2	5.1	н/д
Total percentage of citizens walking, cycling or taking public transport to work	89.0	68.0	93.0	44.7	54.8	63.0	54.0	н/д
Annual water consumption per head m <sup>3</sup>	265.6	147.0	185.8	76.3	55.6	57.6	68.6	143.9 (157.5) (164.2)
Share of waste recycled (%)	0.0	23.6	31.0	57.6	35.0	20.0	3.1	15
Rank	30	1	2	7	8	11	25	n/a

The source: compiled by the authors from data [21]

As one can see from Table 4 the city has a low share (0.5%) of energy production from renewable sources and virtually no domestic waste processed (less than 1%). At the same time, other European capitals demonstrate much better these two indices: Copenhagen: 18.8 and 23.6%, Stockholm: 20.1 and 31.1%, correspondingly. Kyiv has an excessively high per head water consumption: 265.6 m<sup>3</sup>. For comparison, the index of water consumption in some other cities: Copenhagen 147.0 m<sup>3</sup>, Stockholm 185.8 m<sup>3</sup>, Helsinki 76.3 m<sup>3</sup>, and Berlin 55.6 m<sup>3</sup>.

Transparency of atmospheric air has a significant effect on climate change and ecological state of the city. The air transparency is being deteriorated due to emissions of substances from stationary and mobile sources, which are the transport and energy sectors, as well as from the waste management. Greenhouse gases that are released into the atmosphere augment the greenhouse effect, keeping the sun's heat in the lower atmosphere. Today, Ukraine is among the top twenty countries that emit the most greenhouse gases in the atmosphere. The Kyoto Protocol, signed by Ukraine in 1999 does impose certain environmental obligations on the country, though regrettably, not rigid enough. It does not require an attenuation of greenhouse gas emissions as it allows fixing the releases at the level of 1990 indicators. In this case, there is a possibility even to increase the emissions into air.

Air quality in Kyiv depends primarily on emissions of pollutants from stationary sources (production companies, facilities, installations, etc.) and mobile sources (engines of the aviation, railway, and water transport and of the industrial units.) Thus, according to the Central Statistical Office, in 2013 the stationary and mobile sources of emissions released 247,700 tons of materials and, in addition, 9.2 million tons of carbon dioxide into the atmosphere of Kyiv. From year to year the density of emissions increases and is greater than 300 tons per square kilometer, which is almost 30 times higher than the average for Ukraine. The main sources of emissions are motor vehicles of the road transport. In 2013, in Kyiv, emissions from these sources accounted for 215,800 tons of carbon dioxide and 2,700 tons, or 87.1% and 29.3% of the total emissions. In recent years, emissions are growing, especially due to the contribution from road transport.

Due to the increase of amount and concentration of emissions in the air its temperature grows, the number of extreme weather events becomes greater (hot weather, droughts, floods, landslides, hurricanes, etc.). According to

the Ukrainian Hydrometeorological Center, for the last 20 years the average temperature in January and February has increased by nearly 2.5 degrees. The Center reports that the last decade was the warmest in history of meteorological observations. The probability of the summer temperature of 30 degrees or greater has also increased significantly [22].

To avert climate change and mitigate its negative effects, Kyiv undertakes certain scientific, methodological, technological, organizational and investment activities. In accordance with the decree of the executive body of the Kyiv City Council (Kyiv City State Administration) "On ensuring the 2013 environmental activities in Kyiv", in June 2013 the scientists of the Economic Faculty of the Taras Shevchenko Kyiv National University organized the international conference on prevention of climate change: "Climate and the City" (Kyiv case study.) Besides, the Kyiv City strategy to avert climate changes and adapt to them been developed in view of the socio-economic development of the Ukrainian capital. The strategy defines the purpose of the basic principles, the main drivers of climate change, the main lines of organizational and economic instruments to avert climate changes and adapt to them, taking into account the characteristics and prospects of development of the city until 2025. The legal, economic and organizational activities focus on the most energy consuming and energy intensive sectors of municipal services with the purpose to avert climate change in Kyiv for mitigation and adapt to the climate alterations that have already occurred.

More than 70 cities of Ukraine joined the EU initiative "Covenant of Mayors", which is implemented in eleven countries of the Eastern Partnership and Central Asia, and signed it in order to develop an effective energy-saving policy, including a reduction of 20% of the consumption of fossil fuels and reduce CO<sub>2</sub> emissions into the atmosphere in 2020, cut down the share of the city budget allocated for the purchase of energy. Currently the use of heat per square meter in Ukraine is 2-3 times higher than in the EU. The actual consumption of energy is twice as large as the need for it [23].

Based on the experience of foreign countries, Kyiv takes steps towards operation of electric transport vehicles, in particular of electric cars in the city. The world's largest fleet of electric taxi is expected to be in China in 2022. Thus, Shenzhen plans to operate 1,200 buses and 800 taxis equipped with electric motors. According to "BIO Avtomotiv", the company that imports electric vehicles to Ukraine, there are only 130 electric vehicles in the country.

They are environmentally friendly and this is their main advantage compared to those that run on gasoline, though the disadvantages are a long process of the battery recharging, a low speed (typically 70-80 km per hour), and costly batteries with a limited lifetime of 5-7 years. Thus, the cost of the battery can be up to 50% of the overall cost of a 120-180 thousand hryvnia electric car. In addition, the necessary infrastructure for servicing electric vehicles has not been created yet. Despite these and other problems, Kyiv has launched a privately invested project of setting up a taxi company of electric cars. The investment is expected to be paid back in 2-2.5 years. Ten electric charging stations (for ten cars each) are to be arranged in different areas of the city. Electric cars will charge their batteries in 20 minutes. One of these electric charging stations has been in operation in Heroes of Stalingrad of Obolon district street since 2012. The electric vehicles are to be equipped with lithium-iron-phosphate batteries, which with a single charge will provide 150 mileage [24].

Kyiv undertakes measures to reduce the impact of its combined heat power plants (CHPP) on the environment. Thus, the city modernized equipment, introduced a modern energy-saving technologies and equipment for use of natural gas, which is considered to be main environmentally-friendly fuel for CHPP-5 and CHPP-6 that generate heat and electricity for Golosiivsi, Pechersk and Darnitskii (CHPP-5), Obolon, Desna, Dnieper, Podolsky, Shevchenko (CHPP-6) districts of Kyiv. The total capacity of these power plants is 1200 MW, the thermal power is 3614 Gcal / h, and the impact on the environment meets current national and global environmental standards.

The megapolis implements projects aimed at processing hard domestic wastes, which is a source of greenhouse gases in the atmosphere. Clean City national project started came in force in 2010. The City Council approved the Program of municipal waste management for 2010 – 2015. This program comprises construction of five waste processing facilities. A modern waste processing complex with capacity of 65 thousand tons of waste per year started to work in April 2013. It provides recycling and waste delivered from Darnitskii and Obolon districts. However, in recent months the implementation of the planned measures has been suspended due to lack of funding.

In general, the above and other measures to combat climate change are inadequate. According to the Climate Change Performance Index Ukraine moved from the 19th to 35th place surrender its place even India, whose economy exerts one of the greatest world's impact on climate change [25]. Ukraine should create an effective integrated policy to avoid climate change and adapt to climate alterations, actively undertake actions to reduce greenhouse gas emissions, lessen energy intensity of production, and increase use of renewable energy sources, and to ratify amendments to the Kyoto Protocol.

It is expedient to design and implement the national and Kyiv programmes of averting climate change and its adverse effects. One should remember that many of the capitals and cities of the developed countries for example Amsterdam, Berlin, Boston, Vancouver, Hamburg, Hong Kong, Cape Town, London, New York, Paris, Rotterdam, Seattle, Singapore, Toronto and Ho Chi Minh and others have adopted and successfully implement concepts, strategies, programmes of counteracting climate change and providing adaptation to climate alteration.

In designing and implementing the programmes of socio-economic development of Ukraine and other documents one must take into account the risks associated with climate change, defining the tasks in lessening human impact on climate and adapting to climate change. The results of comprehensive studies into weather and climate should be the basis for the programmes to ensure assess-

ment and forecast of the risks and benefits to the economy from climate change, resources to adapt to these changes, as well as threats to national security.

The time has come to define the criteria, parameters (thresholds) conditions of security for the economy and population of Ukraine, the major cities, including Kyiv under climate change. It concerns the indicators of health status, mortality, living conditions, extreme weather events (drought, overwetting), disturbing the environmental balance, the spread of infectious and parasitic diseases, the increase in electricity consumption for cooling the air in summer, etc.

It is essential to develop and implement multisectoral strategies and policies to lessen greenhouse gas emissions by introducing economic mechanisms and levers to reduce the emissions, primarily in industry, energy and transport, and encourage use of renewable energy for production of heat and electricity.

For implementation of Ukraine's course towards European integration, special attention should be paid to the modernization of housing and communal services to curb greenhouse gas emissions and heat into the atmosphere, reduce excessive consumption of the heat, energy, water, waste generation at operation of buildings and structures running households. This will be contributed by the following:

- introduction of a clear transparent system of accounting energy consumption in flats and buildings by equipping them with devices to record consumed water, heat, electricity, and natural gas,
- implementation of an energy management system, preparation of energy certificates of buildings,
- planning new compact houses with windows to the south, reducing the area of the glass coating, excluding air flow area, painting the walls a light color,
- thermal insulation of external walls, windows, entrance doors of buildings, installation of solar collectors on the roofs, updated plumbing, sewer, electrical, ventilation networks, etc.,
- planning construction of streets with an account for prevailing wind direction for optimum wind regime of the city, the cooling of buildings, construction of industrial and residential areas.

Attention should be drawn to the current EU stringent requirements for its members to fulfill their commitments on energy efficiency of buildings. The European Commission summons Poland and Austria to the Court of Justice of the European Union for failure to fulfill obligations to implement the EU Energy Performance of Buildings Directive (EPBD.) In case of a condemnatory judgement, the countries may face daily fines: Poland over 96700 euros; Austria almost 39 600 euros. According to EU requirements each of the EU members must approve the standards of minimum requirements for the energy performance of buildings, create a system of certification and organize regular inspections of heating systems and air-conditioning [26].

Because of the reduction of green area in Kyiv and its suburbs it is necessary to develop and implement a concept, and then a program of arranging green spaces in the city for its adaptation to climate change. Particular attention should be given to the development of organizational-economic mechanism for the implementation of these strategies. Presently there is about 16 m<sup>2</sup> of green space per one Kyiv resident, while, the international standards requires 25 m<sup>2</sup>, which is 1.6 times more [27].

It is essential to strengthen and develop the information base and provide the city residents and wide public an access to information on climate change, its impact on health, human life and society, the benefits of energy conservation and the necessity to achieve it, improve utilization of renewable energy sources, the use of energy-saving technologies and the like.

The conclusions from this study and an insight into further research in this field.

In order to prevent the negative effects of climate change in Kyiv, avert climatic alterations or adapt to them it is necessary to strengthen and develop the socio-economic, environmental and information policy on formation of the climatic eco-friendly environment. Such a policy should comprise a set of measures to develop the city's programme of prevention of climate change and adaptation to climate alterations, the programme of arranging green spaces in the city for its adaptation to climate change, the modernization of housing and communal services, buildings and structures, the arranging of the effective transport and logistics systems, the creation of green areas, the implementation of clean and resource-saving technologies, the use of renewable energy sources and the increasing public awareness of climate change issues. Implementation of these and other strategies will contribute to making Kyiv's environment closer to meeting the requirements and standards of the EU in the field of sustainable development, and in forming of a modern system to manage climate change in urban areas.

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Надійшла до редакції 19.06.14

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 11-16

UDC 331.107.266

JEL: D01

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## SYSTEM PRINCIPLES OF THE SOCIALLY RESPONSIBLE INVESTING OF POWER PROJECTS OF UKRAINE

*The new direction of modern investment projects was researched – socially responsible investing. We consider the system principles of social investment, including the selection of the best options for risk analysis, assessment and minimization. The methods of estimation of social projects in the energy sector of Ukraine for every type of risk were examined. The expert estimation of three power projects was analysed. The regressive model of estimation of competence of every expert was built and the type of projects according to environmental and social principles of analysis has been established.*

**Keywords:** socially responsible investment, investment risk, responsible investment principles, strategies of modernization, investment projects, regression analysis.

**Introduction.** Modern society characterized by the new level of economic and social development. Recently, socially responsible investment (SRI) have increased significantly in popularity among investors worldwide. SRI investors combine financial objectives with their desire to contribute to the solution of social, ethical and environmental issues. Today the successful operation and development industry are largely dependent on the level of social responsibility.

Objective justification for the need of socially responsible development strategy requires proper study of the problem of social investment risks.

The market of social investment is relatively new ([1, 2], 2011). Risks relating to social investment opportunities may be uncertain, they are usually difficult to assess. In-

vestors should carefully weigh the risks associated with investing in the social sphere, as they currently have a low level of regulation compared to other investments.

Despite the increasing urgency of the problem of social and investment activities in theory and practice prevails fragmentary analysis and selective approach to certain aspects of the coverage, including an approach to the study of social investment risks. As a result of particular relevance to the issues of building an integrated system of socially responsible investing, including the identification of risks and the selection of the best options for their analysis, evaluation and minimization.

In the classic sense, "social investment" – a long-term investment of financial resources in the social facilities to

improve the quality of life. But over the years, this definition is out of date and in need of clarification. So there are other approaches, according to which social investment to create and implement the reproduction of human capital, social investments are seen as a way to implement corporate social responsibility.

Association of Managers gave the following definition of the "social business investment" ([1], 2013): physical, technological, managerial and other resources, and financial resources of companies directed by the decision of the leadership for the implementation of social programs, tailored to the interests of the major internal and external stakeholders the assumption that the company will strategically certain social and economic impact.

It is proposed at risk: the possibility of loss arising from the specifics of the phenomena of nature and activities of human society.

The risks inherent in social investing the same properties as other investment risks ([4], 2012):

- Rejection of the intended purpose for which carried selected alternative (rejection of both negative and positive).
- The probability of achieving the desired result.
- No-confidence in achieving this goal.
- Material, moral and other losses associated with the implementation of the selected alternatives under uncertainty.

However, if the main criterion for investment risk is the possibility of failure to achieve the projected income, then the risk of social project are areas where things can go wrong investments may not achieve the intended social benefits.

Total social investment less risky and increases risk of organization. However, different from ordinary investment risks, they have a significant social and environmental value.

Investors of social investment often agree to lower financial returns in order to obtain greater social impact.

Now the main international standards in the field of responsible investment principles are the Responsible Investment (UN Principles of Responsible Investments/ UN PRI), developed by the United Nations and the principles of the Equator (Equator Principles), and based on the standards and guidance of the World Bank and International Finance Corporation (IFC).

One of the Equator Principles – Assessment and analysis of social risks. Namely, analysis and classification, in which each project is evaluated and classified based on the magnitude of its potential impacts and risks in accordance with the environmental and social criteria analysis, in accordance with applicable IFC project risks are divided into next categories ([8], <http://www.equator-principles.com/> (Accessed in February 2014), [9], <http://www.ftse.com/index.jsp> (Accessed in February 2014)):

Category A – projects with potentially significant adverse social and environmental impacts, which are diverse and irreversible (1-1,99 points).

Category B – Projects with potential limited adverse social and environmental impacts that are few in number, usually apply only to the location of the object and can be remedied by measures for their mitigation (2-3,99 points).

Category C – Projects with minimal social or environmental impacts or have social and environmental impacts (4-5 points).

The aim of the research is to analyze the social and environmental projects of modernization of heating Ukraine on the basis of the principles of socially responsible investing.

**Literature review.** In modern domestic science problems of social investments investigated Ye. Libanova, A.Vasilik, G.Poplavskaya, D. Bauyra, M. Natalenko [2, 14, 17].

Today the main international standards in the field of responsible investment principles are the UN Responsible Investment principles, developed by the United Nations (see <http://www.ftse.com/index.jsp>), and the Equator Principles (see <http://www.equator-principles.com>), based on

the standards and guidance of the World Bank and the International Finance Corporation (IFC).

Donets L. ([4], 2012) describes the risk assessment of socially responsible investing (SRI).

Over the last years in Ukraine appeared a lot of new as specially adapted to national realities methods of estimation of investment strategy.

Barsola I., and Kosmynskaya ([1], 2013) give a definition of responsible investment and its importance. Bayura (Bayura, 2011) describes SRI as a highest level of corporate responsibilities.

Formation of the investment strategy of large financial groups with implementation of expert methods using systems analysis was examined in works of Slushaienko ([16], 2012).

Zlenko O. ([17], 2012) describes the role of SRI between entities. But Kaczynski, A., Egorov, Y. ([13], 2009) propose the principles of ecological security of Ukraine, for which it is desirable to choose investment projects.

Methodology for the risk assessment of social investment enterprises studied in the works [18, 19].

**General formulation of the Problem.** Using the above techniques in paper proposes to consider the social and environmental project "Strategy for modernization of Zaporizhia region heating system." The basis for the development of this strategy was the "Zaporizhia heat scheme", agreed with the Ministry of Housing and Communal Services of Ukraine ([12], 2010). The main threats to the reliability of heat supply in the period 2015 – 2025 is a rise in prices for natural gas and heat and high heat losses in housing and budget homes.

The aim of the Strategy is to develop training programs profound modernization of the district heating system of Zaporizhia substitution of natural gas local fuels and energy.

The basis for selection strategies of modernization of the district heating system of Ukraine on the period 2015 – 2025 the following main objectives:

- Reduction of heat loss of customers use by thermo buildings by 65-70 %.
- Multi shift to balance with the substitution of natural gas to local fuel and energy by 80-90 %, while the planned saving in the fuel balance of natural gas as a peaking and reserve fuel source.
- Reducing the environmental impact on the environment and reduce greenhouse gas emissions by 90%.
- Reduce the rate of growth of the tariff burden on the budget and the public at 30-40 %.

The proposed strategy requires the involvement of significant investments (over 1.3 million) in the 2015 – 2025 period.

As part of the proposed strategy, the implementation of the modernization program of the municipal region heating system is planned, which includes the following projects ([12], 2010):

- The investment project number 1. Reducing losses and irrational natural gas and thermal energy. Thermo isolation of 622 houses from Zaporizhia budgets.
- The investment project number 2. Reducing losses and unsustainable consumption of natural gas and thermal energy. 2500 thermo isolation buildings housing Zaporizhia.
- The investment project number 3. The replacement of natural gas by local types of fuel and energy. Transfer hot water residential buildings for electricity.

The proposed strategy is based on a newly developed energy balance heat systems in the 2015 – 2025 period.

This selection of projects for evaluation and modeling is not accidental.

Among the negative effects of recent decades, particularly for scientific and technical progress, scale becomes increasingly pollution of air, water, soil cover degradation, destruction of stockpiles of biological resources, violations of

stability of ecological systems, and many others, including as a result of military activity which adversely affects all components of ecological systems, disrupting their natural balance.

Analysis of research suggests that environmental issues are constantly aggravated. In general, the situation can be characterized by excessive pollution and degradation of the human habitat, limited vital natural resources, growing environmental awareness and concern for the peace community's future.

The cause of the unstable ecological situation in Ukraine is largely economic factors, such as:

- Structural deformation economy of dominance raw-intensive mining and production;
- Inadequacy of environmental study of plans and projects for economic development;
- Poor performance of existing administrative and economic mechanisms of environmental protection.

In general, Ukraine has more than 37 thousand different industrial facilities that annually emit more than 10 million tons of harmful substances. The bulk of emissions of air pollutants from stationary sources contribute energy industries and metallurgy (33 and 28 percent of total emissions). About 60 % of releases accounted for substances that are most prevalent: dust, bisulfur oxides, carbon monoxide, nitrogen dioxide, heavy metals, etc. High levels of contamination observed mainly in the Donets-Dnieper industrial area. In addition, in Ukraine there are about 10 thousand enterprises in industrial complex and farms that intensively use natural resources and pollute ground, water, thereby causing damage to the environment ([6], 2007).

In Ukraine, as in all civilized countries, the priority national interest is to ensure environmental safety in terms of potential and actual disasters, accidents and catastrophes.

According to Article 16 of the Constitution of Ukraine, the main directions of the state policy of Ukraine on environmental protection, natural resources utilization and environmental security declare that ensuring environmental safety and maintaining the ecological balance in Ukraine, Chernobyl disaster – a catastrophe of global scale, preserving the gene pool of the Ukrainian people are the responsibility of the state ([11], <http://zakon4.rada.gov.ua/laws/show/254к/96-вр> (Accessed in February 2014)).

Article 7 of the Law of Ukraine "On National Security" specifies that environmental safety is a component of national security. Together with the environmental safety of the national are included: foreign policy, government, military and security border of the state, the political, economic, social and humanitarian, science and information ([10], <http://zakon2.rada.gov.ua/laws/show/964-15> (Accessed in February 2014)).

Obviously, for a more detailed coverage of the meaning of the term "environmental security" has to rely on scientific developments given that scholars are still not developed a consensus on its definition. Among the most common are:

Environmental security – a set of actions, states and processes that directly or indirectly lead to preventing serious damage (or the threat of such damages) that harms environment, individuals and humanity as a whole.

Environmental security – a set of states, events and actions that ensure the ecological balance of the Earth and all its regions at the level to which physical, socio- economically, technologically and politically ready (can adapt without serious loss) humanity.

**Models and results.** We consider three strategies of modernization investment projects of district heating system of Zaporizhia. It is proposed to consider the methodology for assessing the social project for each risk socially responsible investment ([4], 2012).

**Table 1. SRI risk assessment**

Type of risk	Questions to assess the likelihood of of risk	Methods of assessing the SRI risk
Financial	Is it reasonable design estimates documentation of social action? Which of the amount required for the development of Social Project has already found? Is it possible, if failure of one/several investors find an equivalent replacement?	From 1 to 5, where 1 is virtually non-existent risk, 5 – risk – very likely.
Informational	Do you have experience working with the media? Is it enough developed an episode?	From 1 to 5, where 1 is virtually non-existent risk, 5 – risk – very likely.
Management	Does your team the necessary expertise to develop and implement social project? Extent team members psychologically compatible with each other? Is there any support from the government, donors, etc.?	From 1 to 5, where 1 is virtually non-existent risk, 5 – risk – very likely.
Risk of reliability of members of the social project	Whether as part of your team of professionals specializing in social engineering specialists who understand the technology development final product/ services social project?	From 1 to 5, where 1 is virtually non-existent risk, 5 – risk – very likely.
Legal	Are there contradictions in your social project with applicable regulatory and legal framework?	From 1 to 5, where 1 is virtually non-existent risk, 5 – risk – very likely.

Source: Donets, L. I., 2012

By this method the experts evaluated the above investment projects № 1, № 2 and № 3 [15, 16]. Comprehensive assessment of projects is as follows:

**Table 2. Projects risk estimation**

	Project 1	Project 3	Project 3
<b>Expert 1</b>	4,7	4,5	3,9
<b>Expert 2</b>	4,5	4,2	4,3
<b>Expert 3</b>	4,5	3,9	4
<b>Expert 4</b>	4,3	4,2	3,7
<b>Expert 5</b>	4,5	3,9	3,9
<b>Expert 6</b>	4,3	4	4,1
<b>Expert 7</b>	4,2	4,1	3,9
<b>Expert 8</b>	4,1	4,3	4,4
<b>Expert 9</b>	4,5	3,7	3,8
<b>Expert 10</b>	4,3	4,2	4
<b>Sum</b>	<b>43.9</b>	<b>41</b>	<b>40</b>
<b>Sum/10</b>	<b>4.39</b>	<b>4.1</b>	<b>4</b>

Source: compiled by the authors.

Following the procedure equator principles, all projects can be classified as C, projects with minimal social and environmental consequences, which should be implemented.

However, in order to more accurately assess the risks of the projects will take into account the competence of experts ( $E_i, i = 1...10$ ).

**Table 3. Self-assessment and self-assessment of competence of experts**

$E_1$	$E_2$	$E_3$	$E_4$	$E_5$	$E_6$	$E_7$	$E_8$	$E_9$	$E_{10}$	$E$
7	7	7	9	4	8	8	7	7	8	7.2
7	9	5	10	4	10	10	9	9	9	8.2
6	9	9	9	8	10	10	9	9	9	8.8
9	8	9	10	8	10	8	4	5	8	7.9
4	10	7	7	9	10	9	10	8	10	8.4
9	8	6	10	7	9	10	7	9	10	8.5
7	10	8	8	7	10	9	8	9	10	8.6
8	10	9	9	8	10	9	3	4	9	7.9
10	10	7	9	7	9	9	6	6	10	8.3
7	8	6	10	7	9	10	9	9	8	8.3

Source: compiled by the authors

Competence is determined by self-estimation and self-assessment experts: one expert defines its competence and in other quantitative scale from 0 to 10 points. Averaging assessments of competence (Z), obtained by each of the experts, giving averaged expertise of each expert. The disadvantage of this method is the subjectivity resulting average competence, due, for example, experts belonging to different destinations.

Better suited documentary method, based on an assessment of the personal factors experts ( $x_i, i = 1...10$ ), as the experience of development issues directly connected with the subject expertise, practical experience in the field of specialization, participation in expert valuation or in the special commissions on issues close to the subject of this review and more. For Documentation was obtained by the following table.

**Table 4. Personal factors**

	$x_1$	$x_2$	$x_3$	$x_4$	$x_5$	$x_6$	$x_7$	$x_8$	$x_9$	$x_{10}$
$E_1$	0	0	0	1	88	14	4	1	0	60
$E_2$	0	0	0	1	62	6	4	0	1	44
$E_3$	0	0	1	0	6	0	4	0	0	68
$E_4$	0	0	1	1	101	16	10	1	0	62
$E_5$	0	0	1	0	0	0	4	0	0	58
$E_6$	0	0	1	0	28	2	5	0	1	42
$E_7$	1	0	1	0	49	4	4	0	0	36
$E_8$	1	1	0	0	92	6	12	0	1	59
$E_9$	0	1	0	0	62	4	6	1	0	56
$E_{10}$	0	0	0	1	37	2	4	0	1	59

Source: compiled by the authors

These factors ( $x_i$ ) affect the quantitative assessment of the competence of the expert (C) based on influence coefficients ( $a_k$ ), which can be reflected to some linear formula:

$$C = a_1x_1 + a_2x_2 + \dots + a_kx_k .$$

**Table 5. Information about the experts. Adjusted values**

$U_1$	$U_2$	$U_3$	$U_4$	$U_5$	$U_6$	$U_7$	$U_8$	$U_9$	$U_{10}$	$U$
0	0	0	2.4	211.37	33.63	9.61	2.40	2.4	144.12	<b>17.29</b>
0	0	0	1.47	91.19	8.83	5.88	1.47	1.47	64.72	<b>12.06</b>
0	0	2.79	0	16.71	0	11.14	0	0	189.41	<b>24.51</b>
0	0	0	1.61	162.19	25.69	16.06	1.61	1.61	99.56	<b>12.69</b>
0	0	1.62	0	0	0	6.47	0	0	93.81	<b>13.59</b>
0	0	2.21	0	61.76	4.41	11.03	2.21	2.21	92.64	<b>18.75</b>
2.69	0	2.69	0	132.01	10.78	10.78	0	0	96.99	<b>23.17</b>
1.30	1.3	1.3	0	120	7.83	15.65	1.3	1.3	76.96	<b>10.30</b>
0	1.93	0	0	119.81	7.73	11.59	1.93	0	108.22	<b>16.04</b>
0	0	0	2.36	87.48	4.73	9.46	2.36	2.36	139.50	<b>19.62</b>

Source: compiled by the authors

Transforming the initial data  $Z, X$  in weighted  $V, U$  (Table 5) allows the device to use traditional regression analysis.

By means of a stepper regression, selecting regressors (variables, their squares or products of reciprocal) deter-

mine the most suitable model. Calculations are made using application package EViews.

$$C = a_0 + a_1U_3^2 + a_4U_8^2 + a_5U_3U_9.$$

**Table 6. Modeling results**

Dependent Variable:	V			
Method	Least Squares			
Date	12/14/13	Time	12:16	
Sample	1 10			
Included observation	10			
Variable	Coefficient	Std. Error	t-Statistics	Prob
$U_3^2$	2.168141	0.159429	13.59944	0.0000
$U_8^2$	1.976546	0.221990	8.903767	0.0001
$U_3U_9$	-1.937605	0.268624	-7.21307	0.0004
C	7.610401	0.873039	8.717134	0.0001
$R^2$	0.968726	Mean dependent var	16.80200	
$R_{adj}^2$	0.953089	S.D. dependent var	4.766869	
S.E. of regression	1.032453	Akaike info criterion	3.190926	
Sum squared resid	6.395750	Schwarz criterion	3.311960	
Log likelihood	-1.15224E-05	Hannan-Quinn criter.	3.058152	
F-statistic	61.95101	Durbin-Watson stat	1.439858	
Prob(F-statistic)	0.000066			

Source: compiled by the authors

From the calculations it can be concluded that the model is adequate.

$$C_i = 7.61041 + 2.168141U_3^2 + 1.976546U_8^2 - 1.937605U_3U_9$$

Substituting the coefficients found in the model, we find the calculated values of competence.

$$C_i = [7.99; 6.21; 8.16; 9.94; 8.16; 6.72; 8.16; 6.21; 7.99; 6.21]$$

So, only take into account objective data on the competence of experts, allows you to get an objective assessment of the estimated (Table 7).

**Table 7. Assessment of projects risk based on the competence of experts**

	Estimated competence of experts (C)	Project 1	Project 2	Project 3
Expert 1	7.99	37.58	35.98	31.18
Expert 2	6.21	27.95	26.08	25.7
Expert 3	8.16	36.71	31.82	31.53
Expert 4	9.94	42.75	41.76	36.79
Expert 5	8.16	36.71	31.82	31.82
Expert 6	6.72	28.88	26.87	27.54
Expert 7	8.16	34.26	33.45	31.82
Expert 8	6.21	25.46	26.70	27.32
Expert 9	7.99	35.98	29.58	23.73
Expert 10	6.21	26.70	26.08	24.84
Sum	75.75	332.99	310.14	292.27
	Sum/Sum(C)	4.4	4.09	3.85

Source: compiled by the authors

Using computational competence of experts based on a model that takes into account the documented data on individual experts, we got a few other estimates (Table 1 and Table. 7). Thus, the rank of the project 3 decreased from 4 to 3.85, and the rank of the project 1 increased to 4.4.

Thus, the method of the equator, 1st and 2nd projects can be classified as C, and the third-categorized as B, which means limited potential for adverse social and environmental risks. The first two projects – with minimal social and environmental consequences.

**Conclusions.** Now the main international standards in the field of responsible investing are the principles by which each project is evaluated and classified based on the magnitude of its potential impacts and risks in accordance with

the environmental and social criteria analysis. The successful functioning and development industry is largely dependent on the level of social responsibility.

Activation of human factors in the enterprise is one of the decisive factors in the total social and economic potential subjects of facility management, because the underestimation of the value of social investments leadership local businesses largely inefficient work of the organization.

Socially responsible investment (SRI) have increased significantly in popularity among investors worldwide. Objective justification for the need of socially responsible development strategy requires proper study of the problem of social investment risks.

We have analyzed the social and environmental projects of modernization of heating Ukraine on the basis of the prin-

ciples of socially responsible investing. Expert method was used. Experiments have shown that the use of mathematical models to assess the competence of experts gives good results. This technique allows you to get more accurate results for the determination of the project category.

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Надійшла до редколегії 23.04.14

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### СИСТЕМНІ ПРИНЦИПИ СОЦІАЛЬНО-ВІДПОВІДАЛЬНОГО ІНВЕСТИВАННЯ ЕНЕРГЕТИЧНИХ ПРОЄКТІВ УКРАЇНИ

*Досліджується новий напрямок інвестування сучасних проєктів – соціально відповідальне інвестування (СВІ). Розглядаються системні принципи соціального інвестування, включаючи вибір оптимальних варіантів аналізу ризиків, їх оцінки та мінімізації. Розглядається методика оцінки соціальних проєктів в енергетиці України за кожним видом ризику СВІ. Проведено експертну оцінку трьох енергетичних проєктів. Побудовано регресійну модель оцінки компетентності кожного експерта і встановлено категорію проєктів відповідно до екологічних і соціальних принципів аналізу.*

*Ключові слова: соціально-відповідальні інвестиції, інвестиційний ризик, принципи соціального інвестування, стратегія модернізації, регресійний аналіз.*

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### СИСТЕМНЫЕ ПРИНЦИПЫ СОЦИАЛЬНО-ОТВЕТСТВЕННОГО ИНВЕСТИРОВАНИЯ ЭНЕРГЕТИЧЕСКИХ ПРОЕКТОВ УКРАИНЫ

*Исследуется актуальное направление инвестирования современных проектов – социально-ответственное инвестирование (СОИ). Рассмотрены принципы построения целостной системы обеспечения, включающие выбор оптимальных вариантов анализа рисков, их оценки и минимизации. Рассматривается методика оценки социальных проектов в энергетике Украины по каждому виду риска СОИ. Проведена экспертная оценка трех энергетических проектов. Построена регрессионная модель оценки компетентности каждого эксперта и установлена категория проектов, соответствующая экологическим и социальным принципам анализа.*

*Ключевые слова: социально-ответственное инвестирование, инвестиционный риск, принципы социального инвестирования, стратегия модернизации, регрессионный анализ.*

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 16-21

UDC 519.85

JEL: C 610

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### CASE STUDY IN OPTIMAL TELEVISION ADVERTS SELECTION AS KNAPSACK PROBLEM

*Abstract : In this research paper, we shall consider the application of classical 0-1 knapsack problem with a single constraint to selection of television advertisements at critical periods such as prime time news, news adjacencies, break in news and peak times using the WINQSB software. In the end of this paper we shall formulate the task of investigation of the post optimality solution of optimal Television Adverts Selection with respect to time allocated for every group adverts.*

*Keywords: advertisements, integer programming, knapsack problem, fuzzy linear programming, sensitivity analysis.*

**Introduction.** The Knapsack Problems are among the simplest integer problems. The problems in this class are typically concerned with selecting from a set of given items, each with a specified weight and value. Sum of weights a subset of items does not exceed a prescribed capacity and sum of selected items values is maximum.

Knapsack problems have been intensively studied since the pioneering work of Dantzig [1] in the late 50's,

both because of their immediate applications in industry and financial management, but more pronounced for theoretical reasons, as Knapsack problems frequently occur by relaxation of various integer programming problems. In such applications, we need to solve a Knapsack problem each time a bounding function is derived demanding extremely fast solution techniques. The family of Knapsack problems all require a subset of some given items to cho-

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sen such that the corresponding profit sum is maximizing without exceeding the capacity of the knapsack(s). In the 0-1 Knapsack problems each item may be chosen at most once, while. The multi-choice Knapsack problems occur when the items should be chosen from disjoint classes. Sinha and Zoltners [2] proposed to use multi-choice Knapsack problems to select which components should be linked in series in order to maximizing fault tolerance.

Moreover Nauss [3] proposed to transform nonlinear knapsack problems to multi-choice Knapsack problems. In the second category we should mention that the 0-1 Knapsack problem appears as sub problem when solving generalized assignment problem, which again is heavily used when solving Vehicle Routing Problem (G.Laport [4]).

**Knapsack problems and analysis data.** Suppose the producer of a TV program wants to select among numerous adverts for the prime time (news at 19:00 h GMT), which is interspersed with five or six spots of adverts of not more than three minutes each. It is self-evident that the optimal solution of the knapsack problem above will indicate the best possible choice of investment.

The objects to be considered will generally be called items and their number by  $n$ . The value and size associated with the  $j$ -th item will be called profit (cost of advert) and weight (duration of advert), respectively.

The traditional 0-1 Knapsack Problem (KP) for this case can be mathematically formulated through the following integer linear programming

$$\sum_{j=1}^n v_j x_j \rightarrow \max \tag{1}$$

subject to

$$\sum_{j=1}^n w_j x_j \leq W, \quad x_j \in \{0,1\}, \quad j = \overline{1,n}, \tag{2}$$

where  $v_j$  is value (cost of advert) and  $w_j$  is the weight (duration of advert) of the  $j$ -th item respectively,  $j = \overline{1,n}$ , and  $W$  is the maximum time allocated for adverts.

If we know quantity of different adverts categories, costs and weights in each category, the model above can be rewrite as

$$\sum_{i=1}^m \sum_{j=1}^{n_i} v_j^i x_{ji} \rightarrow \max \tag{3}$$

$$\sum_{j=1}^{n_i} w_j^i x_{ji} \leq W^i, \quad x_{ji} \in \{0,1\}, \quad j = \overline{1,n_i}, \quad i = \overline{1,m}, \tag{4}$$

where  $m$  represented the quantity of categories  $n_i$ ,  $i = \overline{1,m}$ , – quantities of advertise in every category.

There are two basic methods for solving the 0-1 knapsack problems: the first, the ideas of branch-and-bound techniques have frequently been applied to Knapsack problems since Kolesar [5] and, the second, dynamic programming methods. However we uses the first method in software WINQSB [6] to have been used to solve large scale problems. This study was undertaken using data collected from S.K.Amponsah [7].

TV is a public broadcaster which depends to the greater extent on government subvention. Broadcasting Corporation is however mandated to generate revenue to supplement the government subvention. To this end TV has various ways of generating additional income. These include sponsorship of programs, social and funeral announcements, advertisements among others. However, this research focused on advertisements, which are slotted in the programs schedules prepared quarterly to generate additional income to sustain the operations of the TV station. TV uses an arbitrary method in the selection. In this process an advert is accepted if there is an available time without regard to optimizing revenue. The category of adverts selection studied included:

- prime time news (19.00 h GMT);
- news adjacencies (five minutes before and after news at 12.00, 14.00, 19.00 and 22.30 h GMT);
- other news time (12.00, 14.00, 19.00, 22.30 h GMT);
- break in programs (peak and off peak).

Table 1 shows the various rates for the different categories of adverts at TV. For example Prime time News adverts for 15 sec costs \$215 while for 60 sec, the rate is \$750. The rates are high for Prime time News and news adjacencies. These are periods where most customers want their adverts televised to reach a larger TV audience. The off peak rates are low compared with the peak periods. Customers usually request for a number of spots for their adverts. Table 2 shows request received by TV for Prime time News (19 h GMT). Customer 1 requested for two spots of adverts for fifteen seconds each at prime time news. The cost of the two adverts is \$ 430 (i.e., 215+215) as indicated in the value column. The weight of this advert is 30 sec.

Table 1. TV adverts rates

Category ( $i = \overline{1,4}$ )	Rates in \$			
	15 second	30 second	45 second	60 second
Prime times news (19h GMT)	215	375	562	750
News adjacencies	130	250	375	500
Break in news	135	244	362	525
Break in program	91	160	220	360

Table 2. Prime time news adverts-19:00 h GMT

Advertise No. $j$	Time in sec.	No. of spots requested	Category (weight), $w_j^1$	Cost \$ (value), $v_j^1$
1	15	2	30	430
2	30	3	90	1125
3	45	1	45	562
4	15	1	15	214
5	30	3	90	1125
6	45	2	90	1124
7	60	1	60	750
8	30	2	60	750
9	45	2	90	1124
10	15	1	15	215
11	15	1	15	215
12	30	1	30	375
13	45	2	90	1124

Закінчення табл. 2

Advertise No. $j$	Time in sec.	No. of spots requested	Category (weight), $w_j^1$	Cost \$ (value), $v_j^1$
14	15	2	30	430
15	30	2	60	1125
16	45	2	90	1124
17	30	3	90	1125
18	30	3	90	1125
19	45	2	90	1124
20	60	1	60	750
21	45	1	45	562
22	15	1	15	215
23	15	1	15	215
24	15	1	15	215
25	30	2	60	750
26	30	3	90	1125
27	15	2	30	430
28	60	1	60	750
29	30	3	90	1125
30	15	2	30	430

Additionally, customer number 5 requested three spots of 30 sec each, i.e. 90 sec (weight) with a cost of \$1125 (value). The total time available for adverts at the prime time news is 20 min (i.e., 1200 sec) but the total time requested is 1710 sec. Other customers opt for the News Adjacencies. This is 5 min before and after the prime time news at 19.00 h

GMT. As shown in Table 3, the total time available is 10 min (600 sec) but the customers requested a total of 810 sec. Tables 4 and 5 depicts the weights and the values for the adverts requested for the 22:30 news time and for peak time on week days, respectively. The total time available is 600 sec but the customers requested 720 sec.

Table 3. Adverts for news adjacencies -18:55 -19:00 and 20:00-20:05

Advertise No. $j$	Time requested (weight), $w_j^2$	Cost \$ (value), $v_j^2$
1	30	260
2	45	375
3	15	130
4	90	750
5	60	500
6	60	250
7	90	750
8	15	130
9	15	130
10	30	250
11	30	260
12	60	500
13	45	375
14	15	130
15	15	130
16	15	130
17	60	250
18	30	260
19	60	500
20	30	260

Table 4. Adverts for Break in News at 22:30 Hours GMT

Advertise No. $j$	Time requested (weight), $w_j^3$	Cost \$ (value), $v_j^3$
1	30	150
2	45	200
3	15	75
4	90	400
5	60	290
6	60	270
7	90	400
8	15	75
9	15	75
10	30	150
11	30	150
12	60	290
13	45	200
14	15	75
15	15	75
16	15	75
17	60	270
18	30	150
19	60	290
20	30	150

Table 5. Break in program adverts for peak time on week days

Advertise No. $j$	Time requested (weight), $w_j^4$	Cost \$ (value), $v_j^4$
1	15	91
2	15	91
3	30	160
4	90	440
5	30	182
6	90	480
7	90	440
8	90	480
9	60	320
10	15	91
11	15	91
12	15	91
13	60	320
14	90	480
15	30	182
16	60	360
17	90	480
18	30	182

Finally the mathematical problem is formulate as knapsack optimization problem :

$$430x_{1,1} + 1125x_{2,1} + 562x_{3,1} + 214x_{4,1} + 1125x_{5,1} + 1124x_{6,1} + 750x_{7,1} + 750x_{8,1} + 1124x_{9,1} + 215x_{10,1} + 215x_{11,1} + 375x_{12,1} + 1124x_{13,1} + 430x_{14,1} + 1125x_{15,1} + 124x_{16,1} + 1125x_{17,1} + 1125x_{18,1} + 1124x_{19,1} + 750x_{20,1} + 562x_{21,1} + 215x_{22,1} + 215x_{23,1} + 215x_{24,1} + 750x_{25,1} + 1125x_{26,1} + 430x_{27,1} + 750x_{28,1} + 1125x_{29,1} + 430x_{30,1} + 260x_{1,2} + 375x_{2,2} + 130x_{3,2} + 750x_{4,2} + 500x_{5,2} + 260x_{6,2} + 750x_{7,2} + 130x_{8,2} + 130x_{9,2} + 250x_{10,2} + 260x_{11,2} + 500x_{12,2} + 375x_{13,2} + 130x_{14,2} + 130x_{15,2} + 130x_{16,2} + 250x_{17,2} + 260x_{18,2} + 500x_{19,2} + 260x_{20,2} + 150x_{1,3} + 200x_{2,3} + 75x_{3,3} + 400x_{4,3} + 290x_{5,3} + 270x_{6,3} + 400x_{7,3} + 75x_{8,3} + 75x_{9,3} + 150x_{10,3} + 150x_{11,3} + 290x_{12,3} + 200x_{13,3} + 75x_{14,3} + 75x_{15,3} + 75x_{16,3} + 270x_{17,3} + 150x_{18,3} + 290x_{19,3} + 150x_{20,3} + 91x_{1,4} + 91x_{2,4} + 160x_{3,4} + 440x_{4,4} + 182x_{5,4} + 480x_{6,4} + 440x_{7,4} + 480x_{8,4} + 320x_{9,4} + 91x_{10,4} + 91x_{11,4} + 91x_{12,4} + 320x_{13,4} + 480x_{14,4} + 182x_{15,4} + 360x_{16,4} + 480x_{17,4} + 182x_{18,4} \rightarrow \max$$

subject to

$$30x_{1,1} + 90x_{2,1} + 45x_{3,1} + 15x_{4,1} + 90x_{5,1} + 90x_{6,1} + 60x_{7,1} + 60x_{8,1} + 90x_{9,1} + 15x_{10,1} + 15x_{11,1} + 30x_{12,1} + 90x_{13,1} + 30x_{14,1} + 60x_{15,1} + 90x_{16,1} + 90x_{17,1} + 90x_{18,1} + 90x_{19,1} + 60x_{20,1} + 45x_{21,1} + 15x_{22,1} + 15x_{23,1} + 15x_{24,1} + 60x_{25,1} + 90x_{26,1} + 30x_{27,1} + 60x_{28,1} + 90x_{29,1} + 30x_{30,1} \leq 1200 ;$$

$$30x_{1,2} + 45x_{2,2} + 15x_{3,2} + 90x_{4,2} + 60x_{5,2} + 60x_{6,2} + 90x_{7,2} + 15x_{8,2} + 15x_{9,2} + 30x_{10,2} + 30x_{11,2} + 60x_{12,2} + 45x_{13,2} + 15x_{14,2} + 15x_{15,2} + 15x_{16,2} + 60x_{17,2} + 30x_{18,2} + 60x_{19,2} + 30x_{20,2} \leq 600 ;$$

$$30x_{1,3} + 45x_{2,3} + 15x_{3,3} + 90x_{4,3} + 60x_{5,3} + 60x_{6,3} + 90x_{7,3} + 15x_{8,3} + 15x_{9,3} + 30x_{10,3} + 30x_{11,3} + 60x_{12,3} + 45x_{13,3} + 15x_{14,3} + 15x_{15,3} + 15x_{16,3} + 60x_{17,3} + 30x_{18,3} + 60x_{19,3} + 30x_{20,3} \leq 600 ;$$

$$15x_{1,4} + 15x_{2,4} + 30x_{3,4} + 90x_{4,4} + 30x_{5,4} + 90x_{6,4} + 90x_{7,4} + 90x_{8,4} + 60x_{9,4} + 15x_{10,4} + 15x_{11,4} + 15x_{12,4} + 60x_{13,4} + 90x_{14,4} + 30x_{15,4} + 60x_{16,4} + 90x_{17,4} + 30x_{18,4} \leq 600$$

where

$$x_{j,i} = \begin{cases} 1, & \text{if } j\text{-th advertise of } i\text{-th category is selected, } j = \overline{1, n_i}, i = \overline{1, m}, m = 4, n_1 = 30, n_2 = 20, n_3 = 20, n_4 = 18, \\ 0, & \text{otherwise.} \end{cases}$$

**Results of the analysis.** By using software WINQSB we obtained the results for the analysis of data from the Table 1 to 5 (Prime Time News, news adjacencies, break in News and break in program) are shown below.

The optimal selection these adverts yielded \$26659. From the Table 6, nineteen adverts were selected from the 30 requested to give an optimal value of \$15503. The selection for news adjacencies, the break in news, break in program and a peak period yielded \$5070, \$2860, \$3350, respectively.

Table 6. (Provide self-explanatory caption)

Advert Category	No. of adverts requested	No. of adverts selected	Time availability, sec	Optimal value, \$
Prime times news (19h GMT)	30	23	1200	15379
News adjacencies	20	16	600	5070
Break in news	20	17	600	2860
Break in program	18	13	600	3350
Total				26659

Adverts numbers which selected in categories:

- prime times news:  $\{1, 2, 4, 5, 8, 10, 11, 12, 14, 15, 17, 18, 19, 20, 22, 23, 24, 25, 27, 28, 29, 30\}$  ;
- ews adjacencies:  $\{1, 2, 3, 4, 7, 8, 9, 11, 12, 13, 14, 15, 16, 18, 19, 20\}$  ;
- break in news:  $\{1, 2, 3, 5, 6, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$  ;
- break in program:  $\{1, 2, 3, 5, 6, 8, 10, 11, 14, 15, 17, 18\}$  .

The resulting solution can be examined for sensitivity. Sensitivity analysis is usually performed by using principles of shadow prices and reduce costs [6]. But in this case we have nonconventional linear programming task. So sensitivity problem can be formulated as the fuzzy mathematical programming problem with fuzzy time values allocated for every group adverts [8]:

$$\sum_{i=1}^m \sum_{j=1}^{n_i} v_j^i x_{ji} \rightarrow \max \quad (5)$$

subject to

$$\sum_{j=1}^{n_i} w_j^i x_{ji} \leq \tilde{W}^i, \quad x_{ji} \in \{0, 1\}, \quad j = \overline{1, n_i}, \quad i = \overline{1, m}, \quad (6)$$

where  $\tilde{W}^i, i = \overline{1, m}$ , – fuzzy defined time values allocated for every group adverts. Fuzzy values  $\tilde{W}^i, i = \overline{1, m}$ , can be considered as the right triangular fuzzy numbers (TFN)  $\tilde{W}^i = (W^i, W^i, W^i + \Delta W^i), i = \overline{1, m}$ , with tolerances  $\Delta W^i > 0, i = \overline{1, m}$ . These tolerances determine the values of the boundary changes necessary time resources.

Using the max-min operator (as Zimmermann [9]) crisp linear programming problems for (5), (6) is formulated as follows:

$$\lambda_0 \rightarrow \max, \quad (7)$$

$$\sum_{i=1}^m \sum_{j=1}^{n_i} v_j^i x_{ji} - \lambda_0 (U - L) \geq L, \quad (8)$$

$$\sum_{j=1}^{n_i} w_j^i x_{ji} + \lambda_i \Delta W^i \leq W^i + \Delta W^i, \quad i = \overline{1, m}, \quad (9)$$

$$x_{ji} \in \{0, 1\}, \quad j = \overline{1, n_i}, \quad i = \overline{1, m}, \quad \lambda_i \in [0, 1], \quad i = \overline{0, m},$$

where  $U = \sum_{i=1}^m \sum_{j=1}^{n_i} v_j^i x_{ji}^0, L = \sum_{i=1}^m \sum_{j=1}^{n_i} v_j^i x_{ji}^1, x_{ji}^0, x_{ji}^1, j = \overline{1, n_i},$

$i = \overline{1, m}$ , – optimal solutions of optimization tasks (5), (9) for  $\lambda_i = 0$  and  $\lambda_i = 1, i = \overline{1, m}$ , respectively.

Solving this task as a fuzzy linear programming problem with the several parameters  $\lambda_i, i = \overline{1, m}$ , we obtain values that determine possible changes in the right-hand

sides of constraints that achieves the optimum value of the objective function.

**Conclusion.** This publication examines the application of the classical 0-1 knapsack problem with one constraint to the television broadcast adverts selection during critical periods. It is defined the task of obtaining the maximum profit from the advertising, broadcast in four categories of events. The solution of the real example is obtained by using WINQSB software. The problem of the sensitivity analysis study of the television advertising adverts choice solutions depending on the time periods allocated for every group adverts. It is considered fuzzy linear programming problem with multiple parameters, the solution of which allows to get the best choice of broadcasts for the changes in time limits allocated to each of the categories. The proposed approach yields optimal choice adverts and ensures the highest profit in the process of broadcasting. Availability limits and possible changes in the time bands provide the choice variability and allow the obtaining of the optimum value of the objective function subject to the ambiguity of time requests. This approach can be seen as the process of predicting the impact of changes in the input data on the solution obtained.

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Надійшла до редколегії 13.03.14

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**ПРИКЛАД ОПТИМАЛЬНОГО ВИБОРУ ТЕЛЕВІЗІЙНОЇ РЕКЛАМИ НА ОСНОВІ ЗАДАЧІ ПРО РЮКЗАК**

У цьому дослідженні розглянуто застосування класическої задачі 0-1 ранце с одним ограничением для розв'язання задачі вибору пакетів телевізійної реклами у критичні періоди трансляцій, таких як прайм-тайм новини, новини між продовженнями, у перервах новин та у години пик за допомогою програмного забезпечення WINQSB. Сформульовано проблему постоптимального дослідження розв'язків задачі оптимального вибору телевізійної реклами за обсягом часу, відведеному кожній групі об'яв.

Ключові слова: реклама, цілочисельне програмування, задача про рюкзак, нечітке лінійне програмування, аналіз чутливості.

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**ПРИМЕР ОПТИМАЛЬНОГО ВЫБОРА ТЕЛЕВИЗИОННОЙ РЕКЛАМЫ НА ОСНОВЕ ЗАДАЧИ О РЮКЗАКЕ**

В этом исследовании рассмотрено применение классической задачи 0-1 ранце с одним ограничением для решения задачи выбора пакетов телевизионной рекламы в критические периоды трансляций, таких как прайм-тайм новости, новости между продолжениями, в перерывах новостей и в часы пик с помощью программного обеспечения WINQSB. Сформулирована проблема постоптимального исследования решений задачи оптимального выбора телевизионной рекламы по времени, отведенному каждой группе объявлений.

Ключевые слова: реклама, целочисленное программирование, задача о рюкзаке, нечеткая линейное программирование, анализ чувствительности.

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 21-26  
UDC 2964  
JEL F 63

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## DEVELOPMENT OF TRANSNATIONAL CORPORATIONS IN THE ASPECT OF GLOBALIZATION

*This article analyses the main world transnational companies (TNCs) and the impact of globalization on their activities. Globalization is a powerful real aspect of the new world system and it represents one of the most influential forces in determining the future course of the planet. In this process TNCs play an important role. Last researches are analyzed and they show that number of TNCs increased every year. Investments in offshore financial centers (OFCs) remain at historically high levels. By joining each other TNCs create global value chains (GVC). From one hand it is the different processes in different parts of the world that each add value to the goods or services being produced. Positive and negative impact of GVCs is shown. The KOF index of globalization in the world and in Ukraine is investigated. The main regional trends, which could involve into regional industrial development compacts, are analyzed.*

**Keywords:** transnational companies; globalization; global chains; index of globalization.

**Introduction.** Since the beginning of the twenty-first century, profound changes have been underway in the international economy, brought by the advance of globalization and transnationalization, sweeping technological changes and the emergence of new and powerful competitors, such as China, India and, more generally, the countries of the Asia-Pacific region. The implications of these changes are both varied and complex. The globalization of the financial market, for example, is far outstripping that of the real economy, making real-time operations a more common feature in the world of finance than in production or foreign trade. The subprime mortgage crisis in the United States and its repercussions in the global financial system have revealed the extreme volatility of the world's financial markets and exposed how vulnerable developing economies are even when sound and prudent macroeconomic policies have been implemented.

**Methodology.** The question of globalization and transnationalization was investigated by many economists such as R. Robertson, I. Wallenstein, P. Smith, A. Dreher and others. Theoretical and methodological base for this paper is UNCTAD's, IMF's, the World Bank's database. However, there are a lot of various publications on the topic of globalization, this question is still not clear to the bitter end.

**The subject is** to analyze the activities of main TNCs and to investigate new aspects of globalization process.

**The main purposes** of this paper are:

- ✓ to clarify the notion of "globalization" as applied to the world economy;
- ✓ to find the main block parts of globalization process;
- ✓ to evaluate the interaction of the world economy with globalization and business transnationalization;
- ✓ to analyze the position of Ukraine in the world globalization.

**Results.** Globalization is a powerful real aspect of the new world system and it represents one of the most influential forces in determining the future course of the planet. It has manifold dimensions: economic, political, security, environmental, health, social, cultural, and others. The fo-

cus here is on the concept of "globalization" as applied to the world economy. The term was coined in the 1980s, but the concept is an old one that has different interpretations to different people. Partly as a result of these different interpretations, there are very different reactions to "globalization," with some policymakers, scholars, and activists seeing it as a force for advancing the world economy while others, again all three, seeing it as a serious danger to the world economic system [3].

Globalization is understood here to mean major increases in worldwide trade and exchanges in an increasingly open, integrated, and borderless international economy. There has been remarkable growth in such trade and exchanges, not only in traditional international trade in goods and services, but also in exchanges of currencies, in capital movements, in technology transfer, in people moving through international travel and migration, and in international flows of information and ideas [5, p.20].

Economic globalization has been the dominant trend of the world economic development at the turn of the 20th – 21st centuries. Though the research interest to globalization problems has grown for the latest decades, the practical and methodological issues are still disputable concerning category- and- conceptual identification, possibility of economic evaluation of not only globalization significance, but also the peculiar to the latter transnational transformations with respect to regional groupings, individual countries with different levels of economic development, and the world economy, as a whole [4].

Last researches shows that number of state owned TNCs increased from 650 in 2010 to 845 in 2012, that is big growth. The number of net M&A deals by private equity remained at historically high levels, although value fell by 34% [1].

Table 1. TOP-10 world biggest TNCs, 2013

#	Company name	Nationality	Industry	Rank (2013/2008)	Market Cap. \$ bn
1	APPLE	United States	Technology	+40	416
2	EXXON MOBIL	United States	Oil & Gas	-1	404
3	GOOGLE	United States	Technology	+33	263
4	BERKSHIRE HATHAWAY	United States	Financial	+9	257
5	PETROCHINA	China	Oil & Gas	-3	255
6	WAL-MART STORES	United States	Consumer Service	+5	246
7	GENERAL ELECTRIC	United States	Industrials	-4	240
8	MICROSOFT	United States	Technology	-1	240
9	IBM	United States	Technology	+18	238
10	NESTLE	Switzerland	Consumer Goods	+4	233

Analyzing Table 1 we can see that the great amount of world biggest TNCs are originally from the USA. The second place takes China. 11<sup>th</sup> place takes Ind&Comm BK,

China, financial sector. Most of the companies are technology and oil & gas.

Further in Fig.1. there are some leading scopes of world TNCs.

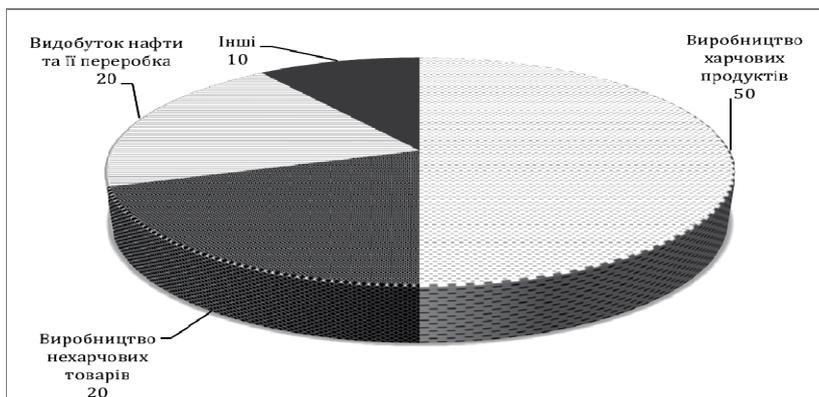


Fig. 1. World TNC leaders by economic activities, 2013, per cent

Source: World investment report 2013. Global Value Chains: Investment and Trade for Development, UNCTAD, Division on Investment and Enterprise Geneva, – 26 June 2013

From Fig.1. we can see that leading scope is technology. Than there are oil and gas and consumer goods. Others includes industrials, financials, health care, etc.

Global processes of redistribution of the world market affects on different sectors dominated by TNCs. In case of Ukrainian accession to the WTO, a significant portion of domestic enterprises face that. Of course they are not ready to face the competition with the leading Western companies. The main question for Ukraine is to create our own Ukrainian transnational structures to interact with TNCs both in Ukraine and in the world markets. This way chose China, Russia, India, Indonesia, Mexico, Venezuela, etc. (as well as industrial developed countries, where there are hundreds of large TNCs). The experience of these countries shows that the national capital is able to compete with TNCs only if it is structured into powerful financial-industrial education, adequate international peers and are able to pursue an active foreign policy. However, to create a corporation of full closed cycle that could take raw materials extraction, processing, manufacture of a product and its implementation, Ukrainian certain industries need time. While some steps in this direction have already been made. So, for the past two years considers the possibility of creating a state in the energy sector of a vertically integrated companies such as "Oil of Ukraine" on the basis of "Ukrnafta", JSC "Ukratnafta" and NPC "Galichina", which consisted of 700-800 gas stations and controlled up to 15 per cent of market share of light oil in the country. At the same time close to the creation of native TNC – integrated oil company with all elements of the process chain "production – processing – marketing" are Privatbank and UkrSibbank.

Some success in terms of business achieved transnational Corporation "Industrial Union of Donbass" (ISD). Main attention is paid to the creation of a vertically integrated holdings in the chain "coal – coke – metal". At the same time ISD creates not truncated companies (without foreign infrastructure), but the full ones, for what the company is actively expanding into foreign markets, attract new partners, together with foreign companies involved in the creation of consortia to promote their products in the foreign market. Close to the creation of full cycle TNC Donetsk "System Capital Management", that controls such giants as "Azovstal" Enakiyev Steel, Avdiivka Coke.

However, the process of creating of Ukrainian TNCs can be greatly accelerated and expanded in the industrial spectrum in the aspect of attracting foreign partners. For this companies which are in cooperation with foreign firms can form common structures to engage in strategic alliances through the creation of interstate corporations. For major domestic economic structures (at the beginning of 2003 in Ukraine there were about 36 thousand corporate joint associations) the most attractive option of creating transnational corporations may be their association with the Russian industry partners, that can course to creation of Ukrainian- American, Ukrainian-Canadian or Ukrainian-German corporations. Deploying domestic TNCs with capital of Russia and other CIS countries, can be a determining factor in the post-Soviet economic reintegration segments and has prospects of entering the markets of third countries. In Ukraine and Russia, there are many similar enterprises, which may, by combining efforts and capabilities, create a powerful body corporate that can take a serious position on foreign markets. Therefore, the creation of the

Ukrainian-Russian TNK can serve as a powerful stimulus for the expansion of production capacity of structures that will be part of these multinationals, and to increase their financial performance, which in turn will contribute to the further diversification of production capacity rates and volumes of produced products, and will integrate the bilateral economic space much higher than a dozen international agreements and arrangements. Thus the creation of

Ukrainian TNCs allows to protect national economic interests, will contribute to the further development of Ukrainian economic structures, the internationalization of Ukraine into the world economy, its participation in the process of global transformations.

A lot of TNCs remain to withdraw profits to offshore financial centers (OFCs). Investing in offshores never ceased to be a leading that Fig.2. shows.

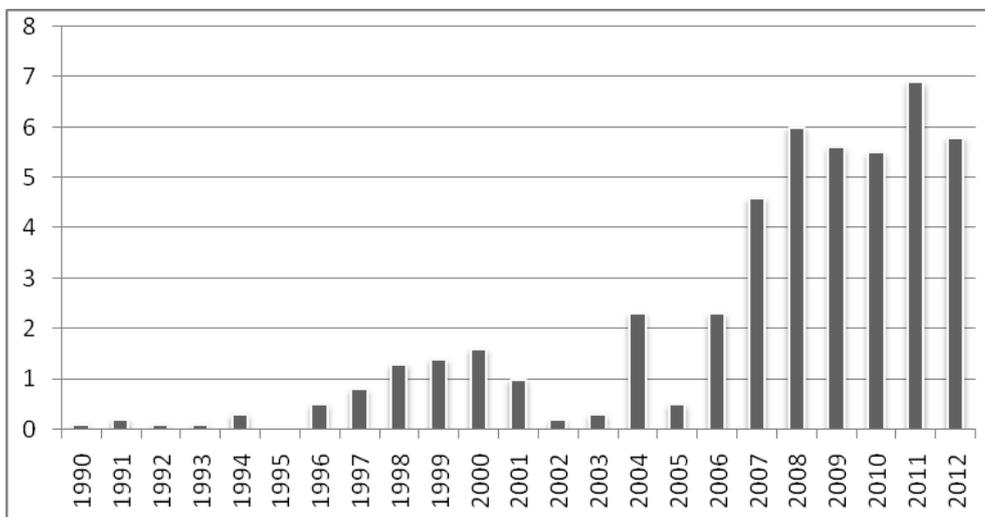


Fig.2. Value of OFCs in global FDI flows, 1990-2012, per cent

Source: World investment report 2013. Global Value Chains: Investment and Trade for Development, UNCTAD, Division on Investment and Enterprise Geneva, – 26 June 2013

From Fig.2. we can see that investments in OFCs remain at historically high levels. The quantity of investments in OFCs accounted for approximately 1 billion USD in 1990 while in 2000 it grew to 20 billion USD. From 2000 it started to decline, but we saw a great increase in 2004 of 30 billion USD. It was a big fall in 2005 (25 billion USD), but in 2007 it reached it previous level. From that time we can see a growth, the biggest one was in 2011 and the growth rate was 90 billion USD. In 2012 it fell to 78 billion USD.

By joining each other TNCs create global value chains (GVC). From one hand it is the different processes in different parts of the world that each add value to the goods or services being produced. By joining a global value chain, small enterprises have the ability to transform their business into an international operation offering greater opportunities.

The contribution of GVCs to development can be significant, however participation in GVCs also involves risks which are showed on Fig. 3.

+	-
<ul style="list-style-type: none"> <li>● Value added trade contributes nearly 30 percent to developing countries GDP on average</li> <li>● There is a positive correlation between participation in GVCs and growth rates of GDP per capita</li> <li>● GVCs have a direct economic impact on value added, jobs and income</li> <li>● Participation in GVCs can help countries' acquisition and dissemination of technologies and skills, and spread international best practices, including on social and environmental issues, e.g. through the use of CSR standards.</li> <li>● GVCs can also be an important avenue for developing countries to build productive capacity, opening up opportunities for longer-term industrial upgrading</li> </ul>	<ul style="list-style-type: none"> <li>● GDP contribution of GVCs can be limited if countries capture only a small share of the value added created in the chain</li> <li>● Also, a large part of GVC value added in developing economies is generated by foreign affiliates of TNCs, which can lead to relatively low "value capture", e.g. as a result of transfer pricing or income repatriation</li> <li>● Technology dissemination, skill building and upgrading are not automatic. Developing countries face the risk of remaining locked into relatively low value added activities</li> <li>● Environmental impacts and social effects, including on working conditions, occupational safety and health, and job security, can be negative</li> <li>● The potential "footlooseness" of GVC activities and increased vulnerability to external shocks pose further risks</li> </ul>

Fig.3. Positive and negative impact of GVCs on the countries and their economies

Source: Top 100 the biggest world companies by market capitalization, pwc. – 2013

As a result of Fig.3. we can conclude that countries need to make a strategic choice on whether and how to promote GVCs. Countries need to carefully weigh the pros and cons of GVC participation, and the costs and benefits

of proactive policies to promote GVCs or GVC-led development strategies, in line with their specific situation and factor endowments. Some countries may decide not to promote GVC participation. Others may not have a choice:

for the majority of smaller developing economies with limited resource endowments there is often little alternative to development strategies that incorporate a degree of participation in GVCs. The question for those countries is not so much whether to participate in GVCs, but how. In reality, most countries are already involved in GVCs one way or another. Promoting GVC participation requires targeting specific GVC segments, i.e. GVC promotion can be selective. Moreover, GVC participation is only one aspect of a country's overall development strategy [1].

To have comprehensive understanding of the process of globalization and its impact on the world economies we analyzed KOF globalization index. The KOF Index of Globalization is a ranking of the most global countries based on three dimensions of globalization: economic globalization, social globalization and political globalization. Further on Fig.4. there is a dynamic of the process of globalization from 1991 to 2010 in the world and in Ukraine [2].

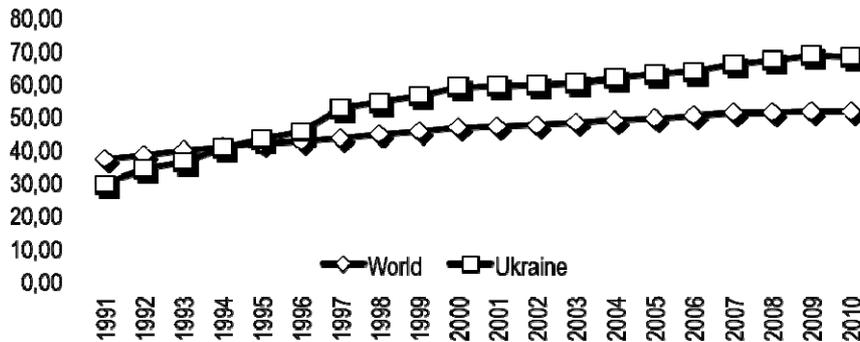


Fig. 4. Dynamic of the process of globalization in the world and in Ukraine, 1991-2010, KOF

Source: Dreher A., 2006. Does Globalization Affect Growth? Empirical Evidence from a new Index, Applied Economics 38, 10:1091-1110; Dreher A., Gaston N. and Martens P., 2008, Measuring Globalization – Gauging its Consequence, New York: Springer

From Fig.4. we can see that in comparison with the world Ukraine has very high growth of the globalization index which includes such indices and variables as economic globalization (actual flows and restrictions); social globalization (data on personal contact, on information flows, on cultural proximity) and political globalization. During the last 19 years this rate rose from 29 to 68, while the world index of globalization increased from 37 to 41. It means that our country has rapid pace of development and integrate in the world economy. From the other hand KOF index of globalization in the world shows stable growth without any sharp spikes. Globalization is a process by which the experience of everyday life, marked by the diffusion of commodities and ideas, is becoming standardized around the world. Factors that have contributed to globalization include increasingly sophisticated communications and transportation technologies and services, mass migration and the movement of peoples, a level of economic activity that has outgrown national markets through industrial combinations and commercial groupings that cross national frontiers, and international agreements that reduce the cost of doing business in foreign countries. Globalization offers huge potential profits to companies and nations but has been complicated by widely differing expectations, standards of living, cultures and values, and legal systems as well as unexpected global cause-and-effect linkages [6, 7].

The situation in Ukraine these days is unfavorable for any kind of investments and cooperation. We had a great influence of world economic crisis on our economy; the recession was strong and deep. Ukrainian economy did not have enough time to recover and come to pre-crisis levels. Current political crisis reduced investment attractiveness of our economy and the KOF index underwent reduction, because KOF index of globalization shows stable growth without any sharp spikes. Further on Fig.5. we show the main regional trends, which could involve into regional industrial development compacts [1] and improve the situation in some regions.

From Fig.5. we can see that partnership between governments in region, between the public and private, between governments and international organizations and between trade and investment promotion agencies play an important role for all regions. These are the basic block parts of regional industrial development compact.

**Conclusions & Discussions.** To summarize we should mention that in this article the concept of "globalization" was clarified. Globalization is a powerful real aspect of the new world system, and it represents one of the most influential forces in determining the future course of the planet. It has manifold dimensions: economic, political, security, environmental, health, social, cultural, and others. It has been reshaping the world faster than ever in the last two decades. Globalization is understood here to mean major increases in worldwide trade and exchanges in an increasingly open, integrated, and borderless international economy. Globalization is a process of interaction and integration among the people, companies, and governments of different nations, a process driven by international trade and investment and aided by information technology. This process has effects on the environment, culture, political systems, economic development and prosperity, and on human physical well-being in societies around the world.

This process closely linked with the process of transnationalization and the development of transnational companies. Number of state owned TNCs increased from 650 in 2010 to 845 in 2012. The number of net M&A deals by private equity remained at historically high levels, although value fell by 34%. Investments in offshore financial centers (OFCs) remain at historically high levels.

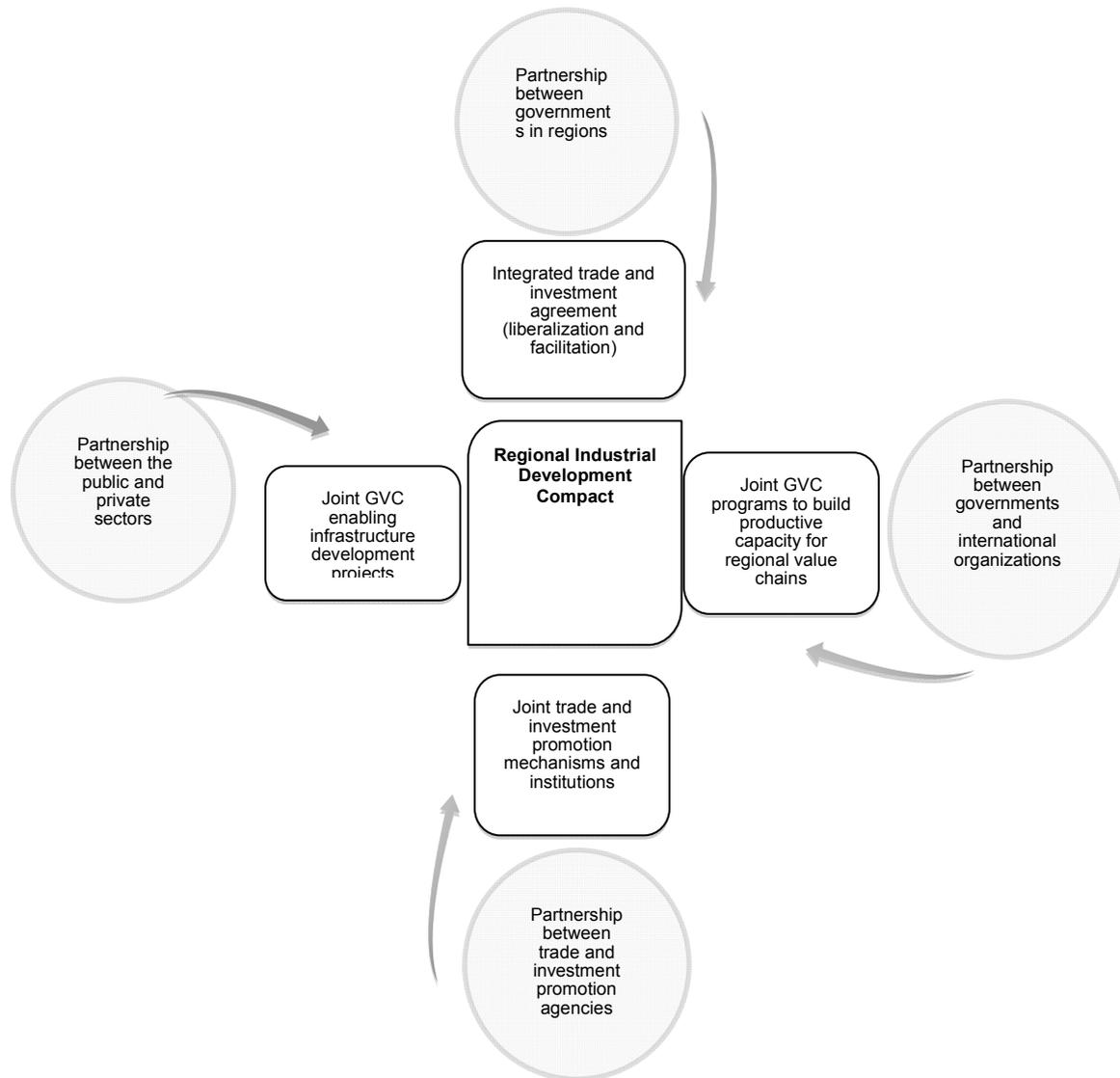


Fig.5. Main regional trends, which could involve into regional industrial development compacts

Source: Top 100 the biggest world companies by market capitalization, pwc. – 2013

By joining each other TNCs create global value chains (GVC). From one hand it is the different processes in different parts of the world that each add value to the goods or services being produced. By joining a global value chain, small enterprises have the ability to transform their business into an international operation offering greater opportunities. Countries need to carefully weigh the pros and cons of GVC participation, and the costs and benefits of proactive policies to promote GVCs or GVC-led development strategies, in line with their specific situation and factor endowments. Some countries may decide not to promote GVC participation.

Overall, we should take some measures to support our economy and the economy of our region to participate in the complex process of globalization and transnationalization. Help our companies to cooperate with TNCs or create our national ones.

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Надійшла до редколегії 09.05.14

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#### РОЗВИТОК ТРАНСНАЦІОНАЛЬНИХ КОРПОРАЦІЙ В АСПЕКТІ ГЛОБАЛІЗАЦІЇ

У статті проведено аналіз розвитку транснаціональних корпорацій в аспекті глобалізації. У даній статті розглянуто теоретичні та методологічні основи поняття глобалізація. Досліджено діяльність основних світових ТНК. Проаналізовано індекс глобалізації КОФ у світі та в Україні. Розглянуто глобальні ланцюги та їх вплив на економіку.

Ключові слова: транснаціональні компанії; глобалізація; глобальні ланцюги; індекс глобалізації.

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### РАЗВИТИЕ ТРАНСНАЦИОНАЛЬНЫХ КОРПОРАЦИЙ В АСПЕКТЕ ГЛОБАЛИЗАЦИИ

*В статье проведен анализ развития транснациональных корпораций в аспекте глобализации. В данной статье рассмотрены теоретические и методологические основы понятия глобализация. Исследована деятельность основных мировых ТНК. Проанализировано индекс глобализации КОФ в мире и в Украине. Рассмотрены глобальные цепи и их влияние на экономику.*

*Ключевые слова: транснациональные компании; глобализация; глобальные цепи; индекс глобализации.*

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 26-32

UDC: Q56

JEL Q 58

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### ECO-INTELLIGENT TOOLS – A NECESSITY FOR SUSTAINABLE BUSINESSES

*Many of the challenges associated with sustainable development can be traced in the way modern society produces and consumes. Production, distribution and supply of goods and services require material and energy consumption, having an impact on natural resources both quantitatively and qualitatively, generating waste, pollution and disrupting ecosystems. Eco-business intelligence is the capacity of people, processes and applications / tools to organize business information, to facilitate consistent access to them and analyse them in order to improve management decisions, for better performance management of the organizations that are increasingly pressed to synchronize their processes and services with a sustainable development agenda, through the development, testing and implementation of decision support software. By adopting sustainable practices, eco – intelligent companies can gain added value, increase market share and boost shareholder value. Moreover, the growing demand for "green" products has created new markets and the visionary entrepreneurs already reap the rewards of approaching sustainability. Large and small companies are learning that sustainable business practices not only help the environment but also can improve profitability by pursuing higher efficiency, fewer harmful side-effects, and better relationships with the community and more. Gaining competitive advantage is a core concern of the companies and the existence of systems of identification, extraction and analysis of available data in a company, but also from the external environment, to provide real support for business decisions, is an essential ingredient of success. This paper highlights the necessity of eco-intelligent tools that help determining the organization's strategies, identifying the perceptions and capabilities of the competitors, analyzing the effectiveness of current operations, deploying long-term prospects for environmental action and establishing indicators and key variables for organizational health, security and natural growth of its assets. The proposed tool is a decision support system that will be implemented in an online environment, tested and integrated with the information systems of the organizations. The eco-intelligent business tool can be used to obtain competitive advantages by the organizations that seek to contribute to a better quality of life in the present without compromising the development and life quality of future generations.*

*Keywords. business intelligence, sustainable companies, decision support systems.*

**Introduction.** The intelligence in the business society has occurred in the late 1960s, early 1970s, emerging from government and military spheres, where it remains deeply rooted even today.

During 1960-1970, marketing and strategic management broke into management thinking, both being based on the theory of "turmoil in the business" by Igor Ansoff.<sup>1</sup> Thus, companies have started to collect information about competitors, initially focusing on tactical and operational sales and marketing. As a result, information about competitors, although limited, have become part of business plans.

In the years 1980-1990 there was an incisive penetration of competitive intelligence. The most important event was the publication of Michael Porter's books "Competitive Strategy" (1980), "Competitive Advantage" (1985) and "Competitive Advantage of Nations" (1990). They have had a decisive influence on the business community, presenting aspects of competition and the business environment. Porter's five forces model is still used by many companies as an important part of the strategic process. Although at the time many companies started analyzing the industry and competition, they lacked the full support of the management. Also in the '80s and '90s, in the United States appeared concept of benchmarking, "introduced by Xerox, it became a very important management application to

compare performances between companies' branches and even between competing companies" [1, p.24].

Another important milestone in the evolution of competitive intelligence was the establishment in 1986 of the Society of Competitive Intelligence Professionals (SCIP), and in the 90s the term "competitor" was replaced with "competitive". On the anniversary of 25 years of existence, the directors voted "the official change of the name from the Society of Competitive Intelligence Professionals into Strategic and Competitive Intelligence Professionals, to reflect the development and evolution of competitive intelligence" [2].

From the beginning until now, the mission SCIP has been amended four times. Thus, in 1986, its mission was to help professionals develop their expertise in collecting and gathering information, dissemination of competitive intelligence and involvement of decision makers in a productive dialogue, creating organizational competitive advantage. Then, in 2003, there was the first change of the mission, SCIP becoming the global organization chosen by professionals in terms of competitiveness and related disciplines, the first to use qualified personnel to improve business decision-making and organizational performance. In 2005, the objective was to enhance the success of the organization's members through leadership, education, support through legal means and networks.

The last change occurred in 2007, when it was developed the strategy for 2009-2013. The new plan now guides the company aims to meet a number of high value targets. It also recognizes the competitive intelligence as an essential discipline for business decisions and organizational success.

**Understanding Competitive Intelligence.** The competitive intelligence process continually seeks to detect

<sup>1</sup> According to Igor Ansoff's theory, in order to be effective, the strategy of a company must match the level of turbulence present in its environment. Due to the strong impact that turbulences have on the companies, understanding these levels lead to a more profitable business.

any signs of change, analysis, trends and responses, opportunities and new threats to hold at any given time updated information.

If we were to consider competitive intelligence as a tool that will increase competitiveness, we see that it brings significant improvements to the products and services offered by the company.

From the point of view of Craig S. Fleisher and David L. Blenkhorn [3, p.7], competitive intelligence can be understood from two perspectives. The first perspective is that of looking like a progression from raw inputs to final outputs. In this case, it starts from the raw data chunks, which are then organized by experts and processed into information. This information becomes intelligence products when placed in decision making. Thus, competitive intelligence is the intelligence refined product that meets the needs of a decision maker to understand a competitive aspect of the internal and / or external environment.

The second perspective of understanding the competitive intelligence is seen as an organizational function. Effective intelligence activities range from the wider business intelligence area to the narrowest analysis of competitors. They can provide the foundation upon which are built market strategies and tactics. As a function mainly staff oriented, competitive intelligence will overlap and reduce other functions, particularly those associated with marketing and planning.

So competitive intelligence plays an extremely important role in the strategic management of a company. This is mainly due to the fact that it has the function of early warning regarding threats to the interests and objectives of business organizations. But it must be emphasized that the information collected can not be of real use only when administered in an intelligent way.

In order to address competitive intelligence and all that it entails in a private organization, it is necessary to understand the meaning of terms such as business intelligence, counterintelligence, information flow, and benchmarking. These processes are closely interconnected, and their implementation in an appropriate manner can lead to a better positioning.

First, it must be stressed that competitive intelligence is an integral part of a much broader concept, namely the business intelligence community. One of the best definitions of business intelligence site was provided by the American consulting and IT research company Gartner. According to its experts, such a concept can be defined as "the ability of people, processes and applications / tools to organize information, to facilitate access to them and analyze them to improve decisions, for better performance management" [4].

Large companies, under increasing pressure of chaotic changes that occur in the market and increasing competition, are increasingly required to develop a system of external data collection and processing them into intelligence, leading to a better functioning of the decision-making process, and therefore success in business.

Therefore, business intelligence cannot be considered a system or a product, but a concept that spans strategy, databases, and applications. Collection, recovery and analysis helps to understand trends, to highlight the strengths and weaknesses of both the own company and competitors.

Business intelligence is not addressed only big companies but also small and medium enterprises, i.e. everyone who need information to better development.

Another component of business intelligence community is the protection of the company, known in technical terms as the competitive counter – intelligence.

Counterintelligence "aims to neutralize the collection efforts of a competitor through a series of imaginative, flexible and active measures" [5, p.5].

Counterintelligence "deals with intrusions that are not illegal. There can be used barriers to prevent an exodus of information, but they must be placed in company procedures and in the minds of employees, not on points of entry sites" [6, p.184].

The counterintelligence action is a multi-layered protection that hides own weaknesses from those who, knowing them, can get benefits. Counterintelligence is also used to limit exposure to those strengths that will let them know. "It's an ongoing process by which an organization sees itself from its competitors' perspective, in order to lock the exposure to economic terrorism, cyber and industrial, fraud, negligence, unlawful acquisition of information and other security risks" [7, p.79].

Information flow is achieved through four steps:

1. Scheduling and routing, which is determining information needs, collection planning and issuing requests to the search departments;
2. Effective collection of information using various sources and transmission of data obtained for the optimal exploitation;
3. Exploitation of information in which collected data are evaluated, analyzed and synthesized;
4. Dissemination, which involves dissemination of information products to beneficiaries in the form of bulletins, analysis, synthesis, for final capitalization of the cycle.

All these steps lead to the formation of a procedural cycle as information obtained highlight new information needs and information are always reviewed to adapt to changing circumstances.

Benchmarking can be defined as "the process of identifying, understanding and adapting key practices within the organization and other organizations to improve performance" [8].

The emergence of benchmarking dates not very long, it can be identified around 1980, when Rank Xerox<sup>2</sup> realized that its market dominance was strongly affected due to Japanese competition. "Returning the company's assets, 19 % in 1980, was reduced to 8 % three years later, when 80 % of European photocopiers were provided by Japan" [9, p.212].

Per V. Jenster and Klaus Solberg [10, p.114] present the main elements of the benchmarking process:

1. Determining who should be included in this process, by comparing the performance ratios of competitors or by using an indicator that shows that performance could be improved;
2. Establishing the entity on which it is applied. This process requires the agreement of the other party because normally, benchmarking is a reciprocal process;
3. Studying its own processes in the area of interest;
4. Studying the processes of benchmarking partners;
5. Comparing the results with what is already in the organization;
6. Developing an action plan to improve weaknesses.

The use of benchmarking is limited in terms of the analysis of competitors and is more useful for internal procedural restructuring, especially as it is likely to get a collaboration between different business organizations. However, normal practice in benchmarking is that "information obtained from a reciprocal process are used only for the purpose agreed at

<sup>2</sup> Rank Xerox was formed in 1956 through the combination of Xerox Corporation in the U.S. and UK Rank Organization, for producing and marketing Xerox products in Europe, Africa and Asia. Initially, the shares were 50/50, but in a few years, Xerox has bought other shares, leading to a ratio of 80/20, which led, in the late 1980s, the company's name change from Rank Xerox to Xerox.

the outset, as their use for other purposes makes the process of benchmarking unethical." [10, p.115].

Benchmarking can be a useful tool in building a competitive advantage and is one of the tools that could help achieve world-class performance. It can be used only within the organization, for example, in a business that operates in several countries and has several branches that perform the same tasks. This leads to an overall improvement and a significant increase of trust, but is unlikely to help business organizations to place themselves ahead of the competition.

In the process of benchmarking there can be identified five stages: data collection, report production, preparation of the evaluation report, discussion of the results and implementation of the action plan.

Therefore, benchmarking aims to evaluate data by experts discussing the results, so that in the end the most innovative methods that benefit the organization to be taken and implemented.

It can thus be seen the multitude of processes and actions occurring in the private sector for better business management and success. All, managed with the highest degree of reliability, lead to understanding the environment in which private organizations operate.

It can be said that the ability of a competitive intelligence analyst to achieve a vision of the future is driven by creativity, by observation, but also by understanding the ways of developing new technology.

In carrying out competitive intelligence one should not lose sight of the ethical aspect, the whole process being compromised if this essential component is not met. The issue of ethics has been much discussed in recent years, the line between industrial espionage and competitive intelligence is a volatile one.

Competitive intelligence can be developed by all legal means, through information available on the internet or by using specialized software, and any information available to the public.

#### **Management and Sustainable Business Practices.**

In a world facing increasing environmental, social and economic challenges, business companies have been charged with the task of aligning their processes and services with a sustainability agenda. However, the concept of sustainability is complex, interdisciplinary and contested. Approaches to sustainable businesses may range from the development of new technologies for increased efficiency to re-framing technological uses and pursuing more fundamental changes within the ingrained culture of the organization. Furthermore, while all business enterprises can make a contribution towards sustainability, the ability to make a difference varies greatly by sector and organization size.

A good management of environmental services has now become the focus of many business strategies tending to the aspiration of 'greening' their infrastructures and product deliveries. The growing demand for "green" products has created major new markets in which visionary entrepreneurs reap the rewards of approaching sustainability [11]. Hence, by adopting sustainable practices, companies can gain competitive advantage, increase market share and boost shareholder value.

Over the last years, there has been an increased pressure on enterprises to broaden the focus of sustainability and accountability in business performance beyond that of financial performance. Demands for sustainability management spring from a variety of sources, including societal mandates incorporated into regulations, fear of loss of sales, and a potential decline in reputation if a firm does not have a tangible commitment to corporate sustainability management [12, 13].

Corporate sustainability is not just a buzzword—for many industry leaders and corporations, it has become an invaluable tool for exploring ways to reduce costs, manage risks, create new products, and drive fundamental internal changes in culture and structure. However, integrating sustainability thinking and practice into organizational structure is not a trivial task and it requires a vision, commitment and leadership. It also requires a systems approach with an appropriate management framework that enables design, management and communication of corporate sustainability policies [14].

Industrial systems cause and determine flows of material and energy in society and are therefore an important part of the human economy. Although industry is sometimes seen as a source of environmental degradation and social concerns, it is widely recognized that it is an essential part of development and wealth creation. Therefore, as an important social actor, industry must play a prominent role in creating a sustainable future [15].

The challenge of sustainable development for any business is to ensure that it contributes to a better quality of life today without compromising the quality of life of future generations. If industry is to respond to this challenge, it needs to demonstrate a continuous improvement of its triple bottom line, i.e. economic, social, and environmental performance, within new and evolving governance systems [14].

Furthermore, environmental (e.g. climate change) and social (e.g. accountability) demands from shareholders and stakeholders are contributing to the pressure for companies to consider sustainability issues more seriously. However, the major challenge to companies and industries is to demonstrate their current contribution to the society as a whole without compromising the potential for continuing to deliver improvements or future generations. In short, sustainability management practices at a firm level may help the management board to align its corporate and business strategy and to meet key sustainability challenges [16].

However, increasingly, a second major reason for incorporating sustainability into business practice is starting to emerge: it makes business sense to be more sustainable. In their recent report, the World Business Council for Sustainable Development (WBCSD) and the International Institute for Sustainable Development (IISD) identify a number of business benefits of addressing sustainable development concerns [17]:

- Cost savings due to cleaner production methods and innovation—innovation and technology can improve material, energy and product efficiencies;
- Lower health and safety costs—a safe and healthy environment for workers and the community improves wellbeing, which translates into higher productivity, reduced compensation and damage suits, and reduced costs for social services and medication;
- Lower labour costs and innovative solutions—providing good working conditions can improve motivation and productivity, lower labour absenteeism or turnover and result in fewer union disputes;
- Easy access to lenders, insurers, preferential loans and insurance rates—lower risks achieved through implementation of a sustainable development strategy may lead to lower loan rates or insurance costs;
- Best practice influence on regulation—companies that follow best practice are much better placed than their competitors to influence how standards are set and the direction of regulatory change;
- Company's reputation—a commitment to sustainable development may enhance a company's reputation and secure its social licence to operate, also helping to attract the best people to join the company;

- Market advantage—a move towards integrated supply chain management may allow building deeper relationships with customers and capturing more value by providing service rather than selling products only;

- Ethical investors—the rapid expansion of the ethical and socially responsible investment movement poses a new challenge for companies as investors screen out those associated with unacceptable social and environmental performance.

Despite urgent calls for the adoption of corporate sustainability management practices [18, 12, 13], its incorporation into corporate organizational management often remains more superficial than effective [18]. One of the reasons for this lack of integration is, according to Briassoulis [19], both that companies do not know how to measure and

address the issues in a systematic way, as well as the shortfall of available tools to support sustainability management practices in concrete and operational terms.

**Knowledge Management and Instruments for Assuring Competitive Advantage.** Uncertainty forces us to guide our future events in different directions, but without knowing if the chosen direction is the safest. Uncertainty creates opportunity plans and strategies that may not work as expected, and this situation is generating risk. Uncertainty arises due to the amplitude of changes and identifying changes underlies the assessment of potential risks. To evaluate the risks specific to the business, identification must begin with the vectors of change.



Vectors of change in business are events or variations leading to the development of the business. Vectors vary by environment and scope. In the business area there were identified four major types of vectors that produce change:

- scientific and technological innovation;
- new laws and new government policies;
- new social / demographic / ecological trends;
- new habits, new consumer preferences.

To avoid the uncontrolled widening of the gap between risks and opportunities, fueled by uncertainty, it is preferable to build a bridge between strategic knowledge based on science and supported by business intelligence mechanisms.

Knowledge management determines how internal / external knowledge can be balanced or how an organization can create added value of its intangible / immaterial assets. More specifically, knowledge management can be explained as the process of identification, retrieval, sharing, implementation, dissemination and creation of knowledge in the circumstances held by an organization. Knowledge management plays an important role in facilitating strategy formulation and implementation of business intelligence; it involves learning from success and failure previously.

According to J. Bickford [20], lessons learned is that knowledge gained from an innovation or a negative experience that causes an employee or an organization to improve its processes or activities for job security, efficiency or increased quality intake.

The lessons help the collection, analysis and dissemination of relevant casuistry enabling project teams and organizations to fight for success.

Another ingredient, recently used by business intelligence is artificial intelligence. It integrates and complements the power of the human brain with computer intelligence power through the use of advanced interpretation and technologies such as knowledge-based systems, artificial neural networks, algorithmic, based on case arguments etc. However, interpretation and discovery are based on intelligent links and patterns in large data and text. It involves technologies such as extraction of information from data (data mining), the extraction of information from text (text mining), rule induction, self-organizing maps and other related techniques.

Collecting and applying lessons learned are important processes in knowledge management in engineering, but certainly in project management. These lessons learned are intended to avoid repeating the failures, the shortcomings of the past and allow the spread of best practices.

Although lessons learned systems are developed to promote the exchange of knowledge, in the literature it is estimated that approximately 70% of these systems are

inefficient [21]. A key reason for this lack of efficiency due to use of analysis of passive and / or active approaches to dissipation.

One problem found in systems using lessons learned has to do with the process itself. For knowledge management to be successful, its specific practices to be incorporated into the daily activities of the employees.

Bob Galvin, former President of Motorola, identifies five key features of the business intelligence specialist: appreciation of anthropology, to highlight human intelligence, to be an active listener, a creative thinker and always have something new to say. According to Galvin, the ability to master these features make the difference between a business intelligence professional who has success and those who don't [22].

Moreover, before taking a decision, leadership must promote the views of the minority. Only in this way it is progressing and producing innovations. A business intelligence specialist can provide a revolutionary thought so both minority opinion to be expressed, and the view of the majority. It is understood that one skilled in business intelligence will spend more time gathering information than doing analytical work. Process refers to the correct questioning, understanding and prioritizing business information needs, the process of gathering information, interpreting complex data and achieve early warning, finally, improving the field of action of those decisions.

A tool for preparing and training to acquire specific skills is the famous war game – games / methodologies for business strategies, divided into teams representing the company and its competitors home, working on the basis of competitive intelligence research provided from inside (a library or drive their own competitive intelligence) or obtained from an external provider.

**Sustainable Businesses.** The business sector is responsible for a significant proportion of the environmental footprint, in addition to having a major influence on wider social and economic sustainability issues, both nationally and internationally [23]. Therefore, it is crucial to improve the environmental and sustainability performance of businesses and organizations in order to achieve a more sustainable society.

Sustainable businesses and green businesses are businesses that have no negative impact on global or local environment, the community, society and economy. Sustainable business is business trying to satisfy the triple approach of sustainability: its economic, social and environmental components [24]. Often, companies have progressive policies for environmental sustainability and human

rights [25]. Generally, a business is considered to be green if it meets the following four criteria [26]:

- Incorporating sustainability in each of its business decisions.
- Provides environmental products and services that replace the demand for products and / or organic services.
- It is greener than traditional competition.
- Made a commitment to the principles of environmental sustainability in its business operations.

A sustainable business is any organization participating in ecological or green activities to ensure that all processes, products and production activities adequately address the current environmental concerns, while maintaining a profit. In other words, it is a business that "meets the needs of the present world without compromising the ability of future generations to meet their own needs" [27]. It is the process of evaluating how to design products that take advantage of current environment and how well a company behaves when products are made from renewable resources [28].

The Brundtland Report stressed that sustainability is a stool with three legs: people, planet and profit [27]. Sustainable business tries to strike a balance between these three pillars of sustainability, using the concept of sustainable development in the supply chain to reduce environmental impact, economic growth and social welfare [29].

Everyone affects market sustainability and the planet in one way or another. Sustainable development in an enterprise can create value for customers, investors, and the environment. A sustainable business must respond to customer needs while at the same time, treating the environment well [30].

Gerard Keijzers argues in his paper The transition to the sustainable enterprise [31] that the sustainable business is about "business processes that not only curb polluting emissions, and ensure re-use of renewables and recyclable resource stocks, but also allow for the preservation of the key stocks of natural capital, while at the same time allowing for adequate social and economic development, both nationally and internationally".

The turn of the 'green' in business has been associated with a multitude of conceptions and practical ideas. Authors like Keijzers [31], Rennie [28, 30], Galvao [29], and Matthews [24], attempted to define sustainable business or green business as business that not only curb pollution, ensure re-use of renewables and recyclable resources, and preserve natural resource stocks, but also respond to customer needs while at the same time leaving no negative impact on the environment, community, society and economy.

According to Hart's model [32], quoted by Keijzers [31], enterprises undertake the following steps in the transition towards sustainable businesses:

- "first they concentrate on their strategies on preventing waste and pollution,
- subsequently they start working on improved collaboration in the supply chain through integrated chain management and product stewardship schemes,
- and, finally, they arrive at an integrated strategic environmental management approach incorporated in all levels within the business organization".

However, customers, financial partners, non-governmental organizations, governments, the globalization of economies and internationalization of social and environmental standards exert new pressures on companies to take on social and ecological responsibilities. As a response, companies start to contribute to the development of sustainable energy and transport infrastructures, and in designing and implementing new sustainable technologies [31].

#### **The Necessity of Eco-Business Intelligence Tools.**

The business environment is not static, and companies that

fail to see the dynamics of change and adapt, are finally defeated by those that succeed. Failure to identify risks is not related to a particular area, however failure can be identified with the mentality / culture within companies. The most likely to fail are large and arrogant companies that become cumbersome to change and unable to adapt to market developments. On the other hand, studies show that surprise attacks were not successful due to the skills of misleading the competitor or the lack of early warning signals. They were unsuccessful due to lack of accountability and believe as they happen, which led to ignoring the signs of risk. Due to lack of discernment and a formal system to overcome the deadlock in time, certain managers are waking up only when crisis strikes and the performance is low. At this point, it is already too late for recovery, both for themselves and for the company, employees and investors, which ultimately end up paying the price of management errors.

It is necessary for senior management to demand not only the information you want to possess and those that need to know. This principle applies to structures for collecting and processing information, which should provide not only information management needs (specific information required by management) and those that represent or may represent a point of utmost importance for management structures.

The flow of information and decision should be one fluid, in both senses of the chain of command, to prevent formation of undesirable vacuum. Stagnation at the decision flow of information and response is partial or total closure of the system.

Openness to new ideas, new information for decision calculated and filtered, not just focus on tradition and innovation can create a system capable of self-sustaining at risk. Intuition management becomes valuable when it is supported by values well aware, however, intuition turned spectrum of cognitive dissonance will certainly lead to a failure predetermined side effects.

Knowing the vulnerabilities and threats, risk assessment strategies based on tradition and innovation, monitoring information internally and externally, using internal and external tools for collecting and processing information, facilitate a continuous flow of information (flow obstructions may lead the partial or total collapse of the system) – are elements necessary for the operation management through business intelligence system.

**Conclusions.** Sustainability topics are influencing the economic success of companies more than ever. Sustainability has become a driver for both risks and opportunities in business. Strategic management and information management are thus challenged to take into account sustainability information. Independent of the strength of their influence, elements of sustainability can work through market or non-market processes to have an effect on business success [33].

The starting point for an effective management of elements of sustainability relevant to business success is an understanding of their interrelationships. Building a sustainable business is a long-term and multilevel challenge which requires strategic thinking and a systems approach. Corporate sustainability is not an 'add on' but must be an integral part of business and, like all other business activities, it must be managed in an appropriate way.

Although business responses to corporate sustainability issues are varied, the core message is simple: corporate sustainability is a managerial issue as well as a strategic issue. Researches also indicate that a company's decision to engage in corporate sustainability management is a strategic choice [13].

After years of significant investment in putting in place a technological platform that supports business processes and strengthens the efficiency of operational structure,

most organizations have reached a point where the use of tools to support the decision making process at the strategic level emerges as more important than ever. Herein lies the importance of the area known as business intelligence (BI), seen as a response to current needs in terms of access to relevant information through intensive use of information technology (IT) [34]. BI systems have the potential to maximize the use of information by improving the company's capacity to structure a large volume of information and make it accessible, thereby creating competitive advantage, what Davenport calls "competing on analytics" [35].

The managerial approach sees BI as a process in which data gathered from inside and outside the company are integrated in order to generate information relevant to the decision-making process. The role of BI here is to create an informational environment in which operational data gathered from transactional systems and external sources can be analyzed, in order to reveal "strategic" business dimensions for the transition towards the sustainable organization.

**Acknowledgements.** This work was supported by the strategic grant POSDRU/159/1.5/S/133255, Project ID 133255 (2014), co-financed by the European Social Fund within the Sectorial Operational Program Human Resources Development 2007 – 2013.

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Надійшла до редколегії 03.05.14

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### ЗАСОБИ ЕКО-РОЗВІДКИ ЯК НЕОБХІДНІСТЬ ДЛЯ СТАБІЛЬНОСТІ БІЗНЕСУ

*Багато з проблем, пов'язаних зі стійким розвитком, можна простежити на шляху виробництва і споживання, яке здійснює сучасне суспільство. Виробництво, розподіл і постачання товарів і послуг потребує як матеріал, так і споживання енергії, що впливає на природні ресурси як кількісно, так і якісно, генерує відходи, забруднює і руйнує екосистему. Еко-бізнес-розвідка це здатність людей, процесів та програм / інструментів організувати бізнес-інформацію так, щоб полегшити постійний доступ до них і аналізувати їх з метою поліпшення управлінських рішень, для кращого управління ефективністю організацій і впровадження підтримки прийняття рішень. Ця стаття підкреслює необхідність екологічно розумних інструментів, які допоможуть виробленню стратегій організацій, виявленню можливостей конкурентів, аналізу ефективності поточної діяльності, розгортанню довгострокової перспективи для природоохоронної діяльності та встановленню показників і ключових змінних для здоров'я, безпеки і природного приросту активів.*

*Ключові слова. бізнес-розвідка, стійкі компанії, системи підтримки прийняття рішень.*

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### СРЕДСТВА ЭКО-РАЗВЕДКИ КАК НЕОБХОДИМОСТЬ ДЛЯ СТАБИЛЬНОСТИ БИЗНЕСА

*Многие из проблем, связанных с устойчивым развитием, можно проследить на пути производства и потребления, которое осуществляет современное общество. Производство, распределение и поставка товаров и услуг требует как материалов, так и*

потребления энергии, что непосредственно воздействует на природные ресурсы как количественно, так и качественно, генерирует отходы, загрязняет и разрушает экосистему. Эко-бизнес-разведка это способность людей, процессов и приложений / инструментов организовать бизнес-информацию так, чтобы облегчить постоянный доступ к ним и анализировать их с целью улучшения управленческих решений, для лучшего управления эффективностью организаций и внедрения поддержки принятия решений. Эта статья подчеркивает необходимость экологически разумных инструментов, которые помогут выработке стратегии организаций, выявлению возможностей конкурентов, анализа эффективности текущей деятельности, разрыванию долгосрочной перспективы для природоохранной деятельности и установления показателей и ключевых переменных для здоровья, безопасности и природного прироста активов.

*Ключевые слова:* бизнес-разведка, устойчивые компании, системы поддержки принятия решений.

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 32-36

JEL Q01, O31

UDC 330.34

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## INNOVATION CONSTITUENT OF SUSTAINABLE DEVELOPMENT

*The paper substantiates an innovation constituent of sustainable development along with environmental, social and economic pillars of the concept. Determining of implementation details of innovation activity by J. Schumpeter is a theoretical prerequisite to understanding of innovation constituent. An innovator-entrepreneur provides a customer with an information image of 'new combinations.' The image is created by identifying customer's future needs, which outline business aims, subject and appropriate means for creating the innovation products. However, consumer choice is largely motivated by values and specific rules of behavior. The rules of consumer society that in the industrial age become the motive, morality and institution, did not consider the reproductive capabilities of the environment. This disagreement was previously presented in *The Limits to Growth* by the Club of Rome and was reflected in the concept of sustainable development, which gained immense significance after the report of the World Commission on Environment and Development in 1987 (*Our Common Future*). The study highlights importance for establishment of new social values that motivate innovators to change their thinking, comprehend their responsibility not only to consumers but also to the environment and future generations. The Rio+20 Corporate Sustainability Forum: Innovation and Collaboration for the Future We want, organized by the UN Global Compact, demonstrates the interest of entrepreneurs in practical implementation of the concept of sustainable development, through an effective innovation activity. The paper summarizes management tools for implementing business commitments to action in priority areas of ensuring sustainable development: Energy & Climate, Water & Ecosystems, Agriculture & Food, Economics & Finance of Sustainable Development, Social Development, and Urbanization & Cities. Main stages of changes in companies are outlined for making responsible innovation solutions and implementing the innovation constituent of sustainable development.*

*Keywords:* the concept of sustainable development; innovation constituent of sustainable development; information image of innovation; values; tasks for business agents.

**Problem statement.** The foundation of the concept of sustainable development forms the three pillars: environment, society and economy. However, phenomenon of development provides such element as innovations. The innovation constituent of sustainable development targeted at ensuring business agents involvement in establishing mechanisms for implementation of the concept of sustainable development and harmonious combination of efforts at the international, national and micro levels. Because creation of such innovative product or service, that are not only able to identify new customer needs, but also will meet public values generated within the concept of sustainable development, depends on the company.

**Analysis of recent researches and publications.** A significant amount of research reports and publications are addressed to issues relating to sustainable development among which it is worth noting the Club of Rome studies, including A. Peccei, Dennis and Donella Meadows, G. Pauli. A fundamental role in establishing the concept of sustainable development performed the Brundtland Report, which elucidated the term 'sustainable development' for world community. Among the Ukrainian researches who working on creation of the national concept of sustainable development are experts of the State Institution *Institute of Environmental Economics and Sustainable Development of NAS of Ukraine*, in particular M. Khvesyuk, I. Bystriakov, Y. Khlobystov. The role of innovation in the concept of sustainable development takes an important place in studies by the following developers and practitioners: M. Atkins, F. Grosse-Dunker, E. Hansen, B. Kaafarani, R. Nidumolu, C. Prahallad, M. Rangaswami, R. Reichwald, J. Stevenson, and others.

**Unsolved aspects of the problem.** Numerous meetings under the auspices of the UN, the World Development Reports, and Conferences on Sustainable Development

demonstrate the immense significance of the concept in preserving life on Earth and actualize corporate sector involvement in establishing mechanisms for achievement of sustainable development. It is important to identify tasks of the innovator-entrepreneur in creating 'new combinations' for customer. The current customer before deciding to buy a product or service will carefully weigh own 'costs of choice' (described by T. Sakaiya) and pay attention to values. Nowadays, producers of material and perfect goods should clearly realize that humanity requires not only economic dimension of well-being but also provide environmental and social components of public welfare.

**The paper aims to** substantiate the innovation constituent of sustainable development as a conceptual basis of environmental, social and economic components and organizational essentials for their harmonization in the triad 'customer-producer-society' through development and commercialization of sustainable products and services, which materialize scientific and technical knowledge.

**The study results.** The innovation constituent is of special importance for issues relating to sustainable development mainly because of the fact that in the previous research literature dealing with analysis of innovation as a creation of 'new combinations' J. Schumpeter was probably the first who pointed out a problem of future needs, difficulties in persuading consumers to percept new needs and resistance to changes of social environment due to emergence and development of innovations, that interrupt common economic activities [1, pp. 88, 155-157]. The theoretical prerequisite to understanding of system-forming function of the innovation constituent of sustainable development is Schumpeter's approach as to implementation details about business activities of the innovator-entrepreneur, – exposing fundamental differences in such

essential characteristics as business aims, subject and means for action. Innovators input future needs to business aims, which clearly distinguish new needs. They must provide understanding of new needs for customer. Innovators also create new subject and means for action – innovation products targeted at the end-usage and investment, which materialize new scientific and technical knowledge, that make capable to create and satisfy new needs and ways of designing innovation products. Thus "innovations in economy generally are implemented not after spontaneous emergence of new needs among customers and reorientation of production system under their pressure, but only when production creates new customer needs [1, p. 132]".

The main feature of innovation products is heterogeneity in contrast to markets with dominance in traditional products that meet basic customer needs, and as mass and standardized products are homogeneous. Therefore, information asymmetry between producer and customer on the markets with traditional products is virtually absent, while for the markets of innovation products, targeted at meeting new needs, which customer has to understand, high asymmetry of information distribution is normal. Producer should objectively create the informative image of innovation. It raises a new kind of transaction costs – 'costs of choice', which may be internal (rests with the customer) and external (carries the producer of goods).

A great significance for considering 'costs of choice' in the context of innovation products by way of production value, generated by knowledge, are reflected by T. Sakaiya, who elucidates these expenditures like the costs related to making decisions. These interpretative frameworks (heuristics in H. Simon) customer develops as to making decision about buying innovation products. T. Sakaiya states that customer takes into account the price to pay for alternative products; dominant public thought about solutions that are logical (with common sense); advertising; review of mass media; prestige of particular products among those who has a considerable influence on public opinion [2, p. 363]. However, in creating the interpretative frameworks for human activity as a customer, values generated by institutional environment are the most important. Above mentioned values are cultural values, which represent the rules of behaviour that are acquired and transmitted through culture in classification of V. Wenberg. The rules, in its turn, are divided into personal and social – informal (embodied in customs, traditions, etc.) and formal (enshrined in legal system) [3, p. 9].

Consumer society, started in developed countries in the industrial age due to development of market forces and encouraging competition, cause a continuous increase in accumulation and consumption, creating new rules of consumer behavior. According to J. Baudrillard in the industrial age consumption turn into collective behavior, becoming the way of socialization for individual: "consumption is the active and collective behavior; it is the motive, morality and institution [4, p. 111]". The market becomes a mechanism for creating and stimulating demand, including demand for human needs that are beyond the scope of reasonable needs. Producers of goods are interested in creating a feeling of constant dissatisfaction, insatiability of human wants, encourage prestige, demonstrational needs that are unlimited. Economic growth, focused on consumer society, did not consider the reproductive capabilities of the environment. However, actual physical limits to environment are determined by the ultimate capacity of ecosystems on Earth or the ability of natural systems to economic pressure [5, p. 81]. This disagreement was reflected in *The Limits to Growth* (1972), a report for the Club of Rome's Project on the Predicament of Mankind [6]. The concept of limits to

growth, developed in many studies, show illusory nature of the aim of scientific and technological activities, created on the stage of the natural sciences development. A giant mega-project aims to more completely acquiring the forces and energies of nature, transforming nature to warehouse of resources for the European civilization [7, p. 14]. Nowadays, G. Pauli, in the report for the Club of Rome *The Blue Economy*, suggests interrupting impossible consumerism that overweighs economy by huge debts [8].

The ideas of limits to growth were outlined in the concept of sustainable development. Since the report *Our Common Future* of the World Commission on Environment and Development (WCED), chaired by Gro Harlem Brundtland, was published in 1987, the term 'sustainable development' came into use of researchers and wide public. Sustainable development is a development that meets the needs of the present, but does not compromise, does not impoverish the ability of future generations to meet their own needs [9, p. 41]. It is development that doesn't impoverish the future. The concept of sustainable development is a fundamental paradigm of progress of the world community in the 21st century.

The following three pillars are usually distinguished among main constituents that ensure sustainable development:

- environmental factor in the context of efficient use of natural resources and protection of environment for present and future generations through the ecologization of enterprises activity, actualization of environmental management, establishing green reputation, ensuring environmental safety of biosphere, transition to renewable energy
- social constituent, focused on equitable distribution of wealth, eliminating racial and ethnic discrimination, maintaining stability of social and cultural systems, eradicating hunger and poverty on the Earth, development of wide and widely available education network, preserving cultural and spiritual values, healthcare, job creation, and respect for rights of workers, improving working conditions
- economic component, which provides optimal use of scarce resources to produce goods and satisfy growing needs of mankind, use of energy saving technologies (material-saving), recycling and waste disposal, use of effective market tools, competition and stimulating sustainable activities.

However, the implementation of each of any of the constituents is impossible without innovation, which is a leading force for sustainable development. Therefore, an important task is to substantiate the innovation constituent of sustainable development, capable, due to practical implementation of scientific and technical knowledge in sustainable products and services, provide investment solutions for objects of innovations (combining environmental, social and economic components of sustainable development) that are expected to improve the role of economic agents in caring about future generations. Above mentioned tendencies, in its turn, actualize an administrative constituent of sustainable development which at micro level provides practical implementation of the concept at the stage of establishing the mission and goal setting, business development strategy, where the centre of attention for innovation projects in organizations will focus on creating sustainable products and services based on new scientific and technical knowledge and bring this goods to market as innovation products. Support for this research viewpoint is stated by R. Nidumolu, C. Prahalad, and M. Rangaswami. The supporters argue that in formula for sustainable development the forage belongs to innovations and enabling sustainable development involves finding a number of innovation solutions and forcing changes within each company. The researchers point out five distinct stages of change:

1. Viewing compliance as opportunity. It primarily relates to state regulations and legal standards of doing business. Companies need to comply with the rules and to do so be-

fore they are enforced, which make them capable to get first-mover advantages in terms of fostering innovation.

2. Making value chains sustainable. When companies considered state regulations and other standards, they become more proactive about environmental issues: focus on reducing consumption of non-renewable resources, developing eco-friendly products, reducing waste and analysing each link in the value chain.

3. Designing sustainable products and services. Companies start to comprehend the fact that sizable number of customers prefers eco-friendly offerings and for obtaining competition benefits they need to redesign existing products or develop new ones.

4. Developing new business models. Successful business models include novel ways of capturing revenues, for example, creating online stores, and collaborating with other companies, for example, in developing new delivery mechanisms.

5. Creating next-practice platforms. Obtaining the desired result, it is necessary to question what will be the next task and try to find new innovative approaches to doing business realizing their responsibility to society and the environment [10, p. 57].

Therefore, innovator has to create and bring to market not only sustainable product or service but provide a customer with the information image, which targeted at reducing information asymmetry with the customer of that product. The information image of the product must implement new values that are shared by customer choosing among possible alternatives sustainable products and services. Changing global structure of production and system of social values, as is outlined by V. Bazylevych, to transform from the spontaneous market model for economic activities into socialized and eco-friendly model is a prerequisite for sustainable development [11, p. 741].

Essentially forming new social values is a result of spreading ideas of the concepts of limits to growth and sustainable development, which are supported by academic community. The above mentioned concepts develop in emergence of new cultural type of innovators in culture. According to experts, in the United States values of innovators

in culture (moral values, solidarity, concerning about the environment and social issues, accepting new ideas "on the edge of cultural changes") are shared by ¼ of adults [5, p. 82]. Tendencies of progressive turning point from troubles as to provide means of living to the orientation on the outer and inner world are also indicated in Europe.

At the end of the 20th century, knowledge, culture, institutions, taking responsibility for decisions, and authority become new criteria, which broke domination of wealth and income in structure of social values [4, p. 79]. In the 1980s a new post-materialistic tendency in value orientation emerges with dominating intrinsic motivation of individual development and interpersonal interaction among high payment and social security. Holders of new values are representatives of a generation that entered into an independent life in the 1970s and 1980s. They are inherent in high level of education and pursuit of activities with public recognition. R. Inglehart predicted that moreover by 2000, the number of materialists and post-materialists in Western Europe should be equal [12, p. 239].

Generally, the concept of sustainable development as an imperative to regulating socio-economic processes and balancing socio-economic living conditions reflects the focus of scientific and technical knowledge on generating new global values. These mechanisms should take into account long-term changes that will take place in the coming 50 years, including urbanization, technological progress, new social values, new conditions for availability of natural resources, closer international relations [13, p. 37]. Therefore, not only scientific and public community but also corporate sector involves in establishing new global values. Business sector will implement these values in their own innovation activities in future. Particularly, on the eve of the United Nations Conference on Sustainable Development the UN Global Compact organizes the Rio+20 Corporate Sustainability Forum: *Innovation and Collaboration for the Future We Want* with the aim of private sector and investor involvement in establishing mechanisms for achievement of sustainable development summarised in Table 1.

**Table 1. Innovation and administrative constituents of the concept of sustainable development in the context of implementing the tasks of the Rio+20 Corporate Sustainability Forum: *Innovation and Collaboration for the Future We Want***

Area	Tasks for business agents in implementing the innovation constituent	Commitments to action in administrative practice
Energy & Climate	<p>In these areas companies should work to find opportunities for increasing energy efficiency by developing relevant products; promoting renewable technologies; reducing greenhouse gas emissions from industrial processes and creating products that allow to reduce the amount of emissions to the atmosphere; developing innovation solutions in order to adapt society to climate change; investing in development and roll-out of modern energy infrastructure and services.</p> <p>The important business tasks also include: optimization and cost reduction innovations; 'reduce, reuse, and recycle' innovations; business model innovations.</p>	<p>Hundreds of business leaders are committed in advancing practical low-carbon solutions, increasing climate resilience and working to create green economy under joint climate leadership initiative of the UN Global Compact and the UN Environment Programme (UNEP) – <i>Caring for Climate</i>.</p> <p>Many companies are also involved in the UN Secretary-General's <i>Sustainable Energy for All</i> (SE4All) initiative, which provides: doubling the rate of energy efficiency improvements, doubling the share of renewables in the global energy mix and achieving universal access to modern energy services.</p> <p>Over 70 businesses, Governments and international organizations support the idea of creation a <i>Green Industry Platform</i> to ensure the rational use of energy and raw materials, innovative practices and applications for new green technologies.</p>
Water & Ecosystems	<p>The era of business' easy access to natural resources is ending, that's why the main tasks of business are the following: developing technologies for water efficiency and wastewater management; performing research and data analysis with respect to water and ecosystems; developing water-sensitive products and providing water-sensitive services; valuing ecosystems and natural capital.</p>	<p>The UN Global Compact's CEO Water Mandate is a global platform to strengthen corporate water sustainability and nearly 100 companies support it.</p> <p>Growing number of businesses begin to examine their direct and indirect impacts on ecosystems and biodiversity. Companies adopt Biodiversity and Ecosystems Services (BES) strategies and resources to assist in development, implementation and disclosure of related policies and practices.</p> <p>There are other business initiatives aimed at specific sector or industry: the Beverage Industry Environmental Roundtable, the Better Cotton Initiative.</p>

End of table 1

Area	Tasks for business agents in implementing the innovation constituent	Commitments to action in administrative practice
Agriculture & Food	Companies in the food and agriculture industry need to make a significant contribution to increase the production and quality of food; ensure decent workplace and wage conditions to reduce rural poverty; establish and implement innovative agricultural practices; increase food security and access; improve the living conditions in the world's poorest families.	Leading companies commit themselves to practical implementation of the concept of sustainable development in its direct activities: pushing their supplier network to improve practices; training, finance, a fair and consistent buyer for the farmer's harvest; reducing the use of chemical fertilizers; prohibiting expansion of agricultural lands into protected areas; developing innovation solutions to enhance the nutritional value of crops while still in the ground.
Social Development	Governments at all levels have the duty to protect, respect and fulfil human rights, all members of society must comply with national laws and respect international human rights and labour standards. Respecting human rights and rights of workers is a baseline expectation for all enterprises and an integral part of corporate sustainability. Activities of enterprises should not pose risks to women rights, children and indigenous peoples, instead, it is necessary to create new workplaces, provide access to education, healthcare, stimulate peaceful and sustainable growth in poor economies, and work against corruption.	Companies can promote gender equality and women's empowerment through implementing the Women's Empowerment Principles (WEPs). A partnership initiative between UNICEF, the UN Global Compact and Save the Children Embracing is the Children's Rights and Business Principles (Children's Principles) – commitment for business to respect and support children's rights. Important commitments are: improving education; corporate philanthropy; enhancing community's access to natural resources in a particular region; creating strategic social investment projects and infrastructure developments in conflict-affected or high-risk areas; supporting projects that intended to improve governance and reduce corruption risks, etc.
Urbanization & Cities	The priority of business is work towards urban sustainability – long-term durability of a city and its communities as adaptation to changes in all spheres of life.	It is necessary to identify the following commitment: long-term investment in the city economy, ecological restructuring and retrofitting, on-going cultural sensitivity, developing transport infrastructure, promote growth in peripheral regions. However, a major issue is to establish a global, regional cooperation and partnership with the residents, for example: an integrated slum reclamation project linked to restructuring recycling across Porto Alegre; the San Francisco Business Council on Climate Change; USA Great Lakes collaboration.
Economics & Finance of Sustainable Development	Important task is to ensure effective integration of environmental externalities and social considerations into mainstream economic and financial activities; social and environmental costs must be reflected in prices and measures of economic activity, and information on sustainability performance must be available to society; stimulate responsible investment and integrated sustainability reporting; improving the efficiency of corporate governance. Future success of companies depends on the ability to understand, analyse and manage drivers of long-term financial risk and return that include climate change, resource scarcity, global demographic and political changes, social issues, etc.	At the Rio+20 Corporate Sustainability Forum, a social enterprise investment framework was released, designed for incubating and scaling up start-ups and small enterprises with social and environmental missions. Principles for Responsible Investment (PRI) demonstrate that environmental, social and corporate governance (ESG) issues can be material to the financial interests of long-term investors and more than 1,000 investment institutions support it. Five stock exchanges announce a commitment to improve environmental, social and corporate governance disclosure and performance among companies listed on their exchange. Great significance belongs to Global Reporting Initiative (GRI), which develops further series of principles to support sustainable development in an integrated and standalone reporting format.

Source: Based on [14]

The Rio+20 Corporate Sustainability Forum demonstrated a considerable significance to forging partnerships among companies in ensuring sustainable development, as well as establishing public-private partnerships. Governments should encourage innovative initiatives by companies in providing economic growth and improving quality of life. Leading companies should in a certain way perform a role of 'trend setters', they must act as an example for other companies towards sustainable development in all spheres of life and existence of mankind. The business agents are primarily need to realize their responsibility to consumer, environment and society. Implementing the innovation constituent of sustainable development lies in rethinking the role of business in meeting social needs and understanding all opportunities and benefits that are obtained: improving reputation, increasing customer confidence in the company and loyalty for its products, enhancing profitability, interest on the part of stakeholders in business activities, establishing strategic partnerships within industries, across industries, with governments, non-governmental organizations, international organizations, etc.

**Conclusions.** Distinguishing the innovation constituent of sustainable development is completely justified and it provides the following activities:

- design and implementation of innovative products and services in environmental, social and economic spheres (renewable energy technologies, developing and improving alternative energy sources, technologies for effective environmental management, protection and cleaning up ecosystems, ensuring appropriate nutritional value and quality of products and services; knowledge and technologies in the field of social services);
- development of socially responsible investment, which aims not only to get income from investments, but also create positive social changes, have a positive impact on corporate behaviour and reduce a negative influence on environment;
- implementation of integrated reporting on indices of sustainable development;
- development plans for integrated economic development, land-use and transport infrastructure for each region;
- implementation of administrative innovations (engineering, reengineering, benchmarking, innovations in optimization of cost reduction and optimal use of resources);
- promoting cooperation among business, academic institutions, governments, society, stakeholders and forging partnerships;

- support for educational establishments and research institutes in their studies and innovation finding on sustainable development issues;
- development and approval of national strategies and innovation development programs, conducting efficient innovation policy in the public interest.

**Prospects for further research.** Production and implementation of innovations require a significant amount of time and capital, need to mobilize financial resources from all possible sources. It actualizes the need for institutions of venture capital investment. Moreover, the administrative constituent of sustainable development refers to implementation of the concept of corporate social responsibility. It is also important for companies to determine exactly what should be done about the information image of innovation. Therefore the image helps customer with making a sensible decision on its purchase. Ultimately, changes for successful implementation of the concept of sustainable development should be performed not only within the company but also in actions of every person on the planet.

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Надійшла до редколегії 27.05.14

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### ІННОВАЦІЙНА СКЛАДОВА СТАЛОГО РОЗВИТКУ

У статті обґрунтовано важливість виокремлення інноваційної складової сталого розвитку поряд з екологічною, соціальною та економічною компонентами концепції. Теоретичною передумовою розгляду інноваційної складової є визначення Й. Шумпетером особливостей реалізації підприємницької інноваційної діяльності. Підприємець-інноватор надає споживачеві інформаційний образ новинки, який створюється за рахунок усвідомлення майбутніх потреб – цілей підприємницької діяльності, предмету та відповідних засобів створення інноваційної продукції. Однак вибір споживача значною мірою вмотивований ціннісними установками і правилами поведінки. Правила поведінки суспільства споживання, яке в індустріальну епоху стає спонуканням, мораллю та інститутом, не враховували відтворювальних можливостей навколишнього середовища. Ця суперечність спочатку була відображена у Доповіді Римському клубу "Межі зростання" та втілена у концепції сталого розвитку, яка набула культового значення після звіту комісії ООН "Наше спільне майбутнє". Дослідження визначає важливість формування нових суспільних цінностей, які спонукають інноваторів до переорієнтації свого мислення, усвідомлення своєї відповідальності не лише перед споживачем, а й перед довіллям і майбутніми поколіннями. Корпоративний форум "Інновації та співробітництво для майбутнього, якого ми прагнемо", організований Глобальним Договором ООН, уперше продемонстрував зацікавленість підприємців у практичному втіленні концепції сталого розвитку, зокрема через ефективну інноваційну діяльність. У статті узагальнено управлінський інструментарій реалізації прийнятих бізнесом зобов'язань у пріоритетних напрямках забезпечення сталого розвитку: енергетика і клімат, водні ресурси та екосистеми, сільське господарство та продовольство, соціальний розвиток, урбанізація та міста, економіка та фінанси сталого розвитку. Окреслено основні етапи здійснення змін на підприємстві для прийняття відповідальних інноваційних рішень та реалізації інноваційної складової сталого розвитку.

Ключові слова: концепція сталого розвитку; інноваційна складова сталого розвитку; інформаційний образ інновації; цінності; завдання бізнесу.

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### ІННОВАЦІОННА СКЛАДОВА СТАЛОГО РОЗВИТКУ

В статье обоснована необходимость выделения инновационной составляющей устойчивого развития наряду с экологической, социальной и экономической компонентами концепции. Теоретической предпосылкой рассмотрения инновационной составляющей является определение И. Шумпетером особенностей осуществления предпринимательской инновационной деятельности. Предприниматель-инноватор предоставляет потребителю информационный образ новинки, который создается за счет осознания будущих потребностей, удовлетворение которых становится целью предпринимательской деятельности, предметом и средством создания инновационной продукции. Однако выбор потребителя в значительной степени мотивирован ценностными установками и правилами поведения. Правила поведения общества потребления, которое в индустриальную эпоху становится побуждением, моралью и институтом, не учитывали воспроизводственных возможностей окружающей среды. Это противоречие было отражено в Докладе Римскому клубу "Пределы роста" и воплощено в концепции устойчивого развития. Исследование определяет важность формирования новых общественных ценностей, которые побуждают инноваторов к переориентации своего мышления, осознания своей ответственности не только перед потребителем, но и перед окружающей средой и будущими поколениями. Корпоративный форум "Инновации и сотрудничество для будущего, к которому мы стремимся", организованный Глобальным Договором ООН, впервые продемонстрировал заинтересованность предпринимателей в практическом воплощении концепции устойчивого развития, в частности через эффективную инновационную деятельность. В статье систематизирован управленческий инструментариум реализации принятых бизнесом обязательств по приоритетным направлениям обеспечения устойчивого развития: энергетика и климат, водные ресурсы и экосистемы, сельское хозяйство и продовольствие, социальное развитие, урбанизация и города, экономика и финансы устойчивого развития. Определены основные этапы осуществления изменений на уровне предприятия для принятия ответственных инновационных решений и реализации инновационной составляющей устойчивого развития.

Ключевые слова: концепция устойчивого развития; инновационная составляющая устойчивого развития; информационный образ инновации; ценности; задачи бизнеса.

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 37-42

UDC 334.7

JEL: F21, P32, P33

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## FINANCING MECHANISMS FOR INVESTMENT PROJECTS IN THE AGRICULTURAL SECTOR OF UKRAINE'S ECONOMY INVOLVING ANGEL INVESTORS

*The challenges connected with attracting foreign investments into the agricultural sector of the Ukrainian economy as well as diversification of forms of international investments are actual due to the immediate needs of realization of innovative development, technological upgrading and strengthening of agricultural sector attractiveness on the world market. Current situation and problems connected with attracting foreign investments into the agricultural sector of the Ukrainian economy are revealed. It is detected that level of attracting foreign investments into the agricultural sector of Ukraine and into AIC together don't meet the needs of its innovative potential. The following factors of agricultural sector attractiveness have been considered: high soil fertility and favorable weather conditions for growing crops; export capacity; high yield of the Ukrainian farming companies; undervalued assets and low level of capitalization of agricultural companies; attractive tax regime for agricultural producers. It is recommended that agricultural producers should indicate these factors in investment proposals and projects that they present to potential international investors. State investment policy in the agricultural sector is viewed to consolidate the resource base and the sources of investment have been determined. Suggestions to expand the financing mechanisms for investment projects in the agricultural sector involving angel investors have been justified. Economic feasibility of attracting foreign investments for financing of innovation activity of farming companies has been revealed. The key requirements and main stages of investments of angel investment association have been described.*

**Keywords.** Foreign investment attraction, agricultural sector of the Ukrainian economy, investment attractiveness, the mechanisms for investment projects financing, venture financing, international investment collaboration.

**Introduction.** Issues of ensuring competitiveness of the national economy and economic growth are closely connected with the provision of resources. The major source of the economic growth is investments. Given the lack of domestic sources of financing, foreign investment becomes the source that may make the most significant contribution to the technological re-equipment of production, gaining sustained economic growth, development of export industries, import substitution, improving enterprises' efficiency. Thus, the issue of attracting foreign investments into the economy of Ukraine is urgent, including the expansion of forms and mechanisms of international investment of the key branches of economy, establishing of cooperation with different types of international investors.

Attracting foreign investments into the agricultural sector of the Ukraine's economy and diversification of forms of international investing is up-to-the-minute, considering the urgent needs to implement innovative development, technological upgrading and enhancing competitiveness in the global market. Experts say that 60 billion dollars of foreign investments are required for a significant breakthrough of the agricultural sector today.

Issues of the range of problems connected with the processes of attracting foreign investments as well as research of international investment mechanisms are major subjects of the national and foreign scientists: A.P. Haidutsky, B.V. Gubsky, G.V. Kozachenko, D.G. Lukyanenko, O.I. Rohach, A.P. Rumyantseva, D.M. Chervanyova, V.E. Cherkasova, V.J. Shevchenko, I. Blank, L. Gitman, G. Dunning, R. Dornbusch, K. Eklund, M. Quezon, K. Kojima, R. Coase, P. Masse, M. Porter, A. Rugman, P. Samuelson, F. Fischer, S. Haymer and others. However, industry-specific practical aspects of this problem have not been sufficiently studied yet, including the issue of optimizing the forms and mechanisms of international financing of investment-driven development of the

agricultural sector of the Ukrainian economy considering specifics of its investment attractiveness and risks.

**The goal of the article** is to disclose current situation and problems which are connected with attracting foreign investments into the agricultural sector of the Ukrainian economy as well as considering the factors of this sector attractiveness and justifying suggestions on financing mechanisms expanding within investment projects in the agricultural sector involving angel investors.

Today, agriculture of Ukraine is a key industry branch with high level of export and investment potential. Its development requires a favourable governmental innovation and investment policy. To increase the competitiveness of Ukrainian agricultural products without innovations is not possible. Same way, implementing of the market reforms and bringing them to life become possible only with investments.

The agricultural policy priorities are to increase production and improve competitiveness of the agricultural sector, to increase export of farming products, to develop agricultural market infrastructure, to form an integral system of financial and credit support of agribusiness, etc. These objectives require foreign investments, which through a number of reasons enter into Ukrainian economy in deficiency. As of 01.01.2013, external foreign direct investments in the agricultural sector of Ukraine became 857.2 million US dollars, which is only 1.6% in gross volume of national FDI [8]. The agriculture meanwhile provided 3.4% of commodity export earnings, and agribusiness in general provided 25.6% of the Ukrainian commodity export earnings in 2012. In addition, one can observe high rates of export performance growth of agribusiness products: exports grew by 39.7% in 2012 vs. 2011 [9], which is a factor of investment attractiveness growth of the agricultural sector to the foreign investors.

**Table 1. Volumes of foreign direct investments (equity capital) in the agricultural sector of Ukraine, 2007-2012**

Factors	Years					
	2008	2009	2010	2011	2012	2013
Gross volumes of foreign direct investments in Ukraine, million US dollars.	29542.7	35616.4	40053.0	44806.0	50333.9	54462.4
Foreign direct investments volumes in the agricultural sector, million US dollars.	557.3	600.3	680.4	730.7	736.3	857.2
FDI share in the agricultural sector, in %	1.9	1.7	1.7	1.6	1.5	1.6

Source: compiled and calculated according to the State Statistics Service of Ukraine

Gaps in the national legal framework regulating investment activities, financial and stock markets, political instability hinder investment activity in Ukraine in general, and in agricultural sector in particular. Attracting of foreign investments is interfered with frequent changes in legislation and lack of reliable guarantees for the foreign investors' protection, high tax rates, inadequacy of management mechanisms of public expenditure for development and public and private partnerships mechanisms, immaturity of investment infrastructure, bureaucracy and corruption, inconsistency of investment.

World Trade Organization (WTO) World Trade Report – 2013 states as follow: Ukraine is on the 10<sup>th</sup> place in the list of the most attractive countries for the purchase of land with potential of 1.2 million hectares. Analytics of WTO note that international investors are ready to invest Ukrainian agricultural sector even if the investment environment is unfavourable. The issue of land ownership protection creates significant barriers for investment into the Ukrainian agricultural sector.

State Strategy of the economy's agricultural sector development for the period to 2020 declares among the others the following the key problems of the development of agricultural sector of the Ukrainian economy:

- poor investment capacity of the state and the majority of the agricultural sector entities,
- lack of working and available credit funds for farmers to cover the gap in time between the demand for funds and the time of favourable price for sales of products.

Therefore, increasing the investment attractiveness of the agricultural sector of Ukraine's economy will promote increasing of international investments in it. The above strategy states that the Ukrainian agricultural sector with the production potential, which substantially exceeds the domestic demand, is a link that might become a growth driver for national economy and its effective integration into the global economy.

National farming sector compile about 10% of the country's GDP and ensures 95% provision of local population with food, which is one of the highest figures in the world. In addition, Ukrainian market of the agricultural products has a huge opportunity to increase in absolute terms and substitute many items of import. According to the UN, Ukraine is one of three leaders with regard to the dynamics of agricultural production (after Brazil and Russia). The sector becomes even more attractive when you consider the dynamics of food prices for the last 10 years, both in Ukraine and in the world.

National agricultural sector tends to increase: gross agricultural output amounted to 17.6 % in 2011 as compared with 2010. During January-July 2013, agricultural output increased by 14.8% in all household categories compared to the same period of the previous year, including farming units, where it increased by 23.1% and households – by 7%. The latter growth rate in agriculture was achieved largely due to the record grain harvest. The share of farming industry in national GDP is also gradually increasing. In January-July 2013 revenue part of the budget increased by 19.2% at the expense of farmers exclusively. Ukrainian agricultural sector occupies an important place in the world (Table 2).

**Table 2. Place of the Ukraine's agribusiness in global production and export**

Culture	Production / Export	Crop of the year 2012, thousand tons	Share (place) in the world market
Barley	Production	9.095	7% (3)
	Export	2.800	15% (5)
Corn	Production	22.898	3% (5)
	Export	14.000	14% (3)
Wheat	Production	22.124	3% (10)
	Export	5.000	3% (8)
Sunflower-seed oil	Production	3.684	26% (1)
	Export	2.900	49% (1)
Sunflower	Production	9.500	24% (2)
	Export	300	16% (3)
Rapeseed	Production	1.500	3% (6)
	Export	1.060	9% (3)
Soybean	Production	2.200	1% (9)
	Export	1.200	1% (7)

Source: compiled according to data [2]

Experts predict that despite the fact that the agribusiness will employ only about 10% of the population, Ukraine has a chance of becoming a major food manufacturer in the world by 2050.

Below are the factors which attract foreign investors into the agricultural sector:

- Agribusiness is attributed to the basic branches of economy, where investment and innovation projects under the Development Program of investment and innovation activity in Ukraine are implemented. Moreover, the Cabinet of Ministers of Ukraine decided to refer the agribusiness to the priority sectors under the Law of Ukraine "On promotion of investment activity in priority sectors of the economy with the purpose to create new workplaces" in August 2013;

- High level of soil fertility and favourable weather conditions for growing crops. Ukraine has the largest territory in Europe, which is suitable for crops growing (32.5 million ha). Twenty five percent of the world reserves of black soil are

concentrated in Ukraine. The mild climate of Ukraine gives farmers a significant competitive advantage;

- Export capacity. Today, Ukraine is the world leader in sunflower-seed oil exporting and barley exporting. In recent years, Ukraine has produced about 40-50 million tons of wheat and thus strengthened its position as the main supplier of wheat into the world market;

- High yield of the Ukrainian farming companies. Ukrainian agricultural holdings show higher efficiency than the other world ones, mainly due to the lower production costs (cheap labour, low cost of land lease), on the one hand. On the other hand, this advantage is achieved only due to the high level of soil fertility, rather than by using new technologies [1]. Thus, there is a potential for efficiency rising based on new technology attraction.

Investment potential of the agricultural sector is not fully implemented. Therefore, Ukrainian Government is committed to increase level of foreign investments in this industry. Almost entire agricultural sector of Ukraine requires for-

eign-invested reconstruction and modernization – from primary manufacturing processes in farming to produce of deliverables and bringing them to the consumer. It is imperative to increase productivity and reduce losses, provide deeper and more comprehensive processing of raw materials with the aim to increase significantly the final product yield and to improve its consumer qualities. Decrease of agricultural raw material losses and deepening of its processing are those areas, which can benefit significantly within a short time period, in particular, by creating relatively small companies that do not require large foreign investments and provide short payback period of initial investment with low risk for foreign investors.

Agricultural sector of Ukraine is characterized by significant opportunities for investors: agricultural market infrastructure (construction of grain storages, potato storages, terminals, logistics), potential to increase crop yield, industrial production of meat and milk, egg production, there is a large number of small agricultural companies, which can be bought at a profit, no special licensing requirements, favourable tax treatment for farmers. These factors should contribute the investment projects and investment proposals that domestic farmers submit to foreign investors.

Advanced energy-saving technology of crops cultivation is among the promising direction of investment activity at agricultural enterprises. It will aim at resources saving, maintenance and improvement of soil fertility in case of sufficient yield level.

Investment generation method in agribusiness depends on the amount of finance which is requested to implement the investment project. Fund raising, which requires relatively small investments (up to \$ 1 million) in the agricultural sector is not always justified by means of an IPO because of the significant cost of the very IPO. Venture capital is considered as financing type of the promising companies. This is a risky fund raising because investor is involved in the company's business management and he invests in with the aim to increase the value of the very company.

Typically, the venture capital market is divided into the formal and informal ones. The formal venture capital market is represented by the venture funds, which are joined by the financial resources of investors. The informal venture capital market consists of private investors who invest their own money into the new and growing small and medium-sized firms. These investors are called "angel investors" in the world.

Most angel investors are those successful entrepreneurs who possess extensive experience in own business promotion. Distinctive feature of their activity is investing in risky projects that do not have sufficient financial support. Sometimes angel investor' decision bases on a positive impression about the project and confidence in its successful implementation. Therefore, the entrepreneurs who wish to bring funds in their project are challenged to produce such a confidence in the angel investor.

As a rule, angel investors buy minority share of the company, because they want to preserve person's motivation to implement his/her project. If they want to retain control over their investments, they rarely buy blocking package.

The amounts, which angel investors' invest, typically range from 20 thousand to several million dollars. They make number of investments while allocating their capital and minimising risks. Three or more angel investors make approximately 1/3 of all investments. Thus, large projects can be financed and the risk of investors is reduced.

In 2012, angel investors financed in major IT filed (software development and security technologies), pharmacology, biotechnology, medical equipment, service sectors. The projects in the automobile and aviation industries,

mass media production, food and pharmaceutical processing industries were also popular among angel investors. Two thirds of angel investors consider projects that are located within the country, but recently, they have increasingly begun to invest in the countries with a large unrealized potential in a particular area. That is why Ukrainian agribusiness may be of interest for these investors.

Once angel investors invest money in the company, its credibility grows and it becomes easier to attract additional funding from other sources. Besides funding, angel investors contribute the company with experience and management skills. Most entrepreneurs say that knowledge and experience of angel investors is much more important than finance. According to the latest information, 80% of angel investors are actively involved in the company management they invested in.

The main reasons angel investors rely on when investing [6]:

- obtain significant financial benefits (seeking to enlarge capital by 7-10 times for 5-7 years);
- Authority and pleasure, which an angel investor receives by helping the company to grow and strengthen its market position.

The economic merit of attracting angel investors in the projects is as follows:

- Angel investors prefer to finance high-risk business companies with a high growth potential;
- Angel investors prefer small volumes of investments (up to \$ 1 million);
- They invest in almost all sectors. However, it should be noted that they primarily compare potential growth of sectors and base their decisions on the latter;
- Angel investors are more flexible in making financial decisions than venture capitalists. They have their own investment criteria, broader investment horizons, short-term approval and a lower rate of profitability;
- Financing with the participation of angel investors is cheaper than credit funds, since it does not increase the debt burden on the company;
- Most angel investors are useful investors because they share invaluable experience and help a company to grow;
- Financial market of angel investors is more widespread in geographical terms than the venture capital market;
- Financing by angel investors has a positive effect on the company as a whole since it increases its attractiveness in the eyes of other investors;
- Angels investors are useful because they can also provide the company with a credit guarantee;
- They are not afraid to invest in new companies, which are subject to high risk.

In practice, even these companies which once held IPO apply to angel investors. Angel investors allocate their funds in the investment projects. In the agricultural sector, fund raising allocates in construction of railway terminals, elevators, potato storages, high-tech systems and mechanisms for crops processing, machinery, and plants for recycling of waste into biofuels etc. Basically, angel investor is ready to finance up to 500 000 \$. However, if one manage to get financing from the angel investors' association, amount may increase many times.

The European association of angel investors EBAN (European Trade Association for angel investors, Seed Funds, and other Early Stage Market Players) was established in 1999 under the auspices of the European Commission as a mechanism to facilitate the relationship and search for investors (angel investors) and entrepreneurs who need investments. This association is not the only one, but according the latest research, it has the most ex-

tensive network of angel investors. There is an office of the association in every European and some CIS countries. However, it does not mean that they finance the projects only within the country. Usually, they are also interested in promising projects abroad. The above Association is a plat-

form where the interests of angel investor(s) and the entrepreneurs meet together.

Implementation scheme of the Angel Investors Associations' fund raising differs depending the country investor deals with. However, there is a generally accepted algorithm (Fig. 1).

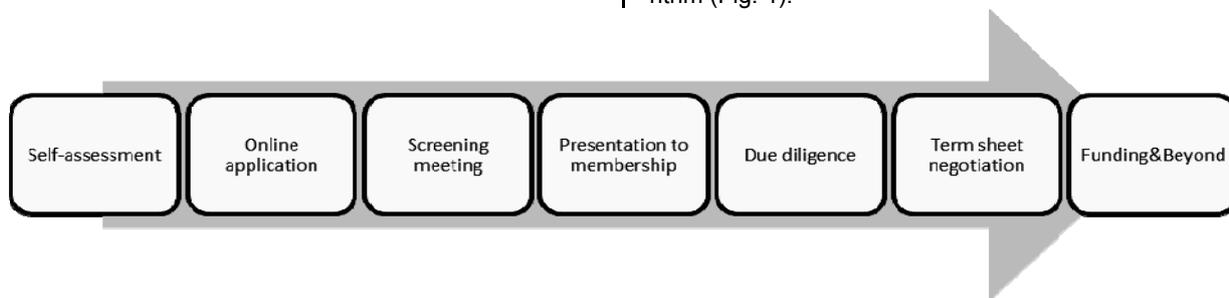


Figure1. Algorithm of receiving financing from the Angel Investors Association (EBAN)

Source: compiled according to the source data [3]

**Stage I. Self-assessment.** At this point, you should clearly determine whether investment from angel investors is of urgent importance or whether or not your company needs investment from angel investors. In case of positive answer, you have to prepare a Business Plan in accordance with the requirements and suggestions put forward by the association.

**Stage II. Online application.** At this stage, you have to sign in on the site as an entrepreneur. Then you have to submit a Business Plan. Special Association Committee estimates principle components of the project and takes one of the following decisions: to invite you for a meeting, to send a draft for revision in collaboration with the committee experts, or to reject the project.

**Stage III. Screening meeting.** If the committee gets interested, you will be invited to a short 10-minute presentation of the project.

**Stage IV. Presenting to the membership.** You will be invited to make a 30-minute presentation to all angel investors – members of the association. At this point, the angel investors, those interested in your project and whom you will further cooperate with, are determined.

**Stage V. Due diligence.** It is the most important stage, since a group of independent experts in cooperation with angel investors will audit financial and economic situation of your company and/or check adequacy of the data of financial ratios calculation, which formed the basis of the business plan.

**Stage VI. Term sheet negotiation.** In case of a successful Due diligence procedure, a final meeting with angel investor (angel investors group) will be held, where the details of the future agreement and cooperation will be discussed.

**Stage VII. Funding & Beyond.** At this point direct cooperation with angel investors starts. Company receives necessary funding and invaluable experience for future development of the company from the world's experts.

In practice, not all submitted projects will be eventually supported. The main reason for rejection of projects at the early stages is non-compliance with the requirements and recommendations put forward by the committee and ultimately by the very angel investors. Therefore, in our opinion, it is important to prioritise project areas of angel investors' attention (Table 3).

Table 3. Main requirements of angel investors during project review

Area	Typical questions
1. Management team	<ul style="list-style-type: none"> <li>Is your management team experienced, motivated, solid and ready to cede some control and decision-making authority, advice and recommendations on the part of outside investors?</li> </ul>
2. Target audience	<ul style="list-style-type: none"> <li>Do you have a target audience (target segment)?</li> <li>Does it show a stable demand for your product /service?</li> </ul>
3. Market size	<ul style="list-style-type: none"> <li>Are your projected income measures significant and constantly growing?</li> <li>Does the company have a potential to expand (increase the volume of production /services) by increasing the size of the market?</li> </ul>
4. Competition	<ul style="list-style-type: none"> <li>Have you identified the target competitors?</li> <li>Does the company have a competitive advantage as compared to competitors?</li> </ul>
5. Technology	<ul style="list-style-type: none"> <li>Is the technology you will use to manufacture equity production reliable (time proved)?</li> <li>Can the experts confirm this?</li> <li>Do you have a Business – Plan of technology commercialization (in case the technology has been recently developed)?</li> </ul>
6. Intellectual property protection	<ul style="list-style-type: none"> <li>Is your intellectual property protected?</li> </ul>
7. Sales strategy	<ul style="list-style-type: none"> <li>Do you have an adequate plan for rapid market penetration and consolidation of your position there?</li> <li>Will you create a strong internal sales team or rely on external channels of partners?</li> </ul>
8. Profit earning capacity	<ul style="list-style-type: none"> <li>Can you demonstrate how you will reach high profitability and sustained growth of cash flow?</li> </ul>
9. Capital	<ul style="list-style-type: none"> <li>How much money you need and what are the purpose of its use?</li> </ul>
10. Financial forecasts	<ul style="list-style-type: none"> <li>Did you prepare the projected balance sheet, profit and loss statement, cash flow report based on actual, reasonable and logical assumptions?</li> </ul>
11. Exit strategy	<ul style="list-style-type: none"> <li>Does your strategy describe the terms and ways of exit from a business of angel investors?</li> <li>Is there a reasonable high probability of obtaining by angel investors 10 times more money as compared to the invested amount in 5-7 years?</li> </ul>

Source: compiled according to the source data [3]

Development of venture business in agricultural sector is limited under current conditions. In major it is caused by number of external factors. Firstly, there is no economic interest of most agricultural enterprises to implement totally new developments, innovations of a high engineering and economic level, which creates a low demand for such novation. Secondly, securities market is underdeveloped, and, thirdly, there is a weak competition in the domestic scientific-technical (sci-tech) market.

The sci-tech market is a very specific one in our country. There is a huge demand to improve existing processes, including sci-tech developments on the one hand. On the other hand demand for revolutionary innovations, new advanced technologies is small. We almost have no market of such products, since the majority of farming companies are not able to change fundamentally the existing technology.

Today, only foreign companies, which actively seek to the market of the Ukrainian intellectual products, show interest in the commercialization of promising developments. But in spite of all obstacles, the venture investment will facilitate development and implementation of innovative projects in agribusiness, since the peculiarities of this activity type is that the funds are provided for a perspective project without any warranties for newly established or small businesses for a long term, and the investors actively participate in venture company management, thus reducing the risk and increasing the rate of return on investment.

Based on the foregoing, one can note that venture capital is potentially cheap source of innovation activity financing for the agricultural enterprise, as it enables the company to grow and not to increase its debt burden. Therefore, the farmers need to improve the investment management through establishing of cooperation with foreign investors, including angel investors, with the purposes to raise funds for the implementation of innovative investment projects.

On the part of the state, implementation of the main directions of the investment policy in the agricultural sector needs further consolidation of resources including all sources of funding. In order to mobilize and use effectively additional sources of financing of the agricultural sector of Ukraine's economy the following measures should be realized:

- Justify the priority list of agricultural sectors for implementation of investment projects, as well as sci-tech programs and major directions of fundamental research, financed out of public funds;
- Improve regulatory role of the state in recovering of the investment process by concentrating and channelling of the investment resources of budgets at all levels as well as credit facilities, which are attracted against guarantee of the Cabinet of Ministers of Ukraine to promote the prioritized areas of farming sector;
- Develop tax incentive instruments of investment processes on foreign investor side;
- Make reasonable choice of investment projects to provide state guarantees to foreign investors if: investment

project is of national level; investment incorporates resource-saving and environment-friendly technologies, products are export-oriented, investment contributes to the creation of new jobs, particularly in the regions with tight labour market;

- Make the transition from irretrievable budget financing of investments to goal-oriented crediting of investment projects on favourable terms and with property guarantees of their intended use;
- Develop a mechanism to strengthen economic interest of the foreign investors in the projects connected with the release of exportable products;
- Facilitate fund raising, including those coming from the international financial institutions, foreign investment funds, venture and angel investors;
- In case Ukraine signs the Deep and Comprehensive FTA with the EU, apply integration mechanisms to enhance investment cooperation with the European investors, etc.

**Conclusion.** Implementation of the above macro level measures together with managerial improvement of investment projects, expansion of variety of forms and mechanisms of funding will attract the funds of foreign investors to ensure innovation and economic development and to raise competitiveness of domestic agricultural sector on the world markets.

**Prospects for further research** is to identify the impact of deep and comprehensive FTA with EU on the processes of investing and fund raising in agricultural sector of Ukraine and to develop recommendations on investment forms and instruments based on cooperation between Ukraine and the EU in the agricultural sector.

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Надійшла до редколегії 23.10.13

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## МЕХАНІЗМИ ФІНАНСУВАННЯ ІНВЕСТИЦІЙНИХ ПРОЄКТІВ В АГРАРНОМУ СЕКТОРІ ЕКОНОМІКИ УКРАЇНИ ЗА УЧАСТІ БІЗНЕС-АНГЕЛІВ

*Проблема залучення іноземних інвестицій в аграрний сектор економіки України та диверсифікація форм міжнародного інвестування є актуальною з огляду нагальних потреб здійснення інноваційного розвитку, технологічного переозброєння та посилення конкурентоспроможності на світовому ринку українських аграрних підприємств. Розкрито стан та проблеми залучення іноземних інвестицій в аграрний сектор економіки України. Виявлено, що рівень залучення прямих іноземних інвестицій в сільське господарство України та в цілому у вітчизняний АПК не відповідає його потребам та інвестиційному потенціалу. Визначено фактори інвестиційної привабливості сфери АПК, що включають в себе наступні: висока родючість ґрунтів і сприятливі погодні умови для вирощування сільськогосподарських культур; високі експортні можливості; висока дохідність українських аграрних компаній та наявність резервів її підвищення; недооціненість акцій та невисока капіталізація українських компаній; сприятливий податковий режим для агровиробників. Запропоновано відобразити ці фактори в інвестиційних пропозиціях та проєктах, які вітчизняні аграрії презентують потенційним іноземним інвесторам. Визначено напрямки державної інвестиційної політики в аграрному секторі з метою консолідації ресурсної бази*

та джерел фінансування. Обґрунтовано пропозиції щодо розширення механізмів фінансування інвестиційних проектів в аграрному секторі за участю міжнародних інвесторів, у тому числі бізнес-ангелів. Розкрито економічну доцільність залучення венчурного капіталу та бізнес-ангелів для фінансування інноваційної діяльності аграрних підприємств. Охарактеризовано ключові вимоги та етапність отримання фінансування від міжнародної асоціації бізнес-ангелів.

**Ключові слова:** залучення іноземних інвестицій, аграрний сектор економіки України, інвестиційна привабливість, механізми фінансування інвестиційних проектів, венчурне фінансування, міжнародне інвестиційне співробітництво.

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## МЕХАНІЗМИ ФІНАНСИРОВАНИЯ ИНВЕСТИЦИОННЫХ ПРОЕКТОВ В АГРАРНОМ СЕКТОРЕ ЭКОНОМИКИ УКРАИНЫ ПРИ УЧАСТИИ БИЗНЕС-АНГЕЛОВ

Актуальность проблемы привлечения иностранных инвестиций в аграрный сектор экономики Украины и диверсификация форм международного инвестирования обусловлена необходимостью осуществления инновационного развития, технологической модернизации и повышения конкурентоспособности на мировом рынке украинских аграрных предприятий. Раскрыто состояние и проблемы привлечения иностранных инвестиций в аграрный сектор экономики Украины. Выявлено, что уровень привлечения прямых иностранных инвестиций в сельское хозяйство Украины и в целом в отечественный АПК не соответствует уровню его потребностей и инвестиционного потенциала. Сформулированы факторы инвестиционной привлекательности сферы АПК Украины, которые включают в себя следующие: высокая плодородность земли и благоприятные погодные условия для выращивания сельскохозяйственных культур; высокие экспортные возможности; высокая доходность украинских аграрных компаний и наличие резервов ее повышения; недооцененность активов и невысокая капитализация украинских компаний; благоприятный налоговый режим для агропроизводителей. Предложено отображать эти факторы в инвестиционных предложениях и проектах, которые отечественные аграрии представляют потенциальным иностранным инвесторам. Представлены направления государственной инвестиционной политики в аграрном секторе с целью консолидации ресурсной базы, а также источников финансирования. Разработаны и обоснованы рекомендации по расширению механизмов финансирования инвестиционных проектов в аграрном секторе при участии международных инвесторов, в том числе бизнес-ангелов. Раскрыто экономическую целесообразность привлечения венчурного капитала и бизнес-ангелов для финансирования инновационной деятельности аграрных предприятий. Охарактеризованы ключевые требования и этапность получения финансирования от международной ассоциации бизнес-ангелов.

**Ключевые слова:** привлечение иностранных инвестиций, аграрный сектор экономики Украины, инвестиционная привлекательность, механизмы финансирования инвестиционных проектов, венчурное финансирование, международное инвестиционное сотрудничество.

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 42-48  
UDC 330.4:338.24: 519.86  
JEL C65 D40 L95 Q25

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## MODELING IN THE PROCESSES OF CHOICE OF THE COMPANY DELIVERING BOTTLED WATER BY THE CONSUMERS ON THE BACKGROUND OF REFLEXIVE MANAGEMENT

*In this work the problem of high quality drinking water provision is described and analyzed. It is shown that a person may obtain such water by various ways one of which is bottled water delivery by specialized companies. The existence of numerous players on drinking water market stipulates the occurrence of the number of problems – in particular, the choice of the delivering water company by the consumer and fight of such companies for the consumer. The work proposes to apply a reflexive approach in order to influence the choice of the consumer, which allows the company to make him take the "right" decision. For solving the problem the classical and fuzzy model of reflexive management are described.*

**Keywords:** drinking water, reflexive management, decision making.

**Problem statement.** The problem of water resources provision is actual in the whole world on the state level as well as on the level of each household. Water has a great utility meaning due to its usage in industry, agriculture, as drinking water etc. Although water is a renewable resource, today water pollution in the whole world has reached a critical level. It is subject to rivers, lakes, underground water and World ocean as a whole.

The most actual problem on the level of each state is the provision of its citizens by high quality drinking water. At the moment there are several ways of provision of the people by drinking water: central water supply, artesian water pump rooms, wells, bottled water etc. Water is an essential resource (as air) for the people whose quality of life depends on it. On the one side, everyone understands that in order to improve the quality of life (in the first hand health) of the people it is necessary that they drink clean water every day, especially using such water for making food and drinks. On the other hand, salvation of this problem needs considerable expenses which, as a rule, lie on the shoulders of the households. In such a way, the consumers stand before the problem of choice of the affordable and high quality drinking water. And the companies which provide people with drinking water have another problem: how the influence the choice of the consumers.

### Analysis of the latest researches and publications.

There are numerous works devoted to the provision of the population by high quality drinking water of scientific (theoretical and practical) as well as publicistic character written by the following authors: O. F. Balatskiy, A. K. Gorval, I. L. Golovinskiy, V. A. Golian, V. I. Danilov-Danilian, S. I. Doroguntsov, G. I. Korchak, L. G. Melnyk, M. A. Khvesyuk, A. V. Yatskiy and others. Studying the works of scientists and practitioners allows to make a conclusion that the problem of providing people with high quality drinking water is diverse, important and actual and requires constant monitoring and research of the bottled water market.

On one side the companies delivering bottled water perform social function – provide the population with drinking water, on the other – their activity is aimed at obtaining profit. At the moment there are many players on bottled water market among which are big (national) and small (city level) companies. There are two important problems which require constant salvation: consumer's choice of the company delivering bottled water and influence of such companies on that choice. Relevance and practical meaning of these problems have determined the aim of this investigation.

**The aim of the investigation** lies in the analysis of the accessible ways of providing people with drinking water, research of the bottled water market, grounding of the ne-

cessity of applying of the reflexive management in relations between the company delivering bottled water and the consumer, development of the corresponding economical-mathematical models.

**Main results of the investigation.** Major part of the population in the world and Ukraine consumes water due to central water supply. But even the clearest water that flows through the system of tens or hundreds of kilometers of tubes can lose its quality and even become harmful for the health. The reason is first of all – worn-out state of the tubes and the ability of water to solve practically everything. That is why such water should be additionally filtered before the consumption. For this purpose various filters can be used: filter cups, reverse osmosis systems, peripheral, flow through filters etc. The cost of such filters also differs and depends on many factors, in particular – on the capacity of the cartridge (how many liters of water the filter is capable to clean). Besides, the pollution of the filter should necessarily be observed. But even such cleared water needs to be boiled before consumption. Moreover, even scientists and specialists still do not have the unambiguous attitude towards various filters and their usage. For example, in [1] it is noted that "no water filters can clear water".

Bottled water can be a good alternative. Let us recall how a couple of years ago it was considered to be prestigious to have a cooler in the office with a bottle of water for own and clients' use, and today this attribute of "respectable life" has become a usual thing not only in the office, but even in private apartments as well. Bottled water is a safe and conveniently packed in hygienic container food product which corresponds the state standards and hygienic norms applied to drinking water which is sold and for the purpose of purchase by the people [2, 3]. Today there are the following types of bottled water [2, 4]: artesianwater or artesianwellwater; mineral water; purified water; ground water; spring water; sparkling water; sterilized water; well water.

Wide spread of bottled water is conditioned, in particular, by the fact that even after filters it still remains the pipe water, so its quality is under question. On the contrary, bottled water, as a rule, is produced in ecologically clean regions, does not require boiling, so its quality is higher. Still, nothing is unambiguous here too. In [1] it is stated that preservatives re added in such water which is not noted on the etiquettes. Besides, the use of plastic packing reduces the quality of water in a month after it was packed. In the process of such packing production bisphenol A is used which is very dangerous for the health even in small amounts [5] and gets into water as a result of heating plastic bottle with water. There are also other points of view as for the effect of bisphenol A on peoples' health [6]. It is also clear that plastic packing causes the pollution of environment as well [5].

As we can see, it is hard to say which water is the best and safest for human health. Each person decides what water to consume choosing some rational, from his/her point of view, balance of quality and price. Obviously, the cheapest is water from central water supply system (the cost of 1 liter is less than 1 copeck for Kyiv), the most expensive – bottled water (the cost of 1 liter of such water delivered by the companies may even reach 3 UAH in Kyiv). Despite this, each year we observe the increase of bottled water consumption in Ukraine [7]. The growth of bottled water demand is also conditioned by the growth of the number of enterprises producing, delivering and selling water of this type. For instance, there are more than 50 of such enterprises in Kyiv now which differ by the production volume, type and quality of water, terms of delivery, additional products and services etc.

It is the peculiarity of the bottled water market that enterprises actually offer the same product – water, and have

no opportunity to change its characteristics or widen the assortment. On the contrary, the producers of bread (with the aim of satisfying the needs and wishes of the consumers) make bakery products of wide choice – from usual baton to various rolls with filling, the producers of dairy products offer milk of different fatness, yoghurts with various fruits and berries fillings etc. Thus, these producers aiming at increasing their income and competitive ability on the market can offer various products, change the assortment satisfying the needs and wishes of the consumer. We cannot say the same about the companies producing, delivering and selling drinking water. Although some companies offer water with various characteristics (softened water, silvered, iodinated etc.), the only means for them to compete for the consumer are low price and fast delivery. Still, even here there are some problems: the consumers associate low price with low quality of water, so it is hard to convince especially the new clients that water quality is good. One can of course deliver water right after the client's call, but this will hardly be economically justified. That is why such companies have to search for other means of influencing the consumers' choice.

Several factors influence the consumer's choice, among which are: quality and cost of water, terms of delivery and payment, quality and fastness of delivery, additional services and products.

Quality of drinking water is determined by its physical and characteristics (chlorides, mineralization, ferrum, trihalomethanes, residual chlorine, hardness, alkalinity) and microbiology (E.coli, antibiotics or preservatives) [8]. Some producers and companies delivering water also provide information as for physical and chemical characteristics on the packing, although antibiotics are never noted despite the fact that they may be in water. In this case the consumer should either fully trust the information on the packing or bring the sample of water to special laboratory for testing, or simply taste the water and follow the feelings and impressions after its consumption. For example, the formation of scale indicates that there is much calcium and magnesium salt and the more salt – the harder is water. Many people consider such water less "tasty". There are also presumptions, not confirmed enough by the doctors, that elements of scale may cause the formation of stones in kidneys.

The cost of water is available information for each consumer – it is indicated on the company's site or one can inquire it by the phone. None of the companies splits the price of a bottle and the price of delivery. The consumer only gets to know the cost of the bottle of water, but delivery is usually made under the condition that a consumer orders not less than two bottles. Besides, all the other additional goods or services become available for the consumer only in case of the order of the bottles of water. For example, the company "IDS Aqua Service" offers the consumers water of well-known brands in usual glass and plastic bottles (0.33 l, 0.5 l, 0.75 l, 1.5 l or 6 l), but one can order it only under the condition of ordering the bottles of water (18.9 l).

At the moment the consumers usually make phone calls to make the order. The client orders the necessary products while talking to the company's operator who issues the order, specifies its cost and appoints the time of delivery. While the order of the bottles of water does not bring about any questions (as their assortment is not wide, stable) the order of additional products can cause some problems. For example, the company "IDS Aqua Service" offers only two types of bottled water – "Alaska" and "Old Myrhorod" – and the consumer should only decide how many bottles and of which water he has to order. And the assortment of additional products is much wider (various kinds of water and types of the bottles, different volume

and choice of tea or coffee) which makes it more problematic for the consumer to make a decision. In an ordinary store the consumer sees what he buys, and in case of ordering the products by the phone he has no such opportunity. Still, if the consumer has access to the Internet, he can check these products on the company's site and get an idea about them. Today many companies have started to use their sites not only as sources of information, but as Internet shops as well, where the consumers can make orders. At the moment the majority of companies receive payment for water in course of its delivery, but there are a number of companies, for example, "Etalon", which allow making payments on their sites using bank cards.

Delivery is the main service the companies provide, and the future orders of the consumers depend on its quality and speed. The consumers on their side state the following requirements: delivery should be made at the appointed time (as a rule it is a certain period of time); bottles and additional products should be packed in a proper way; in case if the car is late the driver should let the consumer know about it and check the consumer's opportunity to wait for delivery. The problem of traffic jams in Kyiv sometimes makes it impossible to make a delivery on time. If delivery is late one or two times, it usually does not have any effect on the future orders of the consumer. But if delivery is late all the time, the consumer most likely will stop cooperating with such company. Thus, the companies should take into account the daily traffic on the roads while generating the routes in order to keep to the schedule of water delivery.

Additional products and services can be a competitive advantage as the consumer can order the necessary products without leaving home.

Actual is also the problem of bottles water fakes, especially of well-known brands. That is why almost all the big companies are looking for various ways of fake security. In particular, the company "IDS Aqua Service" uses 5 levels of security [9]: brand-named anti-dust cap, which prevents the dust from getting into the bottle, thermo cap with the name of the company; high-quality polycarbonate bottles; laser deposition of the production date; one-use two-piece plug.

In order to increase the competitive advantages and supersede the unscrupulous producers from the market two organizations were formed – the Association "Bottled Waters of Ukraine" and the Association of the producers of mineral and drinking waters of Ukraine which is a member of European Bottled Water Association – EBWA (or its new name "Watercoolers Europe"). To be a certified member of Watercoolers Europe, the company should meet the high standards of sanitary norms which is available only for big companies with modern equipment. Thus, one of the criteria of choice of the company delivering water can be its certified membership in Watercoolers Europe which guarantees high quality of water. Still, high quality drinking water cannot be cheap, therefore, the producers and suppliers of such water should apply maximum effort to fight for the consumers, they should influence the consumers' choice – in particular, with the help of reflexive management instruments.

Within the framework of reflexive management the influence on the consumer's (the person who makes a decision) psyche is made by intentionally providing him with information that would make him take a decision the company (the managing side in reflexive management) needs. In order to make the consumer take the necessary decision, one should create in him the non-adequately inflated self-esteem at the moment of taking this decision [10]. The art of reflexive management lies in the fact that it should be applied in such a way that the side under influence does not feel it and the decision is foreseen.

In each process of decision making forms the corresponding model of self-actualization which includes [12]:

- destination model (hierarchical total of targets of the process of decision making, the rules of forming the attitude of domination on the multiplicity of targets and on multiplicity of the criteria of estimating the alternatives);
- model of the current state of decision making (the total of alternatives, the multiplicity of criteria, the meaning of criteria for the alternatives on multiplicity of criteria (the attitude of domination, the attitude of priority), the rules of choice);
- model of restrictions (model of relations between the targets of the process of decision making and the targets of other processes in decision making as well as the model of the current state of other processes of decision making).

However, it is hard for a common consumer to build such models. They usually simplify the problem of making choice by the way of comparison of small number of alternatives by definite requirements choosing at this the first alternative which meets all requirements. With this they confirm the statements of the concept of the bounded rationality by Herbert Simon [13, 14].

Besides, the multiplicity of the criteria of the consumer's choice of the company delivering bottled water can also vary. One consumer may use the above mentioned criteria, and the other – the following: the image of the company, other consumers' reviews of the company, the cost of one bottle of water. The first two criteria actually form the notion of the "quality of water" of some company in the consumer's consciousness. The consumer estimates the correlation between the quality of water and the cost of one bottle of water. In this case we can talk about the psychologically comfortable price [15, 16]. In our case, it is the price for one bottle of water which the consumer is ready to pay for high quality water basing on his own experience and the experience of other consumers. If the real price appears to be lower than psychologically comfortable price the consumer may form the opinion that water is low quality and can reject the order (purchase) of such water. In case the real price is higher than psychologically comfortable price the consumer may also reject the order (purchase) of such water.

Thus, one of the tasks of the companies producing and delivering bottled water is setting such price for one bottle of water which would be as close to psychologically comfortable price of the consumer as possible. The price of the sale is set only by the company and the consumer cannot directly influence it. Although in the market scale the influence of the consumers is considerable – if there are no sales, the necessity occurs to lower the price which can lead to various consequences: either for increase of the income due to the increase of sales, or substantial losses if the consumers do not buy such water even for lower price. Still, the company producing and delivering bottled water can influence the forming of psychologically comfortable price by the consumer by means of advertising campaigns showing the dependence of health on quality of water; sponsorship of various sports activities; educational activity as for the quality of life, clean environment etc. In the consumer's consciousness the understanding should form that only high quality water can be the reason for good health, and this water is worth practically any price as health is a priceless gift. In such case we can talk about reflexive management.

Even when the real price fully coincides with the psychologically comfortable price or is close to it there are no guarantees that the consumer will make the necessary for the company producing and delivering bottled water choice in favor of this company. Although, in this case there is a possibility to at least estimate the consumer's readiness to take such decision, in particular, using the model of V. Lefevre. The model he proposes describes the readi-

ness of the person with reflection to make some action (in our case – to choose the company delivering water) [17]:

$$A1 = (a3 \rightarrow a2) \rightarrow a1, \quad (1)$$

where  $A1$  – Boolean function which describes the readiness of the consumer to make the choice (truth, i.e. 1 – the consumer is ready to make the choice, lie, i.e. 0 – the consumer is not ready to make the choice);  $a1$  – the assessment of pressure of the outside world on the consumer (the person taking a decision);  $a2$  – the assessment of the consumer's mental set;  $a3$  – the assessment of intentions (strivings and wishes) of the consumer. In the given formula  $a3 \rightarrow a2$  – self-esteem of the consumer which consists of his mental set and intention in the situation of decision taking.

The assessment  $a1$  represents the subconscious perception by the consumer of the outside world. Making his choice the consumer sometimes does not understand why he took this or that action. Such behavior of the consumer can be reached by means of competent advertising. If  $a1=1$  it means that the environment (the company producing and delivering water) has an absolute influence on the consumer in the process of his making a necessary decision. If  $a1=0$  it means that there is no such influence.

The assessment  $a2$  reflects the obtained by the consumer his own knowledge and expectations on the basis of the received experience from using bottled water of the definite company. This assessment reflects psychological state of the consumer at the moment of his making choice. If there is no own experience other consumers' experience can be used which they share on various forums, in social networks etc. Analyzing these reviews the consumer is trying to reflect in his consciousness their perceptions and feelings in order to make a reasonable choice. In this case we can talk about mutual reflection. If  $a2=1$  it means that the consumer obtained absolutely positive experience from using bottled water of the definite company. If  $a2=0$  it means that consumer obtained absolutely negative experience.

The assessment  $a3$  corresponds to expectation and needs of the consumer he wants to satisfy. In our case the consumer is trying to satisfy his natural need of high quality drinking water. He imagines what high quality water should be, i.e. definite expectations are formed. If  $a3=1$ , the consumer thinks his needs will be satisfied. If  $a3=0$ , the consumer thinks his needs will not be satisfied at all.

In our opinion, as an assessment  $a3$  the module of the difference between the psychologically comfortable price and real price for the bottle of water can be used. We will consider that the less difference by the module is the more the consumer's expectations are satisfied. For transition to Boolean values we propose to set boundary value for difference by the module. If definite value of the module of the difference between psychologically comfortable price and real price appears within the set boundaries, then we can consider that assessment  $a3$  takes value 1, other – 0.

Despite the existence of the even more considerable outer influence the consumer takes his own decisions if there is full freedom of choice among the alternatives. Such choice is called realistic and is defined as all the solutions of the following equation [11]:

$$A1 = (a3 \rightarrow a2) \rightarrow a1 = a3. \quad (2)$$

All of the noted assessments ( $a1$ ,  $a2$ ,  $a3$ ,  $A1$ ) are Boolean, i.e. take values 0 or 1. Sometimes it is quite hard to make a clear assessment. In this case it is proposed to use the instruments of the fuzzy sets theory and possibility theory. Having changed in (1) common to fuzzy implication, we will receive the following model:

$$\tilde{A}1 = (\tilde{a}3 \rightarrow \tilde{a}2) \rightarrow \tilde{a}1, \quad (3)$$

where  $\tilde{A}1$  – fuzzy set which is formed by the linguistic variable which corresponds the resulting assessment of the consumer's readiness for making the choice,  $\tilde{a}1$  – fuzzy set which is formed by the linguistic variable which corresponds the assessment of the outside world pressure,  $\tilde{a}2$  – fuzzy set which is formed by the linguistic variable which corresponds the assessment of the mental set of the consumer,  $\tilde{a}3$  – fuzzy set which is formed by the linguistic variable which corresponds the assessment of the consumer's intentions.

For fuzzy implication there are various ways of calculation of the resulting value of the membership function which were proposed by such scientists as L. Zadeh, K. Godel, E. Mamdani, J. Goggin, N. Vadi, L. Brauer and others [18]. Using the classical fuzzy implication of L. Zadeh, for (3) the following will be true:

$$\mu_{(\tilde{a}3 \rightarrow \tilde{a}2) \rightarrow \tilde{a}1}(x, y, z) = \max\{\min\{\mu_{\tilde{a}3 \rightarrow \tilde{a}2}(x, y), \mu_{\tilde{a}1}(z)\}, 1 - \mu_{\tilde{a}3 \rightarrow \tilde{a}2}(x, y)\}, \quad (4)$$

where  $\mu_{\tilde{a}3 \rightarrow \tilde{a}2}(x, y) = \max\{\min\{\mu_{\tilde{a}3}(x), \mu_{\tilde{a}2}(y)\}, 1 - \mu_{\tilde{a}3}(x)\}$ ;  $\mu_{\tilde{a}1}(z)$ ,  $\mu_{\tilde{a}2}(y)$ ,  $\mu_{\tilde{a}3}(x)$  – membership functions correspondingly to  $\tilde{a}1$ ,  $\tilde{a}2$ ,  $\tilde{a}3$ ;  $x, y, z$  – description of the probable situation for the corresponding assessment (term).

Let's assume that each of the fuzzy sets ( $\tilde{a}1$ ,  $\tilde{a}2$ ,  $\tilde{a}3$ ,  $\tilde{A}1$ ) reflects the corresponding the most desirable result for the company delivering water. Then  $\mu_{\tilde{a}1}(z) = 1$  will mean the absolute influence of the environment on the consumer in his taking the necessary decision, and  $\mu_{\tilde{a}1}(z) = 0$  will mean the full absence of such influence. We will consider that the consumer obtained absolutely positive experience of using bottled water of the definite company if  $\mu_{\tilde{a}2}(y) = 1$ , and absolutely negative if  $\mu_{\tilde{a}2}(y) = 0$ . Analogically when  $\mu_{\tilde{a}3}(x) = 1$  the consumer presupposes that all of his needs will be satisfied, otherwise  $\mu_{\tilde{a}3}(x) = 0$ . Found by the formula (3) value of the membership function for the resulting assessment  $\tilde{A}1$  can be interpreted like

this: if  $\mu_{(\tilde{a}3 \rightarrow \tilde{a}2) \rightarrow \tilde{a}1}(x, y, z) = 1$  then the consumer is absolutely ready to make the necessary decision, if  $\mu_{(\tilde{a}3 \rightarrow \tilde{a}2) \rightarrow \tilde{a}1}(x, y, z) = 0$  then the consumer is not ready to make such decision. The value of the membership function which lies within the boundaries from 0 to 1 will show the level of intensity of the corresponding assessment.

One of the problems of modeling in our case is the necessity of assessment of the behavior (psychoemotional state) of the person under various conditions. It is quite hard to provide such assessment with not just verbal but with exact numeric equivalent. In this case we propose to use Harrington scale which is a verbal-numerical scale containing comprehensive (verbal) description of the gradations and corresponding to these gradations numerical values: very high level (0,8–1,0); high level (0,64–0,8); medium level (0,37–0,64); low (0,2–0,37); very low (0,0–0,2).

Harrington scale is widely used as an instrument of artificial intellect, in particular, in intellectual systems of decision making. It refers to psychophysical scales and allows taking into account psychological peculiarities of the human. Thus, having described a definite assessment with

the words, we can define its level and pass to its numerical equivalent. But the given scale allows passing not only to the one number, but to the range of numbers. In this case we can take either average value of the range, or depending on the person's attitude to the problem – minimal or maximal value of the range. If the person has inclination to risks his/her assessments will be overestimated and correspondingly maximal value of the range can be taken. And, vice versa, if we consider that a person is conservative in taking decisions, is not inclined to risks, we can take the minimal value of the range.

For example, for the assessment  $\tilde{a}_3$  such possible gradations are formulated:

1) very low level – bottled water of the company absolutely cannot satisfy the needs of the consumer in high quality water. Then  $\mu_{\tilde{a}_3}(x) \in (0,0; 0,2]$  and for calculations can be taken  $\mu_{\tilde{a}_3}(x) \approx 0$ , or  $\mu_{\tilde{a}_3}(x) = 0,1$ , or  $\mu_{\tilde{a}_3}(x) = 0,2$ ;

2) low level – bottled water of the company can satisfy only some needs and requirements of the consumer. Then  $\mu_{\tilde{a}_3}(x) \in (0,2; 0,37]$  and for calculations can be taken  $\mu_{\tilde{a}_3}(x) \approx 0,2$ , or  $\mu_{\tilde{a}_3}(x) = 0,285$ , or  $\mu_{\tilde{a}_3}(x) = 0,37$ ;

3) medium level – bottled water of the company satisfies half of the needs and wishes of the consumer (for example, the quality of water by physical and chemical properties is satisfying for the consumer, but packing and term of delivery doesn't). Тут  $\mu_{\tilde{a}_3}(x) \in (0,37; 0,64]$ , and for calculations can be taken  $\mu_{\tilde{a}_3}(x) \approx 0,37$ , or  $\mu_{\tilde{a}_3}(x) = 0,505$ , or  $\mu_{\tilde{a}_3}(x) = 0,64$ ;

4) high level – bottled water of the company can satisfy the majority of the needs and wishes of the consumer. Then  $\mu_{\tilde{a}_3}(x) \in (0,64; 0,8]$  and for calculations can be taken  $\mu_{\tilde{a}_3}(x) \approx 0,64$ , or  $\mu_{\tilde{a}_3}(x) = 0,72$ , or  $\mu_{\tilde{a}_3}(x) = 0,8$ ;

5) very high level – bottled water of the company satisfies absolutely all the needs and wishes of the consumer. In this case  $\mu_{\tilde{a}_3}(x) \in (0,8; 1)$ , and for calculations can be taken  $\mu_{\tilde{a}_3}(x) \approx 0,8$ , or  $\mu_{\tilde{a}_3}(x) = 0,9$ , or  $\mu_{\tilde{a}_3}(x) \approx 1$ .

Analogical gradations can be formulated for other assessments either, including the resulting one.

In case of using the module of the difference between psychologically comfortable price and real price for one bottle of water as an assessment  $\tilde{a}_3$ , it is necessary to normalize the module of this difference (for example, divide by psychologically comfortable price) so that the received value lies within the range from 0 to 1. Note: if real price exceeds the psychologically comfortable price by 2 times it is necessary to select the other means of normalization. The closer to 0 is this value – the better, that is why for transition to membership function value it is necessary to minus it from 1.

For example, psychologically comfortable price is defined by the consumer on the level of 42 UAH for one bottle of water, and real price for one bottle of water constitutes 44 UAH at one company and 26 UAH at the other. In the first case the module of the difference equals to 2, in the other – 16. After normalization we received 0.048 for the first case and 0.38 for the second. Then the value of the membership function will equal correspondingly  $\mu_{\tilde{a}_3}(x) = 1 - 0,048 = 0,952$  (very high level by the Harrington scale) and  $\mu_{\tilde{a}_3}(x) = 1 - 0,38 = 0,62$  (medium level by the Harrington scale).

It is also possible to estimate the readiness of the consumer to make a choice by the model (3) in the following way. We formulate five quality terms which will reflect the possible assessments levels (including the resulting one): very low assessment, low assessment, medium assessment, high assessment, very high assessment. We can use a trapezium-shaped membership function as a membership function of the fuzzy terms [19]:

$$\mu(x) = \begin{cases} 0, & x \leq a \text{ or } x \geq d, \\ \frac{x-a}{b-a}, & a < x \leq b, \\ 1, & b < x \leq c, \\ \frac{d-x}{d-c}, & c < x < d, \end{cases} \quad (5)$$

where  $a, b, c, d$  – coordinates of the X-axis, which correspond to the apexes of the trapezium (see pic. 1).

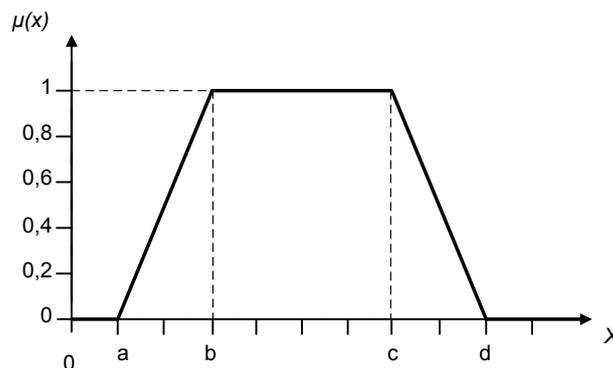


Fig. 1. Model of the trapezium-shaped membership function [19]

For the graphs of membership functions of the fuzzy terms "very low assessment" (VLA), "low assessment" (LA), "medium assessment" (MA), "high assessment" (HA), "very high assessment" (VHA) the coordinates on the X-axis  $a, b, c, d$  are defined for each of the assessments of the model (3) individually and depend on the actual choice situation.

Further we build the expert fuzzy knowledge base which consists of linguistic rules like "If-then", in particular,

by the way described in [19] with experts involvement. Every rule like this reflects the result at the possible combination of assessments  $\tilde{a}_1, \tilde{a}_2, \tilde{a}_3$ . There will be 125 rules. With the help of the membership functions and weighing coefficients we represent the analytical form of the record of the decision rule of defining the possible various assessments  $\tilde{A}_1$ : very low, low, medium, high, very

high. Such final solution is selected for which the value of the membership function  $\tilde{A}_1$  is maximal.

Besides, in the reflexive management of the processes of making decisions by the consumer as for choosing the company delivering water various instruments of modeling can be used, in particular [11]: methods of statistical analysis; methods of economical dynamics; imitation dynamics etc. The usage of economical-mathematical methods and models allows strengthening of the groundings of decisions of the company delivering water as for changing the terms of delivery, packing, the price of water which should facilitate the increase of the company income. The development and implementation of the models of reflexive management, in our opinion, allow to reach this target the best way and for this reason they should become basic in managing the relations between the company delivering water and its consumers.

**Conclusions.** The article regards the actual problem of provision of the population with high quality drinking water. At the moment various types of bottled water are available for the consumers, and this is why the problem occurs of its choice according to different criteria. The consumer makes such choice following, in particular, his financial abilities. Natural is the wish to spare money, but in the case with water this may mean using water of the worse quality which may affect health. On the other hand, "expensive" water does not automatically mean high quality water.

Various organizations of the consumers and organizations protecting the rights of the consumers, mass media conduct the researches of the quality of goods including water on the basis of which the consumer may take a considerate decision. Such researches are quite expensive and cannot be conducted all the time, although they are extremely needed. The situation on the market of water supply, in particular in Kyiv, changes each year: new companies offering cheap water appear, and common consumers need to know whether this water is high quality or not. Besides, such companies stipulate the growth of competition on the market, and its constant players should take some measures.

The article proposes the companies delivering water to use the elements of reflexive management of the process of decision making by the consumer as for choosing the company delivering water. In our opinion, this will allow to increase the compatibility of the companies and their income.

The received results can be the basis for further various theoretical and applied researches of the problem of the consumer's choice of high quality drinking water. It is nec-

essary to develop and improve the existing economical-mathematical methods and models of the reflexive management and develop the new ones, in particular, using the elements of fuzzy sets and fuzzy logic, genetic algorithms, artificial neural networks etc.

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Надійшла до редколегії 05.05.14

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### МОДЕЛЮВАННЯ В ПРОЦЕСАХ ВИБОРУ СПОЖИВАЧАМИ КОМПАНІЇ З ДОСТАВКИ БУТИЛЬОВАНОЇ ВОДИ НА ПІДГРУНТІ РЕФЛЕКСИВНОГО УПРАВЛІННЯ

*Людина може отримати якісну питну воду кількома способами, одним з яких є доставка питної бутильованої води спеціалізованими компаніями. Існування великої кількості гравців на ринку питної води зумовлює виникнення низки проблем, зокрема, вибір споживачем компанії з доставки води та боротьба таких компаній за споживача. У роботі запропоновано для впливу на рішення споживача використовувати рефлексивний підхід.*

*Ключові слова: питна вода, рефлексивне управління, прийняття рішення.*

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### МОДЕЛИРОВАНИЕ В ПРОЦЕССАХ ВЫБОРА ПОТРЕБИТЕЛЯМИ КОМПАНИИ ПО ДОСТАВКЕ БУТЫЛИРОВАНОЙ ВОДЫ НА ОСНОВЕ РЕФЛЕКСИВНОГО УПРАВЛЕНИЯ

*Человек может получить качественную питьевую воду несколькими способами, одним из которых является доставка питьевой бутылированной воды специализированными компаниями. Существование большого количества игроков на рынке питьевой воды приводит к возникновению ряда проблем, в частности, выбор потребителем компании по доставке воды и борьба таких компаний за потребителя. В работе предложено для влияния на решение потребителя использовать рефлексивных подход.*

*Ключевые слова: питьевая вода, рефлексивное управление, принятие решения.*

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 48-52  
UDC 330.43, 33  
JEL: C22, C5, E32, O47

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## STUDYING BUSINESS CYCLES SYNCHRONIZATION

*The paper researches business cycles synchronization. The fluctuations in post-Soviet countries are considered. The study examines different measures of synchronization in groups of countries according to some criteria.*

**Keywords:** business cycle; synchronization; measures of synchronization; credit rating.

**Introduction.** Financial crisis in 2007-09 caused the deep and synchronized global recession in the world, which was accompanied by the significant reduction of the international trade. It is widely believed that the unprecedented synchronization of the downturn across countries is related to the economic globalization witnessed over the decades leading up to the crisis. Globalization has tied the countries more closely together in various ways [5, p.5].

The great part of world literature devoted to researches of economic cycles in different countries indicates the high correlation between developed countries. But despite on many studies on this field the causes of appearance of synchronization are unexplored [6, p.3].

The problem of business cycles synchronization is considered by foreign researches in cases of developed countries, especially for members of European Union and Great 8.

Existing theoretical models studying business cycle synchronization are mostly based on the standard international real business cycle model. In a two-country open economy model with complete financial markets, Backus et al. show that, in a world of fully integrated asset markets, high trade intensity is associated with lower business cycle correlations. Extending this model to account for vertical specialization, Kose and Yi (2001) suggest that higher trade integration might lead to more or less synchronization, depending on the nature of trade and the type of shocks hitting the economies [5, p.9 – 10].

Economists of IMF pay a special attention to mentioned problem. T.Gebling and T.Bayomi compared the turning points of business cycles in G7 countries during the 1973-2000 and revealed the synchronization not only of moments of peaks and bottoms but also coincidence of the duration of recession. The recession at the beginning of 1980<sup>th</sup> were synchronized too [3, c.134].

Heatcote and Perri measured synchronization of GDP, investment, consumption and employment cycles. The measurement is a correlation between time series of USA and non-USA during 1969 – 1981 and 1981 – 2002. Time series were detrended using Hodrick-Prescott filter, first differences and high-pass filters. Results showed the low degree of synchronization between cycles of USA and other countries.

Kose, Prasad and Terrones were the first to examine the correlations of output and consumption growth rates in each country with the growth rate of the composite measure of world output. They estimated dynamic unobserved factor models to decompose fluctuations in the macroeconomic aggregates into a factor common across all countries and a country-specific factor. Finally, they present a more formal regression analysis of factors that influence correlations of individual country.

Doyle and Faust researched changes in movements of growth rates in G7 (basically without Japan). They used not only describing methods but vector autoregression with lag and constant. Also they checked how chosen parameters, for example, correlation coefficients change in time. But there were no direct evidences that correlation increases with increasing integration during last years and decades.

Inklaar and Haan attempted to repeat researches of Artis and Zhang who stated that after installment of the European Monetary System the business cycle synchronisation of most member countries shifted from the United States to Germany.

Inklaar and Haan compared correlation of business cycles  $1 + \frac{(x_t - trend_t)^2}{trend_t}$ , with business cycle in Germany during 4

subperiods of 1960 – 1998. Unlike Artis and Zhang they did not reveal systematic relation between stability of currency exchange and business cycles synchronization.

Traistaru used filtered GDP data and compared the degree of business cycle synchronization between members of European Monetary Union and countries of Central Europe during 1990 – 2003. It was revealed the correlation between groups of countries is lower than correlation inside EMU. The analysis of regression models with dummies shows the similarity of economic structures and bilateral trade intensity positively and significantly related with correlation of business cycle.

Kamacho, Peres-Kiros and Saiz based their research on monthly industrial production time series of current members of European Union, partner countries and some economic development countries. They used a set of researches about comovements of business cycles in these countries. Firstly using the VAR-model the production indices and forecast are calculated. Then appropriate errors are estimated and synchronization of business cycles in two countries is measured as difference (1 – correlation) of their forecast errors. Then authors analyzed short-term and long-term properties of industrial time series filtered with Hodrick-Prescott filter and calculated dynamic correlation suggested but Reichlin. Finally separate binary cycles were constructed, where 1 is a recession and 0 – other case. The correlation is used as measurement of synchronization between business cycles of two countries. Analysis showed the economies of European Union are more synchronized with each other than with outside. Nevertheless close relations can be explained by establishment of Union, not by political values. That's why the deeper integration doesn't cause further increasing of synchronization.

Shirwitz and Walde attempted to explore the changes of synchronization between countries during the time. They chose 17 countries (14 of EU and G7) and detrended their time series using 4 filters: Hodrick-Prescott filter, Christiano-Fitzgerald filter, modification of Baxter-King filter and difference filter. Also the coefficients of correlation and standard errors were calculated. The number of significant coefficients is not constant during the time, generally it reduced at the beginning, but at the end it increased again [4, c.1-3].

Gerlah found out the correlation in output fluctuations between countries with both currency regime fixed and floating. Bekus and Kahoe researched data of 10 industrial development countries and revealed the high degree of similarity between fluctuations in different countries. Canova and Marrinan emphasized on the relation of high correlation between economic cycles and different causes of shocks and transmission mechanisms. All these researches proved the high level of interdependent of industrial development countries.

Credit rating is an independent subjective quality estimation used by investors to define the degree of credibility of creditors and to take a decision about investments. The credit rating has an inverse relationship with the possibility of debt default. In the opinion of the rating agency, a high

credit rating indicates that the borrower has a low probability of defaulting on the debt; conversely, a low credit rating suggests a high probability of default. Sovereign credit ratings give investors insight into the level of risk associated with investing in a particular country and also include political risks. At the request of the country, a credit rating agency will evaluate the country's economic and political environment to determine a representative credit rating. Obtaining a good sovereign credit rating is usually essential for developing countries in order to access funding in international bond markets.

The biggest world credit rating agencies are:

- "Standard and Poor's Corporation" ("S&P") i "Moody's Investors Service, Inc." ("Moody's");
- Fitch Ratings Ltd. ("FITCH");
- Rating&Investment Information Inc. (Japan).

Sovereign rating criteria address the factors that affect a sovereign government's willingness and ability to service its debt on time and in full. An analysis focuses on a sovereign's performance over past economic and political cycles, as well as on factors that suggest to us greater or lesser fiscal and monetary flexibility over the course of future economic cycles.

The five factors that form the foundation of our sovereign credit analysis are:

- Institutional effectiveness and political risks, reflected in the political score.
- Economic structure and growth prospects, reflected in the economic score.
- External liquidity and international investment position, reflected in the external score.
- Fiscal performance and flexibility, as well as debt burden, reflected in the fiscal score.
- Monetary flexibility, reflected in the monetary score [2].

**Problem.** Increasing globalization causes the increased interest to business cycles synchronization. Un-

derstanding of degree of business cycles synchronization is the key to understanding such phenomena as coordination of international policy and shock transmission in different countries. Our study suggests dividing countries into groups according to their credit rating. The fluctuations in post-Soviet countries are considered.

The 18 countries such as USA, Canada, Germany, UK, France, China, Poland, Czech Republic, Slovakia, Russia, Italy, Turkey, Slovenia, Hungary, Croatia, Ukraine, Belarus and Moldova are chosen for research. We divided chosen countries into groups according to some criteria.

1) According to credit rating:

- Group 1 – USA, Germany, Canada;
- Group 2 – Great Britain, France, and China;
- Group 3 – Poland, Czech Republic, and Slovakia;
- Group 4 – Russia, Italy, and Turkey;
- Group 5 – Slovenia, Hungary, and Croatia;
- Group 6 – Ukraine, Belarus, Moldova.

2) According to economic development:

- Group 1 – USA, Germany, Canada, Great Britain, France, China, Italy;
- Group 2 – Poland, Czech Republic, and Slovakia, Russia, Turkey, Slovenia, Hungary, Croatia, Ukraine, Belarus, Moldova.

3) According to geographical location:

- Group 1 – USA, Germany;
- Group 2 – Great Britain, France, Germany;
- Group 3 – Slovenia, Italy, and Croatia;
- Group 4 – Hungary, Czech Republic, and Slovakia;
- Group 5 – Ukraine, Poland, Belarus, Moldova;
- Group 6 – Russia, China, and Turkey;

**Results.** First we determine for each country GDP trend applying a Hodrick-Prescott filter to the log of each country GDP, and then compute its own cycles:  $h_{it} = y_{it} - trend_{it}$ , where  $h_{it}$  – cycle,  $y_{it}$  – export,  $trend_{it}$  – trend.

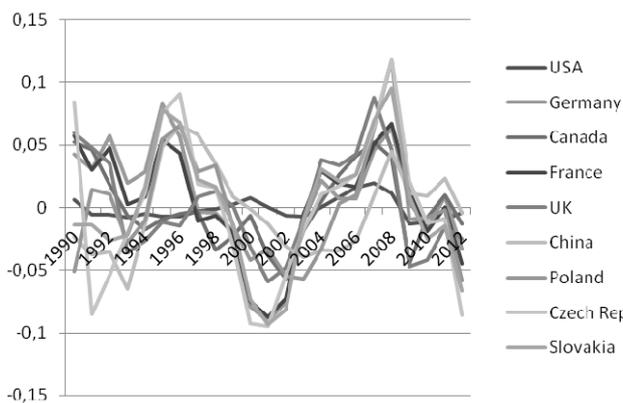


Fig. 1. GDP cycles

To make it convenient to demonstrate we divided our cycles on 2 graphs. Nevertheless we can see the general recession at the beginning of 1990<sup>th</sup> and in 1999 – 2003. The similar behavior of cycles let us to assume about the existence of synchronization between different business cycles.

There are two classes of synchronization measures. The first class is based on regression models. The second class is built directly from the series. We tested the measures of the second class. All indices are calculated for each pair of countries (153 pairs). The first of them was proposed by Giannone and Reichlin and Kalemli-Ozcan et al.:

$$SYNCH_{ijt} = - \left| \left( \ln Y_t^i - \ln Y_{t-1}^i \right) - \left( \ln Y_t^j - \ln Y_{t-1}^j \right) \right|$$

This coefficient a direct measure of the difference in growth rates therefore the different variability across series

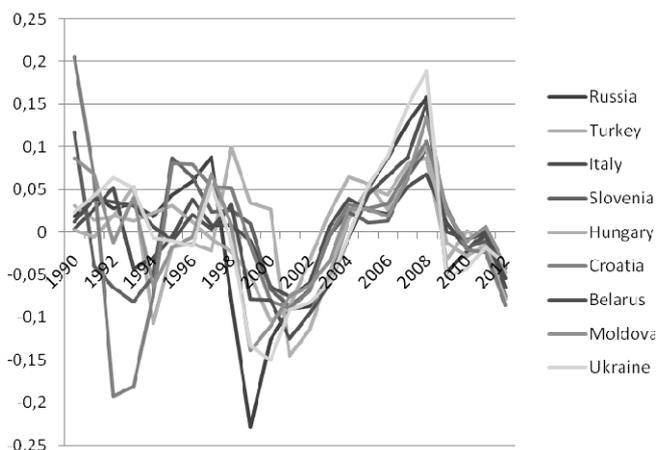


Fig. 2. GDP cycles

will have a direct impact on the period-by-period synchronization index. [1, p.5-8].

This index is non-positive, being that the closer to zero the higher is the measured synchronization between the series. Furthermore it does not over a metrics to know if the cross-correlation is positive or negative and so the analysis of the evolution over time is just done in relative terms.

The next index is the one used in Cerqueira and Martins:

$$SYNCHA_{ijt} = 1 - \frac{1}{2} \left( \frac{(y_{i,t} - \bar{y}_{i,t})}{\sqrt{\frac{1}{T} \sum_{t=1}^T (y_{i,t} - \bar{y}_{i,t})^2}} - \frac{(y_{j,t} - \bar{y}_{j,t})}{\sqrt{\frac{1}{T} \sum_{t=1}^T (y_{j,t} - \bar{y}_{j,t})^2}} \right)$$

where  $y_{i,t}$  represents the output gap or growth rate at time  $t$  for country  $i$  and its variations purposed by Cerqueira:

$$SYNCHb_{ijt} = \frac{1}{2} \ln \left( \frac{1 + \frac{SYNCHA_{ijt}}{2T - 3}}{1 - SYNCHA_{ijt}} \right)$$

$$SYNCHc_{ijt} = \tanh(SYNCHb_{ijt}).$$

Cerqueira and Martins showed that the average of  $SYNCHA_{ijt}$  is the unconditional correlation coefficient over the whole period. However Cerqueira showed that this index has an asymmetric support between  $3 - 2T$  and  $1$ , and by giving to much weight to periods where the index exhibits negative correlation it may bias the result of the analysis

performed. To overcome this shortcoming and provide a balanced support for the index Cerqueira purposed two transformations: one that transforms the original index in an unbounded index (version b), and another that limits the index between  $-1$  and  $1$  (version c). Contrary to the previous three indexes, these are able to distinguish between positive from negative correlation [1, p.9-10].

We measured synchronization with all presented coefficients. Let analyze the results of using  $SYNCHc_{ijt}$ . Calculations were done on historical data of mentioned countries during 1991 – 2012. On the table 1 indices of synchronization between each pair of countries (153 pairs) in 2012 are presented.

**Table 1. Indices of synchronization**

	USA	Germany	Canada	France	UK	China	Poland	Czech R-c	Slovakia	Russia	Italy	Turkey	Slovenia	Hungary	Croatia	Belarus	Moldova	Ukraine
USA																		
Germany	-0,94																	
Canada	0,26	0,34																
France	-0,98	0,75	0,10															
UK	-0,14	0,57	0,74	0,43														
China	0,65	-0,99	-0,66	-0,99	-0,88													
Poland	-0,92	0,76	0,41	0,75	0,61	-0,99												
Czech Repu	-0,99	0,70	-0,34	0,74	0,09	-0,99	0,68											
Slovakia	-0,97	0,76	0,19	0,76	0,48	-0,99	0,75	0,73										
Russia	0,59	-0,21	0,72	-0,50	0,63	-0,09	-0,10	-0,81	-0,41									
Italy	-0,99	0,74	-0,07	0,76	0,31	-0,99	0,73	0,75	0,75	-0,65								
Turkey	0,12	0,44	0,76	0,24	0,75	-0,76	0,50	-0,18	0,31	0,70	0,08							
Slovenia	-0,99	0,73	-0,13	0,76	0,27	-0,99	0,72	0,76	0,75	-0,69	0,76	0,03						
Hungary	-0,99	0,73	-0,15	0,76	0,25	-0,99	0,72	0,76	0,75	-0,70	0,76	0,01	0,76					
Croatia	-0,95	0,76	0,29	0,76	0,54	-0,99	0,76	0,71	0,76	-0,28	0,74	0,40	0,74	0,74				
Belarus	-0,36	0,64	0,72	0,54	0,76	-0,94	0,67	0,27	0,58	0,55	0,45	0,74	0,42	0,41	0,62			
Moldova	0,51	0,01	0,75	-0,29	0,68	-0,30	0,10	-0,69	-0,19	0,76	-0,47	0,73	-0,52	-0,54	-0,06	0,63		
Ukraine	0,72	-0,68	0,60	-0,85	0,40	0,36	-0,60	-0,96	-0,80	0,73	-0,91	0,54	-0,92	-0,93	-0,73	0,24	0,70	

We marked with grey the groups divided according to the credit rating of countries. Then we calculated dispersion in each group.

**Table 2. Dispersion in groups (1<sup>st</sup>)**

Group 1	0,5150
Group 2	0,6238
Group 3	0,0014
Group 4	0,4532
Group 5	0,0002
Group 6	0,0606

The high degree of synchronization is in 3<sup>rd</sup> and 5<sup>th</sup> groups. Cycles in Poland, Czech Republic and Slovakia, and Slovenia, Hungary and Croatia are well synchronized. The reason for this is similar economics, and conditions of development.

Table 3 demonstrates dispersion in countries divided according their economic development.

**Table 3. Dispersion in groups (2<sup>nd</sup>)**

Group 1	0,513346
Group 2	0,355652

The results indicate such way of dividing is too rough. The dispersion is high, so we can't make a conclusion about synchronization. Nevertheless economic develop-

ment is a good criterion to distinguish countries with similar economies and fluctuations. So it is necessary to divide countries not only into 2 groups, but some more.

Table 4. Indices of synchronization

	USA	Germany	Canada	France	UK	China	Poland	Czech R-c	Slovakia	Russia	Italy	Turkey	Slovenia	Hungary	Croatia	Belarus	Moldova	Ukraine
USA																		
Germany	-0,94																	
Canada	0,26	0,34																
France	-0,98	0,75	0,10															
UK	-0,14	0,57	0,74	0,43														
China	0,65	-0,99	-0,66	-0,99	-0,88													
Poland	-0,92	0,76	0,41	0,75	0,61	-0,99												
Czech Rep	-0,99	0,70	-0,34	0,74	0,09	-0,99	0,68											
Slovakia	-0,97	0,76	0,19	0,76	0,48	-0,99	0,75	0,73										
Russia	0,59	-0,21	0,72	-0,50	0,63	-0,09	-0,10	-0,81	-0,41									
Italy	-0,99	0,74	-0,07	0,76	0,31	-0,99	0,73	0,75	0,75	-0,65								
Turkey	0,12	0,44	0,76	0,24	0,75	-0,76	0,50	-0,18	0,31	0,70	0,08							
Slovenia	-0,99	0,73	-0,13	0,76	0,27	-0,99	0,72	0,76	0,75	-0,69	0,76	0,03						
Hungary	-0,99	0,73	-0,15	0,76	0,25	-0,99	0,72	0,76	0,75	-0,70	0,76	0,01	0,76					
Croatia	-0,95	0,76	0,29	0,76	0,54	-0,99	0,76	0,71	0,76	-0,28	0,74	0,40	0,74	0,74				
Belarus	-0,36	0,64	0,72	0,54	0,76	-0,94	0,67	0,27	0,58	0,55	0,45	0,74	0,42	0,41	0,62			
Moldova	0,51	0,01	0,75	-0,29	0,68	-0,30	0,10	-0,69	-0,19	0,76	-0,47	0,73	-0,52	-0,54	-0,06	0,63		
Ukraine	0,72	-0,68	0,60	-0,85	0,40	0,36	-0,60	-0,96	-0,80	0,73	-0,91	0,54	-0,92	-0,93	-0,73	0,24	0,70	

The last criterion of dividing countries into groups is geographical location. It can influence the interdependency of countries and their business cycles via export and import relations and other neighborhood advantages.

Table 5. Indices of synchronization

	USA	Germany	Canada	France	UK	China	Poland	Czech R-c	Slovakia	Russia	Italy	Turkey	Slovenia	Hungary	Croatia	Belarus	Moldova	Ukraine
USA																		
Germany	-0,94																	
Canada	0,26	0,34																
France	-0,98	0,75	0,10															
UK	-0,14	0,57	0,74	0,43														
China	0,65	-0,99	-0,66	-0,99	-0,88													
Poland	-0,92	0,76	0,41	0,75	0,61	-0,99												
Czech Repu	-0,99	0,70	-0,34	0,74	0,09	-0,99	0,68											
Slovakia	-0,97	0,76	0,19	0,76	0,48	-0,99	0,75	0,73										
Russia	0,59	-0,21	0,72	-0,50	0,63	-0,09	-0,10	-0,81	-0,41									
Italy	-0,99	0,74	-0,07	0,76	0,31	-0,99	0,73	0,75	0,75	-0,65								
Turkey	0,12	0,44	0,76	0,24	0,75	-0,76	0,50	-0,18	0,31	0,70	0,08							
Slovenia	-0,99	0,73	-0,13	0,76	0,27	-0,99	0,72	0,76	0,75	-0,69	0,76	0,03						
Hungary	-0,99	0,73	-0,15	0,76	0,25	-0,99	0,72	0,76	0,75	-0,70	0,76	0,01	0,76					
Croatia	-0,95	0,76	0,29	0,76	0,54	-0,99	0,76	0,71	0,76	-0,28	0,74	0,40	0,74	0,74				
Belarus	-0,36	0,64	0,72	0,54	0,76	-0,94	0,67	0,27	0,58	0,55	0,45	0,74	0,42	0,41	0,62			
Moldova	0,51	0,01	0,75	-0,29	0,68	-0,30	0,10	-0,69	-0,19	0,76	-0,47	0,73	-0,52	-0,54	-0,06	0,63		
Ukraine	0,72	-0,68	0,60	-0,85	0,40	0,36	-0,60	-0,96	-0,80	0,73	-0,91	0,54	-0,92	-0,93	-0,73	0,24	0,70	

Analysis of dispersion showed the high level of synchronization in 3d and 4th groups. Cycles in Slovenia, Hungary and Italy are well synchronized. The reason for this is similar economics, and conditions of development. Czech Republic, Slovakia and Hungary also are characterized by similar development, so it's not a surprise that their business cycles are synchronized.

Table 6. Dispersion in groups (3<sup>d</sup>)

Group 1	0,26
Group 2	0,026621
Group 3	0,000132
Group 4	0,000194
Group 5	0,252915
Group 6	0,534049

**Conclusion.** Besides others business cycles synchronization became one of the features modern business cycles. So it's not a big surprise the increasing interest to the analysis of business cycle synchronization across different countries has in both academic and policy fields. Terms such as "globalization" or "world integration" can be found everyday in the press, with all kinds of associated implications. Developed economies have become more tightly integrated in recent years. In these countries, international trade flows have increased substantially and financial markets have become more homogeneous. Promoted by this international integration, growing attention is being devoted to examine whether the efforts to coordinate their economic policies lead to higher business cycle synchronization.

There are a great number of studies devoted to research and measurement of synchronization phenomenon. It is important to take into account all characteristics and to develop a complex methodology of the research. We set a

goal to continue working in this direction, especially for developing and post-Soviet countries.

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Надійшла до редколегії 07.05.14

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#### ДОСЛІДЖЕННЯ СИНХРОНІЗАЦІЇ ЕКОНОМІЧНИХ ЦИКЛІВ

*В статті вивчаються способи оцінки синхронізації економічних циклів. Вивчаються коливання економічної активності в пострадянських країнах. Оцінюються різні міри синхронізації в групах країн згідно визначених критеріїв.*

*Ключові слова. Економічний цикл, синхронізація, міри синхронізації, кредитний рейтинг.*

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#### ИССЛЕДОВАНИЕ СИНХРОНИЗАЦИИ ЭКОНОМИЧЕСКИХ ЦИКЛОВ

*В статье изучаются способы оценки синхронизации экономических циклов. Исследуются колебания экономической активности в постсоветских странах. Оцениваются разные меры синхронизации в группах стран согласно определенным критериям.*

*Ключевые слова. Экономический цикл, синхронизация, меры синхронизации, кредитный рейтинг.*

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 52-58  
UDC 519.862+331.5  
JEL C 30, E 24

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#### LABOUR MARKET IN UKRAINE: AN EMPIRICAL DYNAMIC ANALYSIS USING ERROR CORRECTION MODEL

*The labor market background in Ukraine has not only economic but also significant social value, and therefore is an important element of social and economic policy. The effectiveness of the state socio-economic regulation mechanisms requires profound analysis, modeling and forecasting of the processes of the labor market by means of modern flexible econometric tools, taking into account the short-term dynamics of economic processes and features that are characteristic of the unstable economic development of our country. As a result of empirical research on relationships between the macroeconomic indicators of the labor market in Ukraine, we developed a set of dynamic econometric models using an error-correction mechanism which take into account the long-run equilibrium relationships, as well as provide an opportunity to model the short-term effects of several factors such as the rate of change of wages, size of the labor force, employment and unemployment. The developed model is used to predict future trends of the labor market, as well as to describe the dynamics of its operation under various alternative scenarios of economic development. The application of the developed specifications in the structure of an integral macroeconomic model of Ukraine will allow us to carry out a comprehensive analysis of economic processes in the national economy and its prospects both in the short term and in the long run.*

*Keywords: labour market; econometric modeling; error-correction model; wage; employment; unemployment; scenarios of development; forecasting.*

**Introduction (Problem definition).** Long-term negative trends on the labor market in Ukraine generate economic and social problems associated with poverty and unemployment. They prevent creation of conditions for stabilization and economic growth, deepen social tension in society. The development of economic processes and events in Ukraine demonstrates the need for increased attention to the national labour market, which is an important element of the socio-economic system of the country. The background for carrying out qualitative changes in the socio economic area is a systematic analysis of the dynam-

ics of local labour market development, which will help to form an effective mechanism for the use of human potential. Therefore, the development of relevant dynamic structural economic and mathematical models will allow us to reveal the particular nature of the relationships between the main macroeconomic indicators of the labor market and to predict the future situation in the socio-economic sphere.

**Analysis of the latest research and publications.** Scientific works by S. Babych, D. Bohynya, V. Vovk, V. Heyets', Yu. Gorodnichenko, O. Hrishnova, T. Holubyeva, O. Yermolenko, D. Zoidze, T. Kiryan, M. Kyzym,

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T. Klebanova, Ye. Libanova, I. Lukyanenko, S. Panchyshyn, K. Petrenko, V. Ponomarenko, K. Sultan, T. Umanets, O. Chernyak, V. Fedorenko and others made a significant contribution to the study of theoretical and practical problems of the Ukrainian labour market and its regional characteristics [1–8]. Researchers justify the relevance and need for more detailed and in-depth analysis of the modern labour market characteristics to create a highly effective strategy for sustainable development of the regions and the state as a whole. In particular, Zoidze ([3], 2013) notes that the present stage of socio-economic development of Ukraine's labor market and its individual regions is characterized by a significant excess of labour supply over demand and the existence of hidden unemployment and illegal employment. Babych ([1], 2012) states that an active policy of the government on the labour market in the field of employment should be a priority for both the economic and social policy of the state. Scientists indicate the need for forming an effective socio-economic mechanism of labour market regulation in order to promote productive employment of the population and to increase its real income (Fedorenko [7], 2009). Scientists propose criteria for the evaluation of structural unemployment and measures for state regulation of the economy; they also carry out an analysis of infrastructural changes in regional labor markets (Umanets, Kosmina [8], 2012). Moreover, the Ukrainian labour market, which is in the process of adapting to the global economic space, requires an examination of its links with global trends.

Analysis and study of the labor markets' features in different countries by foreign scientists is based on the study of mathematical economic models. Among others, Checchi and García-Penalosa ([9], 2008) examine the overall impact of labour market institutions on income inequality of households in the European Union. Rotaru ([10], 2013) analyzes the labour market in Romania in terms of the demand for labour and explores a model that describes the relationship between the level of employment and socio-economic indicators of the functioning of the labour market. Mossfeldt and Osterholm ([11], 2011) consider the impact of the financial crisis on the labor market in Sweden. A number of authors use error correction econometric models for modeling the relationships between indicators of labour markets in different countries. In particular, Staneva ([12], 2008) examines problems of labour market development in Bulgaria, performs cointegration analysis and evaluates the ECM-model to describe the relationships between unemployment, employment, wages, productivity and inflation. Nakanishi ([13], 2001) uses new econometric tools to study problems in the Japanese labor market.

Therefore, considering that research on the labor market unit is an important component of the dynamical structural macroeconomic model of Ukraine [5, 6] (Lukyanenko, 2003), which is based on a new conceptual approach, the comprehensive econometric analysis of the dynamics and a mechanism for coordination of various economic processes on the labor market, as well as forecasting the possible scenarios of its development, is relevant and necessary in the current conditions in Ukraine. Experience of Ukrainian and foreign researchers indicates the need for modeling and analyzing the relationships be-

tween indicators of local labor markets and the application of multivariate dynamic econometric specifications that take into account the cointegrating relationships between the variables, long-term trajectory of their behavior and the dynamics of short-term fluctuations.

**The aim** of the paper is an empirical analysis and econometric modeling of relationships between labour market indicators in Ukraine based on a complex of error cointegration models that enable us to combine long-run equilibrium relationships and short-term dynamic adjustment mechanisms, and to consider the peculiarities of the dynamics of processes in the socio-economic sphere of the national economy.

**Primary Material.** To achieve the objectives of the research and define an adequate specification of the labor market macromodel, we must first thoroughly analyze the main trends of the socio-economic development of the Ukrainian economy on the basis of the available statistical database of the national labor market indicators and key macroeconomic indicators for the past thirteen years, in particular the quarterly dynamics of changes in average wages, nominal employment, number of unemployed, economically active population, unemployment rate of the population, as well as the factors that determine their behavior in the long and short term [14]. Following the previous economic and statistical analysis to assess the interdependence of the labor market in Ukraine, we determined the following key indicators: *RGDP* – real gross domestic product (mln UAH); *LF* – the labor force or economically active population (thousands people); *EMPL* – employed population (thousands people); *UNEMPL* – unemployed population (thousands people); *POP* – population aged 15 – 70 years (thousands people); *AWAGE* – average monthly wages per full-time employee (UAH); *WARR* – arrears of wages (mln UAH); *RUN* – the unemployment rate of the population (ILO methodology) (%); *RUNOF* – registered unemployment rate (%); *UNB* – average size of unemployment benefits (UAH); *CPI* – consumer price index. During modelling to account seasonal movements of series we will use variables *S1*, *S2*, *S3*, *S4*, taking value 1 for 1, 2, 3 and 4 quarter respectively and 0 for all other quarters.

We note that different socio-economic categories of human resources are used for the characteristics of various processes on the labor market in economic theory: the population as a source of manpower replenishment, particularly the economically active population, which ensures the supply of labor for the production of goods and services; the real workforce of workers, who are already employed in the economy; as well as potential workers who are not employed, but can work [1; 2]. The economically active population which determines the workforce in the economy depends on the number of available people of a certain age, and factors that are related to wages [8]. Analyzing the dynamics of the population aged 15 to 70 years in Ukraine (change *POP*), we can see (Fig. 1) that during 2004 – 2013 its quantity has been decreasing. The smooth line in Figure 1 is defined on the basis of the estimated non-linear trend model, the specification of which contains dummy variables (included in different ways) and allows us to evaluate the different intersections and different slope coefficients for different periods of time.

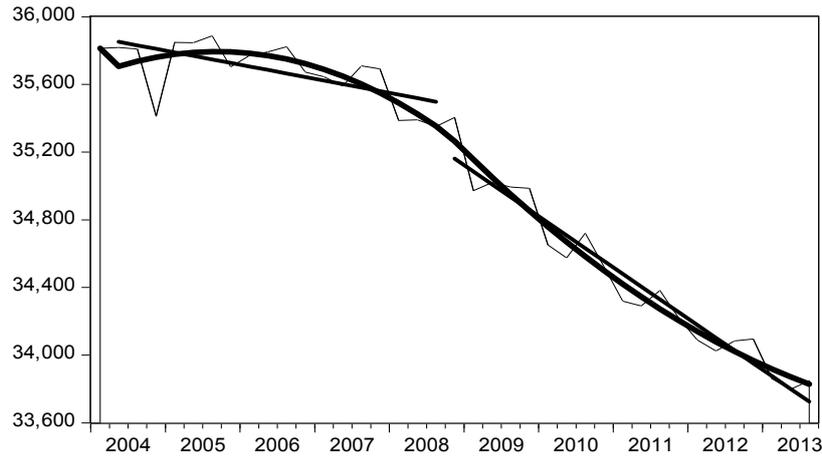


Fig. 1. Dynamics of the population aged 15 to 70 years during 2004 – 2013

Source: author's calculation

Differences in the rate of decline of the working age population deepened the impact of the global economic crisis and increased the negative trends in the economy of Ukraine. However, the percentage increase of the eco-

nomically active population is positive (Fig. 2a), and during 2004 – 2013 it increased from 61% to almost 67% and as a result compensated for the fall in POP's value.

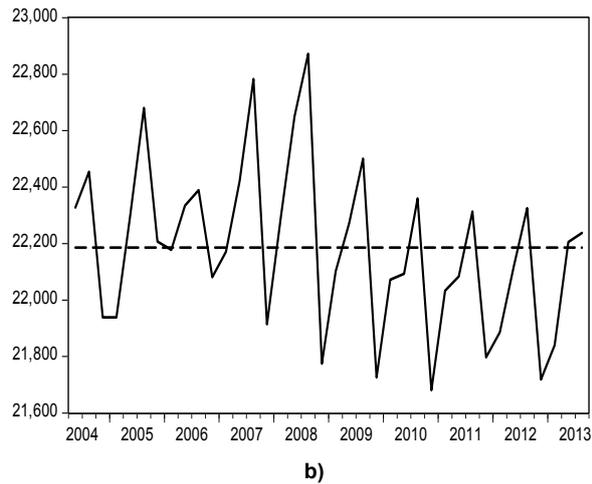
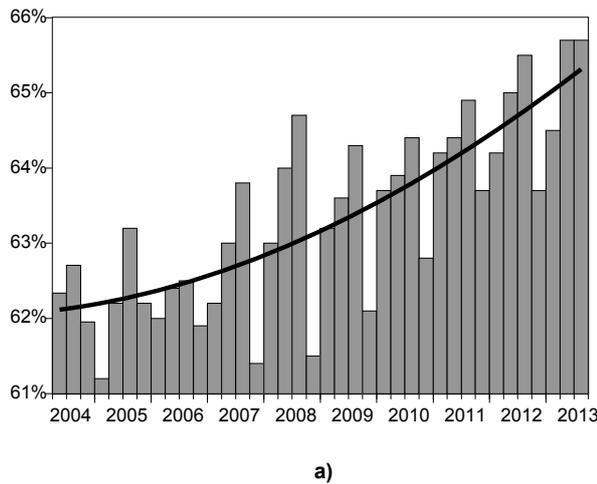


Fig. 2. Percentage rate of economic activity and the dynamics of the labour force in Ukraine

Source: author's calculation

As a result, the numbers for the economically active population (variable *LF*) after 2008 (Fig. 2b) have not experienced the negative changes that are inherent to the total population aged 15 – 70 years. It should be noted that economic activity is characterized by significant seasonal variations and is largest in the third quarter of each year.

If we construct an econometric model, it will describe and make it possible to predict the dynamics of the economically active population in Ukraine. Since the behavior

of the variable *LF* does not show certain trends, which is also confirmed by Sultan's, Lukyanenko's and Gorodnichenko's researches ([6], 2000), we will apply the ARIMA modeling technique using exogenous variables and deterministic shifts in the specifications. As the exogenous variables we will take the total value of the working-age population (*POP*) and the value of the average wage (*AWAGE*). As a result, the estimated model for the economically active population is the following

$$\begin{aligned}
 \Delta \log(LF)_t = & -0.0089 - 1.0922 \Delta \log(LF)_{t-1} - 0.7632 \Delta \log(LF)_{t-2} - 0.3679 \Delta \log(LF)_{t-3} + \\
 & (-3.27^{***}) (-12.96^{***}) (-9.27^{***}) (-4.41^{***}) \\
 & - 0.1979 \Delta \log(POP)_{t-1} + 0.4164 \Delta \log(POP)_{t-3} + 0.087 \Delta \log(AWAGE)_t - \\
 & (-1.01) (2.39^{**}) (2.36^{**}) \\
 & + 0.0222 S3_t + 0.0118 D2008Q4\_prolong_t + e_t + 0.4915 e_{t-1}. \\
 & (6.23^{***}) (-2.11^{**}) (2.41^{***})
 \end{aligned} \tag{1}$$

$Adjust. R^2 = 0.91, \log L_{max} = 142.5, F = 42.1, DW = 2.07, LM = 1.12,$   
 $Q[4] = 3.9, J-B = 2.08, F(ARCH) = 0.29.$

The constructed model except for the impulsive dummy variable also includes stationary variables that determine the growth rate of average wages  $\Delta \log(AWAGE)_t$  and the lag rate of the change in the population of working age

$\Delta \log(POP)$ . The coefficients of these variables determine the weighting of the transfer functions, and show how changes in the exogenous variables affect the temporal dynamics of the endogenous variable. We should note that the change in

the wage growth rate leads to the growth rate of the population's economic activity, in particular the short-term effect of such exposure is 0.087, while the long-term effect due to the autoregressive structure of the model is  $d_0/(1-a_1-a_2-a_3)=0.027$ . Decrease in the population's change rate leads to a decrease in economic activity but with a lag of three quarters. Therefore, as the conclusions of the model (1) show, increased incomes of Ukrainian citizens will raise the economic activity of the working population.

$$\log(AWAGE)_t = \alpha_1 + \alpha_2 \log(RGDP)_t + \alpha_3 \log(EMPL)_t + \alpha_4 RUN_t + \alpha_5 RUNOF_t + \alpha_6 \log(P\_CPI)_t + \alpha_7 \Delta \log(P\_CPI) + \alpha_8 \Delta \log(WARR)_t + \alpha_9 TREND + \alpha_{10} S2_t + \alpha_{11} S3_t + \alpha_{12} S4_t + \alpha_{13} \log(AWAGE)_{t-1} + \alpha_{14} \log(AWAGE)_{t-4} + \varepsilon\_AWAGE_t \quad (2)$$

According to economic theory, model (2) includes indicators of the price level  $\log(P\_CPI)$  and inflation  $\Delta \log(P\_CPI)$ , which are calculated on the basis of the consumer price index, the value of real gross domestic product  $\log(RGDP)$ , the number of employed in the economy  $\log(EMPL)$ , unemployment rates  $RUN$  and  $RUOF$ , the amount of change of unpaid wages  $\Delta \log(WARR)$ , and also takes into account the adaptive nature of temporal changes

$$\log(EMPL)_t = \beta_1 + \beta_2 \log(RGDP)_t + \beta_3 \log(LF)_t + \beta_4 \log(AWAGE/P\_CPI)_t + \beta_5 \log(UNB)_t + \beta_6 \Delta \log(WARR)_t + \beta_7 S2_t + \beta_8 S3_t + \beta_9 S4_t + \beta_{10} \log(EMPL)_{t-1} + \varepsilon\_EMPL_t \quad (3)$$

$$\log(UNEMPL)_t = \gamma_1 + \gamma_2 \log(RGDP)_t + \gamma_3 \log(LF)_t + \gamma_4 \log(AWAGE/P\_CPI)_t + \gamma_5 \log(UNB)_t + \gamma_6 \Delta \log(WARR)_t + \gamma_7 S2_t + \gamma_8 S3_t + \gamma_9 S4_t + \varepsilon\_UNEMPL_t \quad (4)$$

Model parameters ratings (3) and (4) determine the degree of influence of the real gross domestic product, the number of economically active population, the monthly average real wage, its debt and the unemployment benefit for the number of employed and unemployed in Ukraine. We will add equations (2) – (4) with identities

$$LF_t = EMPL_t + UNEMPL_t \quad (5)$$

The positive dynamics of wages, which will help to increase the standard of living and improve the economic situation, in the opinion of many authors, requires the improvement of the existing state socio-economic policy of Ukraine, which in turn requires analysis and systemic modeling processes of the labor market. By comparing different specifications for modeling long-term behavior of the average wage, which is an important indicator of the demand for goods and services in the economy, this general model has been chosen:

in wages and includes lagged values  $\log(AWAGE)$  for the past three periods. Coefficients of the model determine the elasticity changes of the average monthly wage in Ukraine under the relevant factors and indicate the percentage of salary change when increasing the factor by 1%, provided that all other factors remain unchanged.

For modeling the number of employed and the number of unemployed we will use the specifications

$$RUN_t = 100 \cdot UNEMPL_t / LF_t \quad (6)$$

and estimate the system (2) – (6). The system (2) – (6) is a simultaneous equation model (SEM). The consistent estimation of SEM parameters is based on weighted two-stage least squares method using instrumental variables [15]. The evaluation results are shown in Table 1.

Table 1. Estimating Results for System (2) – (6)

Variable	The Equation System for					
	$\log(AWAGE)$		$\log(EMPL)$		$\log(UNEMPL)$	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Const	-7.3965	-0.948	-0.2399	-0.130	24.410	1.007
$\log(RGDP)$	0.4677	5.845***	0.0648	2.790***	-0.7882	-2.469**
$\log(LF)$			0.7432	2.951***	-0.4905	-0.187
$\log(EMPL)$	0.4154	0.518				
$RUN$	0.0064	0.445				
$RUNOF$	-0.0196	-2.197**				
$\log(AWAGE/P\_CPI)$			0.0341	2.235**	-0.6008	-3.288***
$\log(UNB)$			-0.0169	-4.210***	0.2587	5.583***
$\log(P\_CPI)$	0.2120	2.499**				
$\Delta \log(P\_CPI)$	0.0567	0.391				
$\Delta \log(WARR)$	-0.0146	-0.759	0.0035	0.452	-0.1724	-2.315**
TREND	0.0060	2.836***				
S2	-0.0137	-0.537	0.0031	0.894	-0.0267	-0.567
S3	-0.1230	-4.139***	-0.0022	-0.359	0.0110	0.130
S4	-0.1108	-3.372***	-0.0332	-2.681**	0.2325	1.689*
$\log(AWAGE)_{t-1}$	0.4814	2.755***				
$\log(AWAGE)_{t-4}$	0.1880	1.363				
$\log(EMPL)_{t-1}$			0.1834	1.550		
Adjusted R-squared	0.999		0.973		0.882	
Durbin-Watson Stat.	2.093		1.967		2.019	

It should be noted that the time series included in the model are non-stationary and are characterized by stochastic trends. Research of the levels and first differences of these variables on the presence of a unit root using the augmented Dickey-Fuller test indicates their integration of the first order. Therefore, their joint modeling could lead to false regressions that do not reflect causal relationships between variables. However, in the case of cointegration, model (2) – (6) will describe the cointegrating relationships, which according to the terminology of Ingle-Granger charac-

terize the causality or causal behavior of labor market indicators as long-term relationships between variables with similar trend properties. The research of residuals models (2) – (4) based on ADF-test results which are shown in Table 2, indicate their stationarity, and therefore rows  $E\_AWAGE$ ,  $E\_EMPL$ ,  $E\_UNEMPL$  are  $I(0)$  variables. As a result, the model (2) – (6) can be interpreted as a system of long-term equilibrium relationships between the labor market indicators in Ukraine, deviations from which are really temporary.

**Table 2. ADF Test Results for Residuals of System (2) – (4)**

Augmented Dickey-Fuller unit root test for residuals	<i>E_AWAGE</i>		<i>E_EMPL</i>		<i>E_UNEMPL</i>	
	t-Stat	Prob.	t-Stat	Prob.	t-Stat	Prob.
	-5.9897	0.0000	-5.8090	0.0000	-5.9111	0.0000

Equation (2) defines the long-run equilibrium relationship among the average wage, the real GDP, the price level and the level of official unemployment. The variables that determine the number of economically active population, wage arrears and unemployment rate defined by ILO methodology is not statistically significant in this equation, and therefore have no significant impact on the behavior of the average wage in the long term. Equation (3) describes a long-term relationship between the number of employees, real GDP, real wages, labor force and unemployment assistance. In equation (6), which determines the long-term

behavior trajectory of the number of unemployed, real GDP, real wages and their debt are significant.

For modeling the dynamics of labor market indicators in the short term we will examine the specifications of error correction in which the growth rate of endogenous variables depend on the rate of exogenous growth factors, as well as the derivation of value levels of system variables from long-term equilibrium equations (2) – (6), which were observed in the previous period. The following equations of short-term adaptations were derived as a result of the different specifications analysis

$$\begin{aligned} \Delta \log(AWAGE)_t = & 0.112 + 0.386 \Delta \log(RGDP)_t + 0.005 \Delta RUN_t - 0.029 \Delta RUNOF_t + \\ & (3.2^{***}) (4.1^{***}) (1.1) (-3.0^{***}) \\ & + 0.273 \Delta \log(P\_CPI)_t - 0.115 \Delta^2 \log(P\_CPI)_t + 0.037 \Delta \log(UNB)_t - 0.028 \Delta^2 \log(WARR)_t - \\ & (2.1^{**}) (-0.7) (1.7^*) (-1.6) \\ & - 0.09 S2_t - 0.20 S3_t - 0.12 S4_t + 0.596 \Delta \log(AWAGE)_{t-1} + \delta_1 E\_AWAGE_{t-1}, \end{aligned} \tag{7}$$

Adjust.  $R^2 = 0.94$ ,  $DW = 1.81$ ;

$$\begin{aligned} \Delta \log(EMPL)_t = & 0.026 + 0.069 \Delta \log(RGDP)_t + 0.857 \Delta \log(LF)_t + 0.057 \Delta \log(AWAGE/P\_CPI)_t - \\ & (2.0^{**}) (1.9^{**}) (6.9^{***}) (1.4) \\ & - 0.009 \Delta \log(UNB)_t + 0.011 \Delta^2 \log(WARR)_t - 0.02 S2_t - 0.03 S3_t - 0.05 S4_t + \delta_2 E\_EMPL_{t-1}, \end{aligned} \tag{8}$$

Adjust.  $R^2 = 0.98$ ,  $DW = 1.99$ ;

$$\begin{aligned} \Delta \log(UNEMPL)_t = & -0.315 - 0.986 \Delta \log(RGDP)_t - 0.418 \Delta \log(LF)_t + 0.107 \Delta \log(UNB)_t - \\ & (-2.1^{**}) (-2.3^{**}) (-0.3) (1.1) \\ & - 0.284 \Delta \log(AWAGE/P\_CPI)_t - 0.216 \Delta^2 \log(WARR)_t + 0.35 S2_t + \\ & (-0.6) (-2.8^{***}) (1.7^*) \\ & + 0.42 S3_t + 0.48 S4_t + 0.314 \Delta \log(UNEMPL)_{t-1} + \delta_3 E\_UNEMPL_{t-1}. \end{aligned} \tag{9}$$

Adjust.  $R^2 = 0.93$ ,  $DW = 1.80$ .

The system of error-correction model (7) – (9) together with the model of behavior of the economically active population (1) describes the short-term fluctuations in the labor market. The variables  $E\_AWAGE_{t-1}$ ,  $E\_EMPL_{t-1}$ ,  $E\_UNEMPL_{t-1}$  measure the deviation from the estimated long-term equilibrium of cointegrating relations (2) – (6),

observed in the previous period. The parameters  $\delta_1$ ,  $\delta_2$ ,  $\delta_3$  are the coefficients of the rate of adjustment and are important characteristics of the dynamics of the system. They define the convergence of long-term equilibrium relations. Estimates of the rate of adjustment are shown in Table 3.

**Table 3. Speed of Adjustment Parameters System (7) – (9)**

Average Wage Equation (7)		Employment Equation (8)		Unemployment Equation (9)	
Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
-1.0468	-4.27***	-0.8021	-3.77***	-0.965	-5.33***

The high statistical significance of the parameters  $\delta_1$ ,  $\delta_2$ ,  $\delta_3$  indicates that wages, employment and unemployment are sensitive to past deviations from equilibrium trajectories (2) – (6). The negative sign of the coefficients and their proximity to 1 indicate that the variables tend to overcome the gap between them and tend to decrease in the next period if there is a positive deviation from equilibrium relationships.

Analyzing the effects of exogenous variables on the dynamics of the main labor market indicators, we find that the higher the price level, the higher are nominal wages, but they do not grow commensurate with the cost of living. The long-term elasticity of wages caused by the consumer price index is less than one and equals 0.21. In the short run, wages are not flexible and do not respond in a statistically significant way to changes in the inflation rate in the current quarter. Salaries depend on the growth of real gross domestic product, the level of which is a measure of economic growth, and a growth of 1% leads to an increase in salaries of 0.47%. This stimulates employment and reduces the number of unemployed hence its impact on reducing unemployment is much higher (corresponding to

elasticities of 0.06 and -0.79). In the short term, an increase in the growth rate of real GDP leads to wage increases and decreases in proportion to the rate of change in the number of unemployed. Note also that the unemployment rate, which is defined by the ILO methodology, i.e. the proportion of people who are actively looking for work, trying to organize their own business or waiting for answers to their proposed work, has no statistically significant effect on the change in wages in the long run. However, a statistically significant factor influencing wages in Ukraine is the level of unemployment. In particular, an increase of the registered unemployment rate by 1% associated with lower wages by 2% and an increase in the rate of change of the registered unemployment rate of 1% causes a decrease in the growth rate of wages of 3%. A change in the number of employees (as well as the number of economically active population) does not affect the dynamics of wages in the long run. However, increasing the number of economically active population by 10% and the the number of employees by 7.4%, reduces the number of unemployed by 4.9 %. Changes in the rate of growth in

employment in short-term adjustments almost proportionally reflect changes in the rate of change of the economically active population and do not affect the number of unemployed. An increase in real wages significantly reduces the number of unemployed. In the long run, an increase in real wages by 10% is accompanied by a decrease in the unemployment rate of 6%. Increasing unemployment benefits significantly increases the number of unemployed and reduces the number of employees, and increasing aid by 10% leads to an increase in unemployment of 2.5%. However, during the short-term, fluctuations in the rate of growth of real wages and the rate of growth of unemployment benefits do not result in significant changes in the rate of change of the number of employed and the number of unemployed. Moreover, the significance of the lag coefficient of wages in equation (2) shows the adaptive nature of the wage increases. Parameter  $\alpha_{13}$  can be interpreted as a partial adjustment parameter to some desired level of wages. Estimates shows, that the actual salary increase averages 48 percent of the difference between its value and the desired level in the previous period.

The calculated values of the adjusted R-squared and F-statistics indicate the adequacy of both the long and short term specifications and the value of the Durbin-Watson statistic for autocorrelation of residuals by the developed models.

We use the model developed for predicting the future behavior of Ukrainian labor market indicators. To predict the exogenous variables we apply the autoregressive moving average model. Given the nonstationarity and seasonal characteristics of each series, we estimate the ARIMA (4,1,2) model for unemployment benefit  $UNB_t$ , the AR(1)

model with trend and a combination of seasonal dummy variables for the logarithms of real GDP, the ARIMA (2,1,2) model for wage arrears  $WARR_t$ , the ARIMA (2,1,1) model for the registered unemployment rate  $RUNOF_t$  and the ARIMA (4,1,4) model for the logarithm of a number that determines the dynamics of prices ( $P\_CPI$ ). Having obtained on the basis of these models the predicted values of exogenous variables and using the developed dynamic model (1) – (9), we construct forecasts of endogenous indicators. Fig. 3 shows the predicted behavior of the labor market indicators while maintaining the dynamics of the exogenous variables in the future, along with the boundaries of the projected ranges and dynamic variables predicted by the two possible scenarios of future behavior factors. The first scenario assumes that as a result of favorable economic policies real GDP growth in 2014 and 2015 reflects shear and increases by 1% compared to the expected. According to a second possible scenario for future development processes in Ukraine, we assume a quarterly growth rate of inflation in 2014 and 2015 of 2% more than forecasted by its previous dynamics prior to 2014.

The application of the developed complex models of the labor market shows that in accordance with the baseline scenario of the behavior of real GDP, prices, unemployment, the level of unemployment and wage arrears, during 2014 – 2015 in Ukraine we will see a further increase in nominal wages, a slight increase in nominal employment (2%) and in the number of unemployed (6%), while economic activity will almost unchanged (1.6%).

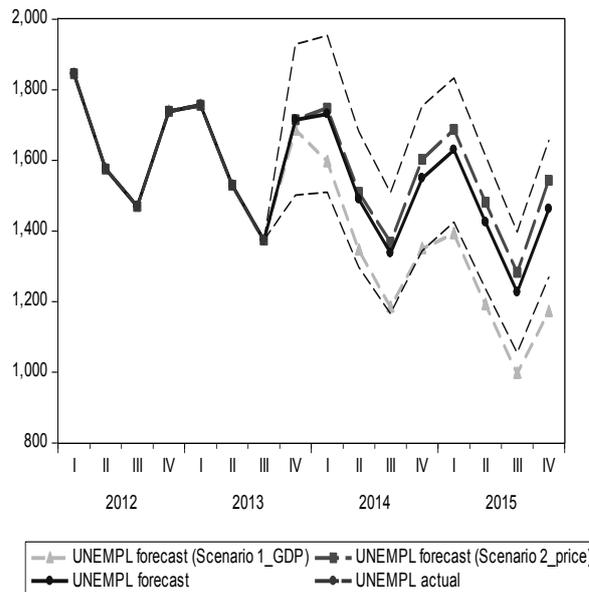
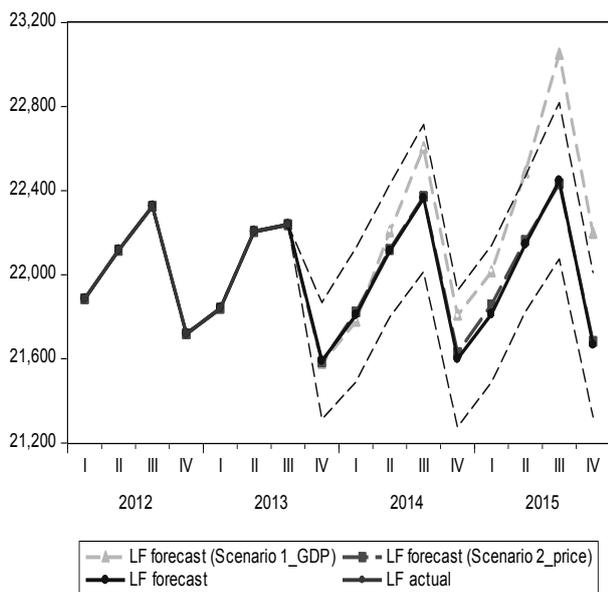


Fig. 3. Estimates of economically active population and unemployment rate

Source: Authors' elaboration based on State Statistics Service of Ukraine Database

If the growth rate of real GDP increases, it will increase the demand for labor and result in improvements to all indicators of the domestic labor market. In particular, as per the simulation, the economic activity of the population and employment will increase by 4% and 6%, respectively, while the number of unemployed will decrease by 27% compared to the end of 2013. Price increases however would show negative consequences, because they would be accompanied by only a nominal growth of wages and practically minimal change in the amount of available labor and employment.

**Conclusions.** The labor market in Ukraine is not only of economic but also of significant social value, and therefore is an important element of social and economic policy. The

effectiveness of the mechanisms of socioeconomic state regulation requires in-depth analysis, modeling and forecasting of labor market flexibility by using modern econometric tools, taking into account the short-run dynamics of economic processes and features that are characteristic of the unstable economic development of our country. As a result of an empirical investigation of the relationship between macroeconomic indicators of the labor market in Ukraine, we have developed a set of dynamic error-correction econometric models that take into account the long-term equilibrium economic relations, as well as allow us to model the short-term effects of several factors on the rate of change of wages, labor, employment and unem-

ployment. The developed models allow us to predict future trends in the labor market, as well as to describe the dynamics of its operation under various alternative scenarios of economic development. Using these developed models within the structure of overall integrated macro models will enable Ukraine to carry out a comprehensive analysis of economic processes in the national economy and its prospects both in the short and in the long run.

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Надійшла до редколегії 05.05.14

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### РИНОК ПРАЦІ В УКРАЇНІ: ЕМПІРИЧНИЙ ДИНАМІЧНИЙ АНАЛІЗ З ВИКОРИСТАННЯМ МОДЕЛІ КОРЕГУВАННЯ ПОХИБКИ

*У результаті емпіричного дослідження взаємозв'язків між основними макропоказниками функціонування ринку праці в Україні розроблено комплекс динамічних економетричних моделей з використанням механізму корегування похибок. Оцінено довгострокові рівноважні зв'язки та короткострокові ефекти впливу низки чинників. Здійснено прогнозування майбутніх тенденцій на ринку праці, а також проаналізовано різні альтернативні сценарії розвитку економіки.*

*Ключові слова:* ринок праці; економетрична модель корегування помилки; сценарії розвитку; прогнозування.

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### РЫНОК ТРУДА В УКРАИНЕ: ЭМПИРИЧЕСКИЙ ДИНАМИЧЕСКИЙ АНАЛИЗ С ИСПОЛЬЗОВАНИЕМ МОДЕЛИ КОРРЕКЦИИ ОШИБОК

*В результате эмпирического исследования взаимосвязей между основными макропоказателями функционирования рынка труда в Украине разработан комплекс динамических эконометрических моделей с использованием механизма коррекции ошибок. Оценены долгосрочные равновесные связи и краткосрочные эффекты воздействия ряда факторов. Осуществлено прогнозирование будущих тенденций на рынке труда, а также проанализированы различные альтернативные сценарии развития экономики.*

*Ключевые слова:* рынок труда; эконометрическая модель коррекции ошибок; сценарии развития; прогнозирование.

Bulletin of Taras Shevchenko National University of Kyiv. *Economics*, 2014, 6(159): 58-64

JEL C5, Q5

UDC 338.1

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### ENVIRONMENTAL SECURITY: INTEGRAL ASSESSMENT (CASE OF UKRAINE)

*Environmental security is a key issue in the context of the national security evaluating of each state and the world in whole. The lack of universality in the term definition, not to mention the technology of an assessment of environmental security, encourages researchers to develop and improve methods and approaches to assess integrated index of environmental safety at the level of the country and its regions. The main scientific results of this study include the following: given the analysis of the strengths and weaknesses of well-known techniques and approaches to the evaluation of ecological security in the world and in Ukraine, represented the authorial approach to the calculation of the integral index of environmental security of Ukraine and its regions, with the option of cross-state comparison; calculated integral index of ecological safety of Ukraine (1996 – 2013); held the comparative analysis of the ecological security of Ukraine and other selected countries; proposed the system of indicators for ranking of regions of Ukraine at the level of its environmental security.*

*Keywords:* Environmental security, assessment, Ukraine, integral index.

**Introduction.** Modern economic development, growth and employment, world population increasing create a new challenge – to support the environmental security. The United States were the first state over the world that recognized the necessity to make significant adjustments in the concept of national security, its targets, strategies and tools with accounting the environmental security as an important component of national security [1]. In 1974 M.Taylor [2]

firstly emphasized on the fact that the main threat to U.S. national security in developing non-military sphere is beyond the military aspect. A few years later, H. Brown [3] identified among the major threats for the national security such as the economic and environmental threats. In 90s the researchers began to assess the threats of national security that are related with environmental crisis. Exhausting of global ecological potential was associated not only

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with the growth of population, but as well as with the excessive consumption of natural resources and production [4]. Thus environmental security is considered as a part of national security. The basic premise for this [1]:

- global environmental crisis connected with increasing pressures on economic systems and reproductive natural resources of the planet;
- for a state the ecological crisis is linked to the reduction of freedom of political choice due to the transboundary nature of environmental problems;
- worsening of the environmental situation in different regions of the world that causes social and political instability.

These arguments formed the basis for enhancing the status of ecological security to the highest level of national priorities.

The purpose of this research is to consider the environmental security through the prism of its index estimations and to propose more up-to-date assessment technique for the case of Ukrainian environmental security index.

**Methodology.** Scientists over the world propose different interpretations of the environmental security (ES). Mostly wide broadcasted opinions to the definition of this concept are summarized in Table 1.

**Table 1. "Environmental security": meaning of the term in the scientific literature**

Source	Description
Andreitsev V. [5]	The state of social relations which guarantees the protection of citizens' rights to have the safe environment for their lives and health, provides the regulation of environmentally hazardous activities and the environmental degradation preventing
Barnett J. [6]	Complex of activities to minimize the anthropogenic threats to functional integrity of the biosphere
Hetman A. [7]	The management process that consists of the implementation of economic, organizational, legal, logistical, educational and other measures to neutralize the threat to the vital interests of human and the environment from adverse effects of economic and other activities, natural and man-made disasters and its consequences.
Kachynskiy A. [8]	The complex system process that manifests itself in the interaction of natural, economic and social factors
Lipkan V. [9]	The component of national security, the management of the national security system under which state and non-state institutions are provided with the ecological balance. There are guarantees of protection of a habitat, the population and the biosphere as a whole, the species composition of flora and fauna, natural resources, health and livelihoods; excluded consequences of this effect for the present and future generations.
Orlov A. [10]	The protection against the possibility of destruction (complete or partial) of the human environment, plants and animals as a result of uncontrolled economic development, technologic lagging, natural disasters and man-made accidents
Reymers N. [11]	The set of states, events and actions that ensure the ecological balance on the Earth and in its regions
Zerkalov D. [12]	The state of protection of individuals, society and a state from the effects of natural disasters and human impacts on the environment

Source: author's compilation

There are thousands of similar definitions like mentioned latter and most of them are collected in categories according to the Millennium project [1996; <http://www.millennium-project.org>] but we can sum up in one simple sentence the main scope of environmental security: the main objective of ES at the state level is to achieve sustainable development with the creation of an enabling and comfort environment for life and reproduction of inhabitants, ensuring the protection of natural resources, prevention of industrial accidents and disasters. Reaching of such main objective is impossible without calculative techniques, as we have to see where we are now and what way and in what speed to move, to see results of our steps. This quite simple understanding of ES

concept is highly ambiguously realized in the assessments techniques of different states [13].

The best known global ecological security index is an international environmental index (Environmental Performance Index (EPI)), comprising by experts in the field of environment at Yale University, USA [14]. EPI is constructed through the calculation and aggregation of 20 indicators reflecting national-level environmental data for 178 states (EPI 2014). These indicators are combined into 9 issue categories, each of which fit under one of two overarching objectives: environmental health and ecosystem vitality [15]. The most valuable in this research is the development of weight scale to show the importance of each component in the integral assessment of EPI (Table 2).

**Table 2. EPI compounds and its weights**

Objective (weight*)	Issue Category (weights**)	Indicator (weights**)
Environmental Health (0.4)	Health Impacts (0.33)	Child Mortality (1)
		Household Air Quality (0.33)
	Air Quality (0.33)	Air Pollution – Average Exposure to PM2.5 (0.33)
		Air Pollution – PM2.5 Exceedance (0.33)
	Water and Sanitation (0.33)	Access to Drinking Water (0.5)
		Access to Sanitation (0.5)
Ecosystem Vitality (0.6)	Water Resources (0.25)	Wastewater Treatment (1)
	Agriculture (0.05)	Agricultural Subsidies (0.5)
		Pesticide Regulation (0.5)
	Forests (0.1)	Change in Forest Cover (1)
	Fisheries (0.1)	Coastal Shelf Fishing Pressure (0.5)
		Fish Stocks (0.5)
	Biodiversity and Habitat (0.25)	Terrestrial Protected Areas (National Biome Weights) (0.25)
		Terrestrial Protected Areas (Global Biome Weights) (0.25)
		Marine Protected Areas (0.25)
		Critical Habitat Protection (0.25)
	Climate and Energy (0.25)	Trend in Carbon Intensity (varies according to GDP)
		Change of Trend in Carbon Intensity (varies according to GDP)
Trend in CO <sub>2</sub> Emissions per KWH (0.33)		

Source: Author's compilation on the base of 2014 Environmental Performance Index (2014 EPI) – Backcasted Indicator Scores (<http://epi.yale.edu/downloads>), where

\* These weightings do not reflect a preference for Ecosystem Vitality over Environmental Health, but rather reflect the underlying variance of the scores to achieve a 50-50 correlation of each objective score to the overall EPI score.

\*\* Weightings may vary depending on whether an indicator is included for a country

EPI is finally calculated according the formula: **EPI = sum (xi\*ai)**, where  $x_i$  – a norm-based score,  $i$  – an indicator of state,  $a_i$  – the weight of score (according to Table 2). The norm-based score calculation is realized according the formula:

$$x_i = \frac{r_i - d_i}{r_i},$$

where  $r_i$  – the difference between the best and the worse value of the score in the whole list of states;  $d_i$  – the difference between the best value of score in the list of states and the fact value of the score for the  $i$ -th state.

This approach to the integral index of environmental security calculating is characterized by absolute transparency and scientific validity. After EPI assessment the country is assigned in one of 5 groups: the strongest, strong, moderate, weak and the weakest according to its environ-

mental protections. In 2012 the largest index of environmental safety was calculated for Switzerland (76.7), Latvia (70.4) and Norway (69.9), the worst environmentally protected countries were Uzbekistan (32.2), Turkmenistan (31.8) and Iraq (25.3). Ukraine took 102<sup>nd</sup> place among 132 countries in the world and belongs to the fourth group of countries with the weak environmental protection. In 2014, with the score 49.01, Ukraine came to the 95<sup>th</sup> place out of 178 states that can be considered as an increasing tendency for the last 10 years (<http://epi.yale.edu/epi/country-profile/ukraine>). The trend of EPI estimations according to the mentioned methodology is stable and slightly increasing (Fig.1). However this slowing scribing trend looks low-speeded for moving in next "league" and the time series forecast allows only **49.57** scores if the tendencies stay same.

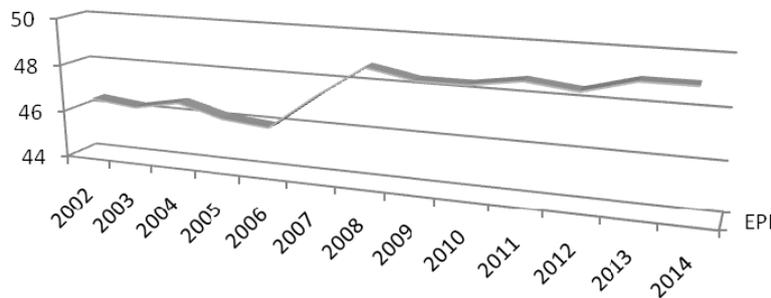


Fig. 1. EPI dynamics in 2002-2014 for Ukraine

Source: author's compilation on the base of <http://epi.yale.edu/epi/country-profile/ukraine>

Next rather famous methodic that should be mentioned is the approach of russian economist Sizova A. [16]. As the integral indicator of the ecological security index she suggests the using of the economic damage assessment based on the amount of usage and restoration of natural resources. Each component includes a number of environmental safety indicators (Fig.2). According to this approach, the integral index calculation formula is as follows:

$$I = \frac{\sum_{i=1}^n Y_i \cdot U_i}{\sum_{i=1}^n y_i \cdot u_i},$$

where  $Y_i$  –  $i$ -th natural resource damage assessment after the remediation activities;  $U_i$  – amount of  $i$ -th natural resources usage after the remediation activities;  $y_i$  –  $i$ -th natural resource damage assessment till the environmental protection activities;  $u_i$  – amount of  $i$ -th natural resources usage till the remediation activities.

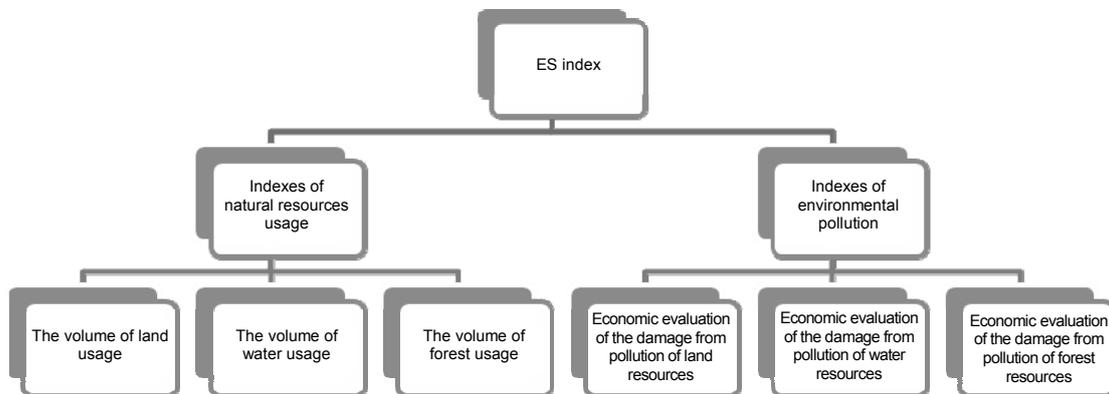


Fig. 2. Compounds of economic assessment of ES

Source: author's compilation on the base of [16]

Despite the objective simplicity of the assessment technique, the main disadvantage of Sizova's method is that environmental security is considered only as an object of economic management, depending on the implemented environ-

mental measures without taking into account other groups of factors that directly or indirectly affect the environment.

As to Ukrainian experience in ES evaluations, the observation of the environment and its level of pollution in

Ukraine are declared in the Article 20 and 22 of the Law of Ukraine "On Environmental Protection" [17]. There is no single approach to the integral environmental assessment. It should also be noted that the Cabinet of Ministers approved the list of indicators of economic and food security however the environmental component is missing there. However, the scientific dissertations and researches are quite often devoted to the idea of the consideration of the ES assessment from different fields, but mostly from economic point of view [18]. The most advertized in Ukraine is the research of scientists who work in the environmental and technological safety department of the National Institute for Strategic Studies under the President of Ukraine. They suggested distinguishing of indicators of the environmental security within such six components [19]:

- *Air resources* (emissions of carbon dioxide; emissions of nitrogen dioxide; density of emissions of ozone-depleting nitrogen oxides; greenhouse gas emissions, per capita; emissions of pollutants from stationary and mobile sources; reducing of emissions of pollutants into the air after the implementation of security measures, thous. t / %);

- *Land resource* (the level of cultivated land (%); the level of land degradation (% of total land area); the share of natural grasslands in the total area of agricultural land (%); disturbed lands; lands that are worked out);

- *Water resources* (GDP water containing (cubic meters / 1000 USD); public access to the safe drinking water (%); the proportion of recycled water used consistently in total water usage for industrial needs (%); polluted wastewaters without treatment into surface water objects; the general usage of groundwater (%); the rate of loss of water from sewerage network (%); the level of maintenance with treatment facilities (%); the degree of wear of water supply and sewage networks (%); scale of flooded areas);

- *Forest resource* (the level of forestation state (%); the level of restoration of forests (%); the proportion of protected areas (%); the level of natural forest regeneration (%));

- *Waste treatment* (the amount of waste generated per capita (t); the amount of hazardous waste (t); the level of waste disposal (%); accumulation of wastes (%); the level of recycling waste usage (%));

- *Economic component* (public expenditures on environmental protection, in % to GDP; resource capacity of the economy (consumption of natural resources per unit of gross value added); energy intensity of GDP (kg of fuel / USD); investments in fixed assets intended for the construction and reconstruction of environmental protection facilities, purchase of equipment for the implementation of environmental treatment, % of GDP; the level of economic losses of natural and man-made disasters, in % of GDP).

Latter approach has a strong positive sense because of the structuring of ecological safety on separated elements that improves the perception of ES index. However, within this methodology there is not designed the apparatus for the regulation and determination of weighting coefficients for the given parameters, making this method impossible to use in practice objectively.

The reprehensive results of the ES index internal sense and perception can be seen in the methodic approach of Ukrainian scientists G. Obikhod and T. Omelianenko [20]. They determine in structure of the integral index of environmental safety indicators within 7 components:

- the atmosphere (18 indicators),
- water (30 indicators),
- land (10 indicators),
- forests (12 indicators),
- minerals (7 indicators),
- exogenous geological processes (22 indicators),

- waste (18 indicators).

Using classical assessment technique (normalizing of indicators, weighting and liner cumulative assessment) they proposed to determine the weighting coefficients by using the method of principal components, which transforms m-dimensional attributive space in p-dimensional space of components. Thus, the main component of the relationship between the primary features and components is described as a linear combination:

$$y_{ij} = \sum_j^m c_{ij} \cdot G_j,$$

where  $y_{ij}$  – the standardized meaning of i-th attribute with the single variances;  $c_{ij}$  – the contribution of the j-th component in the total variance of the set of indicators of i-th sphere. Components of  $G_j$  as well are represented by linear combination:

$$G_j = \sum_j^m d_{ij} \cdot x_{ij},$$

where  $d_{ij}$  – load factors;  $x_{ij}$  – normalized values of indicators. So, the calculation of the integral index of ecological safety of individual components  $A_{ij}$ , taking into account the weight coefficients of each of the indicators included in the group, based on a formula:

$$A_j = \frac{\sum_i^n b_{ij} \cdot x_{ij}}{n},$$

where  $b_{ij}$  – the corresponding weight coefficient;  $x_{ij}$  – the normalized value of indicators;  $n$  – the amount of indicators in j-th block. While corresponding weight coefficient  $b_{ij}$  is calculated like:

$$b_{ij} = \frac{c_{ij} \cdot |d_{ij}|}{\sum_j^m c_{ij} \cdot |d_{ij}|}$$

Finally the assessment of the aggregate indicator of ES is as follows:

$$I = p \sqrt[p]{\prod_{j=1}^p A_j},$$

where  $A_j$  – the aggregated indicator of the ecological security of j-th component;  $p$  – amount of components.

Practical results of G. Obikhod and T. Omel'yanenko for Ukraine on 2012-2013 years gave the evidence that after analyzing the weights of each group in the structure of ecological security, one can conclude the most affective to the level of environmental safety. Thus, the largest share belongs to the block "bowels/minerals" (23.9%), followed by the block "air/atmosphere" – 20.1%. "Land resources", "forest resources", "waste" and "water resources" range from 10 to 15% in the total environmental safety. So the method highlights the environmental insecurity of subsoil/bowels usage at the present.

In the result of the literature analyses of the main approaches to the calculation of the integral index of environmental security, it can be concluded that the best methodology of calculation is a concept developed by Yale University (USA), which objectively describes and evaluates the environmental condition of the states and the world.

In Ukraine, unfortunately, there is still not carried out a comprehensive assessment of environmental safety and there is no single environmental monitoring system. Latter mentioned scientists and other scholars have laid the foundation for further solving problems of ecological safety [20]. However, analysis of the various aspects "research-intensity" in the scientific direction "Environmental Security" indicates terminological uncertainty, general and declarative nature of most proposed methods of ES; the process

of a comprehensive approach that takes into account a wide range of components of hazards; in most cases domination by non-technical and economic methods of regulation of the ES; practical application of the developed concepts and models of limited information indeterminacy, etc. Environmental safety, of course, requires more in-depth development and methodological aspects of the theory, elaboration of scientific basis of management based on thorough research process and formation of conditions of the threats to be clarified, detailed conceptual and terminological apparatus, etc. The first priority for Ukraine should be the development of scientifically sound threshold values of environmental safety, the necessity of developing a common methodology for calculating the cumulative index at the national level.

**Results.** The latter analysis allows us to pass to the next phase of the study, namely to the realization of eco-

nomical and mathematical assessment of the environmental security of Ukraine. Having regard to the conclusions drawn in the methodological section of the manuscript, it is necessary to determine the integral indicator of ecological security of both the national and regional levels with the idea to analyze current environmental situation in Ukraine.

We offer our own method of calculation of ES index. Assume:  $a_j$  – the weight of  $j$ -th component of environmental security;  $a_i$  – the weight of  $i$ -th indicator within the  $j$ -th component of environmental security. In Table 3, there are drafted the components of environmental security, basic indicators within the components, weights and impact of  $i$ -th indicator on the environmental security, where "+" denotes the positive (stimulating) effects on the ecological safety, "-" – negative (de-stimulative), respectively. In our approach we tried to compile and account positive and grounded sides of all ES techniques that were analyzed.

**Table 3. Integral ES index for Ukraine: assessment technique elements**

№	ES components	$a_j$	Indicator	Impact on ES	$a_i$
1	Air resources	0,19	The amount of pollutant emissions, thous.tons	-	0,5
			Emission of CO <sub>2</sub> , thous.tons	-	0,5
2	Land and forest resources	0,19	Lands plowed, %	-	0,4
			Reproduction of forest hectares, thous.h	+	0,4
			Reserves and national parks, thous.h	+	0,2
3	Water resources	0,19	Removed water from natural water objects, mln.cubic meters	-	0,3
			Contaminated water resources, mln.cubic meters	-	0,4
			Power treatment plant, mln.cubic meters	+	0,3
4	Waste treatment	0,19	Generated, tous tons	-	0,3
			Disposed (revised), thous.tons	+	0,4
			Removed in designated areas, thous.tons	+	0,3
5	Environmental policy	0,15	The costs of environmental protection,% of GDP	+	1
6	Energy security	0,09	Index of energy security	+	1

Source: author's compilation

Normalization of values is according:

- for stimulators:  $z_i = \frac{x_i - \min(x_i)}{\max(x_i) - \min(x_i)}$ ;
- for de-stimulators:  $z_i = 1 - \frac{x_i - \min(x_i)}{\max(x_i) - \min(x_i)}$ ;

where  $z_i$  – the normalized  $i$ -th value;  $x_i$  – the  $i$ -th indicator of ES; max and min are taken for the whole analyzed period.

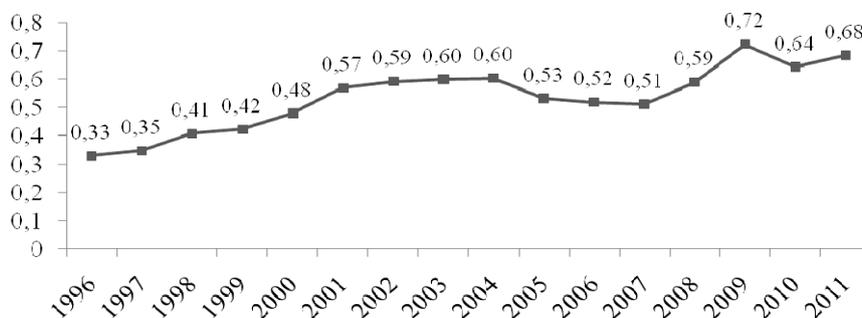
Within each component of ES the index is calculated using the formula:

$$I_j = \sum_{i=1}^n a_i \cdot z_i,$$

where  $I_j$  – an index of  $j$ -th component of ES. And finally, the integral index of ES we propose to calculate according the formula:

$$I = \sum_{j=1}^6 a_j \cdot I_j.$$

The proposed technique is easy in interpretation if so: ES index can range from 0 to 1, then "0" describes the state of the worst environmental security, "1" – the best, correspondingly. Fig. 3 demonstrates the calculated dynamics of ES for Ukraine in the period from 1996 to 2011 [21].



**Fig.3. Integral index of environmental security of Ukraine.**

Source: authorial calculations on the base of data [22-24]

Fig. 1 and 3 provide the same increasing trend of enhancing the ES in the state. From 1996 to 2004, the level of ES of Ukraine gradually improved, but in 2005, the index

began to decline due to the negative trend of increasing emissions of harmful materials (from 2005 index of air began to decrease and reached its minimum in 2007) and the

environmental degradation of water resources. The index continued to decrease until 2007. From 2007 till 2009 there is an increase in the ES index due to the decrease in carbon dioxide emissions, a significant improvement of water resources and increase in forest reproduction. In 2010 the ES index decreasing can be explained with a slight deterioration of all components of environmental security.

To prove the universal and appropriate properties of our technique we implement it for cross-state analyses of ES. To compare environmental security of Ukraine and other countries, it was decided to choose country – geographical

neighbors of Ukraine, at that two of the European Union (Poland and Hungary) and two CIS countries (Russia and Belarus). However, we meet the challenge as the system of indicators, which is provided in Table 3, designed to meet the Ukrainian statistical features reporting on the state environment. Each country has its own characteristic statistical reporting indicators of environmental safety, thus we developed a special list of indicators (Table 4), which includes statistical data common to all countries and free available in public access (web-site of the World Bank [22]). In other moments the method keeps same as latter said.

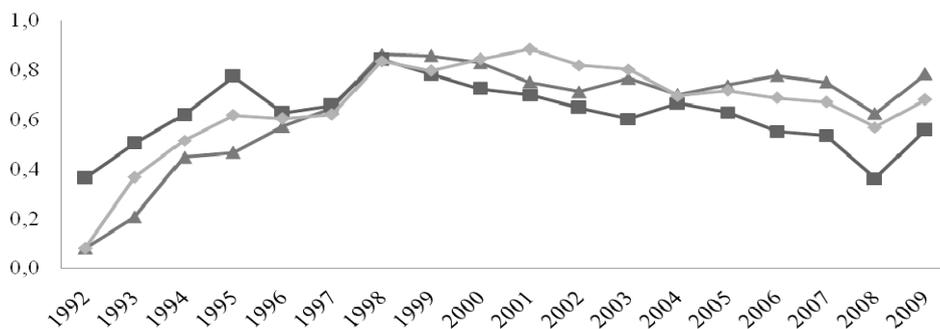
**Table 4. Integral ES index: cross-countries assessment technique indicators**

Indicator	Weighting coefficient
Disposed wastes per capita, kg	0,2
Greenhouse gas emissions in equivalent CO <sub>2</sub> per capita, tons	0,4
Electricity generation by renewable energy resources,% of total	0,2
The level of land degradation,% of total area	0,2

Source: author's compilation

Applying the authorial technique we received the dynamics of the calculated ES indices for Ukraine and CIS countries (Fig. 4). Comparing the environmental security line for Ukraine with the selected CIS states one can agree the fact

that between 2005 and 2009 the environmental protection of Ukraine appeared to be stronger. The worst level of environmental safety in recent years shows Russia that caused by a significant increase in carbon dioxide emissions.

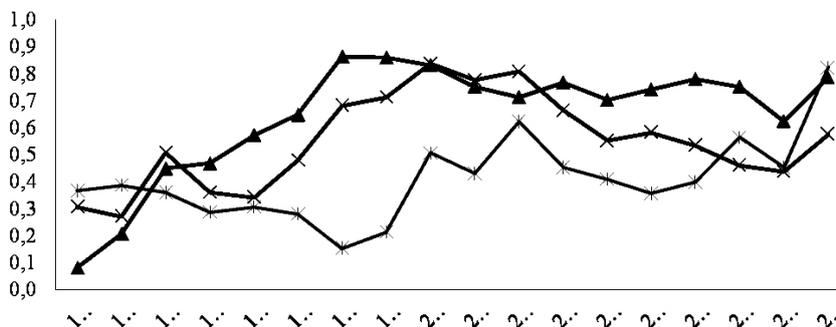


**Fig. 4. ES index for Ukraine and CIS states, where blue line – for Ukraine, red line for Russia and green line – for Belorussia**

Source: author's calculations

Fig.4 shows the calculated values of the ES indexes of Ukraine and the selected EU states. So, we can result that between 2003 and 2008 years the environmental security of Ukraine was better than in Poland and Hungary, this can

be explained by the fact that Ukraine has a better situation with waste management and much larger proportion of power generation by renewable energy – 7%, in comparison with Poland – 1,6% and Hungary – less than 1%.



**Fig. 5. ES index for Ukraine and EU states, where blue line – for Ukraine, violet line for Poland and yellow line – for Hungary**

Source: author's calculations

Beside the positive tendencies in ES index for Ukraine (Fig. 3-5) there are claims that Ukraine is not homogenous in the sense of environmental pollution, and so the security & protection [22; 25-27]. Unbalanced structure and distribution of capacities, diverse character of implemented technologies and production in the regions of Ukraine makes

relevant the analysis of the environmental situation of the state in terms of its structural elements – regional sliding. We implemented latter described mathematic technique to the adjusted system of indicators and weights at the level of Ukrainian regions (Table 5).

Table 5. The system of indicators of ecological safety of Ukraine's regions.

№	Показник	Weighting coefficient*
1	Emissions per capita, kg	0,105
2	Emissions of CO <sub>2</sub> per capita, kg	0,07
3	Deforestation per 1 sq.km, cubic meters	0,07
4	Park zones per 1 sq.km, hectares	0,035
5	Reproduction of forests per 1 sq.km, cubic meters	0,07
6	Disposed (recycled) wastes, % of generated	0,14
7	Removed pollutants in designated areas and facilities, % of generated	0,105
8	The use of secondary raw materials and waste production, % of generated	0,105
9	The agricultural land, % total lands square	0,06
10	Plow land, as % of total area	0,09
11	Extraction of groundwater per capita, cubic meters	0,05
12	The number of environmental measures	0,1

\* received on the basis of correlation analyses  
Source: author's compilation

Thus integral index of environmental security was calculated using the formula:

$$I_j = \sum_{i=1}^{12} a_i z_i,$$

where I<sub>j</sub> – an index of ES of j-th region of Ukraine; a<sub>i</sub> – a weighted coefficient of i-th indicator; z<sub>i</sub> – a normalized i-th indicator.

Application of mentioned approach resulted in the following picture of regional distribution according to the level of ES index.

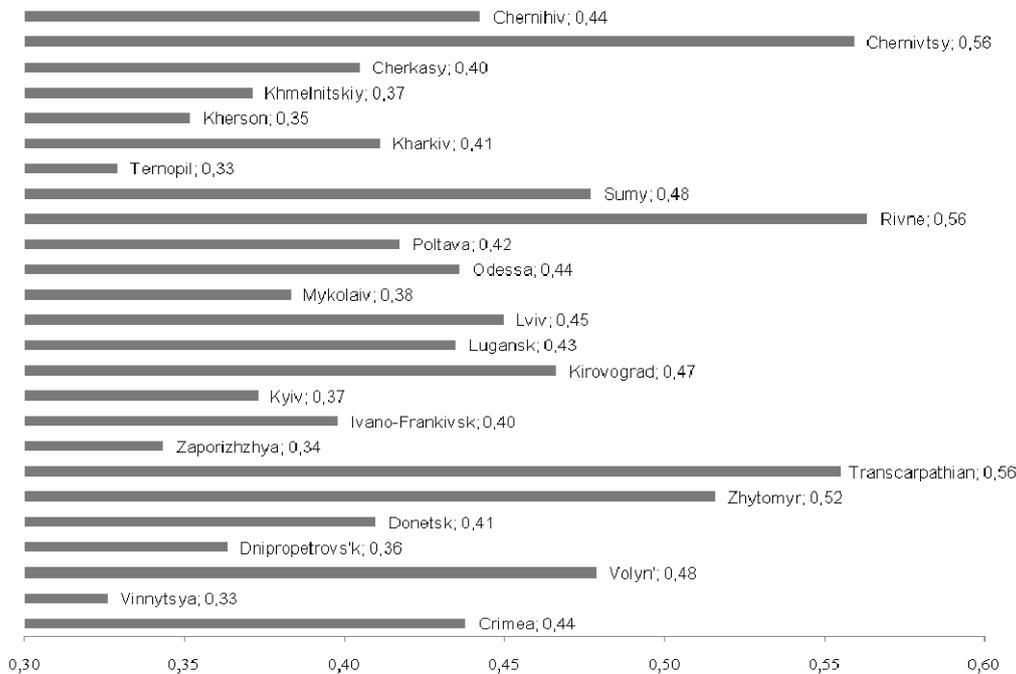


Fig. 6. Integral index of regional ES for Ukraine, dated for 2013 year (Region name, ES index value)

Source: author's calculations on the base of statistical data [23; 28-29]

The integrated assessment can be interpreted in the defining of 5 classes of regional environment in Ukraine (Table 6).

Table 6. Environmental security of Ukrainian regions: classes

ES index	Class and state of ES	Regions
More than 0,55	favorable	Rivne, Chernivtsy and Transcarpathian regions
[0,45;0,55)	satisfactory	Zhytomyr, Volyn', Sumy, Kirovograd regions
[0,4;0,45)	stiff	Lviv, Chernihiv, Odessa, Lugansk, Poltava, Kharkiv, Donetsk and Cherkasy oblasts and the Autonomous Republic of Crimea
[0,35;0,4)	critical	Ivano-Frankivsk, Mykolayiv, Kyiv, Khmelnytsky, Dnepropetrovsk, Kherson regions
Less than 0,35	catastrophic	Zaporizhzhia, Ternopil, Vinnitsya region

Source: author's compilation

So, Rivne, Chernivtsi and Transcarpathian regions are characterized with good level of environmental security. For example, Rivne region is characterized by the largest in Ukraine waste disposal in designated areas (17% of total

wastes) and is the second, after the Chernivtsy region, in terms of the small emission of pollutants per person. Chernivtsy region also leads in the use of recycled materials and waste production (91% of secondary wastes used

in the production process). The most environmentally hazardous appeared to be Zaporizhzhya, Vinnitsa, Ternopil regions. Zaporizhzhya region produces the largest amount of waste over the state and utilizes it in the lowest rate (utilized only 1% of the total wastes generated). Ternopil region is characterized by the lowest number of implementing environmental measures. As to this indicator, the leader is the Donetsk region (151 environmental activities per year), the companies of the region emit in the air the largest volumes of pollutants (395 kg per person per year). However, particularly CO<sub>2</sub> emissions are the highest for Ivano-Frankivsk region (5.8 tons per capita per year).

**Conclusion & Discussion.** Thus, in this paper we attempted to analyze environmental security as a combination of certain properties of the environment and created purposeful human activity conditions under which with the certain economic and social factors the risks of human exposure and adverse changes occurring in the environment can be kept at the lowest possible level. The existence of three levels of environmental security (global, regional, local) requires effective management at each of them in order to achieve comprehensive protection of the environment and humans. Environmental threats and crises that exist in the world today and Ukraine claim about the issue of environmental security, not only at national, but also at the global level. Detailed consideration of these issues is particularly relevant to the present history of the world and Ukraine, particularly.

In the paper we attempted critically to compare as the broadly-circled definitions of ES but as well the main approaches to the calculation of the integral index of environmental safety. The best methodology of calculation is resulted to be a concept developed by Yale University (USA), which objectively describes and evaluates the environmental condition of a state and the world generally. Ukraine according to this methodology belongs to the group of countries with weak environmental protection that highlights the necessity of domestic investigations devoted to this topic more intensively. In Ukraine, unfortunately, a comprehensive assessment of environmental safety is not carried out and there is no single environmental monitoring system. The first priority for Ukraine to ensure the safety of the environment should be the development of science-based and uniform methodology for calculating the integral index of environmental safety. Thus, in this research the method of calculating of the integral index of environmental security of Ukraine was proposed with the accounting of positive and negative features of known separate techniques and researches. The calculations of the ES integral index for Ukraine had shown that since 2007, we note the positive increasing trend in the ES index and its maximum value in 2009 – 0.72. But it should be also stressed the fact of a slight drop in the index dynamics in 2010, followed by growth of 0.08 in 2011 to 0.68. The comparative analysis of the environmental safety of Ukraine with the selected EU countries (Poland and Hungary) and CIS countries (Russia and Belarus) had found that in the period 2005 to 2009 the value of the integral index of environmental security of Ukraine is better than in selected countries. The proposed system of indicators for ranking of regions of Ukraine in aspect of the environmental security provided the reasons to believe that the most favorable ecological situation have

Rivne, Chernivtsi and Transcarpathian region, and as disastrous are depicted Zaporizhzhya, Vinnitsa, Ternopil regions.

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Надійшла до редколегії 25.06.14

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#### ЕКОЛОГІЧНА БЕЗПЕКА: ІНТЕГРАЛЬНА ОЦІНКА (НА ПРИКЛАДІ УКРАЇНИ)

Екологічна безпека є актуальним питанням в розрізі оцінки національної безпеки кожної держави і світу в цілому. Відсутність універсальності у визначенні самого терміну, не кажучи вже про техніку оцінки рівня екологічної безпеки, стимулює дослідників до розробки та удосконалення методів і підходів оцінки інтегрального індексу екологічної безпеки на рівні країни та її регіонів. До головних наукових результатів даного дослідження належать такі: враховуючи аналіз сильних та слабких сторін широко відомих технік та

підходів до оцінки екологічної безпеки в світі та в Україні, запропоновано власний підхід до обчислення інтегрального індексу екологічної безпеки України та її регіонів з опцією міжкраїнного порівняння; розраховано інтегральні індекси екологічної безпеки України за період з 1996 по 2013 роки; здійснено порівняльний аналіз стану екологічної безпеки України та інших країн світу; сформовано систему показників для ранжування регіонів України за станом екологічної безпеки.

Ключові слова: екологічна безпека, оцінка, Україна, інтегральний показник.

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### ЕКОЛОГИЧЕСКАЯ БЕЗОПАСНОСТЬ: ИНТЕГРАЛЬНАЯ ОЦЕНКА (НА ПРИМЕРЕ УКРАИНЫ)

Экологическая безопасность является актуальным вопросом в разрезе оценки национальной безопасности каждого государства и мира в целом. Отсутствие универсальности в определении самого термина, не говоря уже о технике оценки уровня экологической безопасности, стимулирует исследователей к разработке и совершенствованию методов и подходов оценки интегрального индекса экологической безопасности на уровне страны и ее регионов. К главным научным результатам данного исследования относятся: учитывая анализ сильных и слабых сторон широко известных техник и подходов к оценке экологической безопасности в мире и в Украине, предложено авторский подход к вычислению интегрального индекса экологической безопасности Украины и ее регионов с опцией межгосударственного сравнения; рассчитано интегральные индексы экологической безопасности Украины за период с 1996 по 2013 годы; осуществлен сравнительный анализ экологической безопасности Украины и других стран мира; сформирована система показателей для ранжирования регионов Украины по состоянию экологической безопасности.

Ключевые слова: экологическая безопасность, оценка, Украина, интегральный показатель.

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 66-72

УДК 330.341  
JEL Q01

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### ORGANIC PRODUCTION IN UKRAINE: PROBLEMS AND PROSPECTS IN CONTEXT OF SOCIAL ORIENTED ENTREPRENEURSHIP

Practical realization of sustainable development general conception is passing to the organic production, that allows to satisfy society problems, not putting health and future generations' existence under a threat. At this entrepreneurs, which work in the consumer products' field, must displace accents from economic oriented to social oriented entrepreneurship. The article is dedicated to research negative and positive factors that influence on social oriented Ukrainian enterprises in the sphere of organic goods production. The special attention is attended to the analysis of foodstuffs producers' activity, the results of which have considerable direct influence on consumers' health. The value of informative influences on consumers and producers is analyzed. State support directions of organic goods production, creation of internal market ecologically safe products infrastructure are defined. Recommendations are given according to research results in relation to stimulation social responsibility of businessmen and model forming, which combines interests of consumers and producers, environmental preservation, population health refinement and ecological situation improvement.

Keywords: sustainable development, social oriented entrepreneurship, organic product, organic production.

**Introduction.** Today our world is an environment where innovations continuously are inculcated and realized. Without new products it is impossible to imagine modern life. In this connection businessmen aim to be creative and innovative, because it has become a necessary operating condition at the market. However it should be mentioned that consumer economics brought to changes of climatic terms and various cataclysms, that, in turn, are accompanied by considerable human and economic losses. For this reason entrepreneurship development must take into account conception of sustainable development, that consists in the necessity of balance establishment between satisfaction of contemporary humanity necessities and defence of future generations interests, plugging their requirement in a safe and healthy environment.

Problem of clean environment and healthy life-style is actual enough nowadays among overwhelming majority of Ukrainian population. Such situation was caused by worsening quality of both agroproducts in connection from application a great amount of chemical and mineral fertilizers for productivity increase and harmful influence on people health various foodstuffs through content in them unavailing and dangerous ingredients. In fact meal consumption is the necessary condition of full life and high level of capacity. For this reason businessmen that deal with food field must displace accents from economic oriented to social oriented entrepreneurship.

The problems of research social oriented entrepreneurship and sustainable development are described in numerous scientific works by foreign researchers such as

J.-M.Fortier, B.Huber, A.Lejzerovich, U.Niggli, T.Perris, R.Wiswall [1-2]. Among the Ukrainian specialists it is possible to name such, as Z.Galyshka, I.Komarnutskyi, S.Doroguntsov, V.Tregobchuk. To the range of organic production problems are engaged S.Antonec, M.Artush, S.Begej, N.Berlach, V.Gudz, V.Vovk, V.Kisil, M.Kobets, U.Manko, V.Pundys, I.Prumak, M.Rubak, V.Rekynenko, O.Hodakivska, M.Shukyla, I.Shyvar. Role and place of organic production at realization sustainable development main provisions as eurointegration terms and food safety of Ukraine are reflected in researches [3-6], basic factors of global and national levels, which stimulate and restrain development of organic industry in Ukraine are defined in works [7-9].

However questions of organic production development in the context of social oriented domestic entrepreneurship are remained not enough investigated. The modern stage of society development needs elaboration and introduction a new Ukrainian economy model, that envisages combination of consumers interests and products' producers, environmental preservation, improvement of population health and refinement of ecological situation. Organic production in most researches is justly bound to the production of agricultural goods. However organic products are not only foodstuffs. We can also take the wide spectrum of consumer goods, such as cosmetic, clothing, furnitures, hygiene goods and others like that. Therefore the question of input social responsibility touches not only agroproducers, it embraces the representatives of different entrepreneurial activities, a lot of spheres of national economy and must be investigated complex and system.

An aim of the article is research of Ukrainian enterprises in sphere of organic goods production as a display of social oriented business and give recommendations in relation to stimulation entrepreneurship social responsibility and forming a model that combines interests of consumers and producers.

**Relationship between sustainable development and social oriented business.** Long time there was a widespread idea in Ukrainian society, that home products are useful and safe. However statistical data of the last years testify increasing population morbidity on cancer, circulation of blood system, skin illness, increase amount of in-born anomalies (table 1). Presently almost twice as much as compared to 90th register the cases of malignant new formations, violations in circulation of blood system, defects of development. Important reasons of such negative situation are worsening of environment and also qualities of consumer products, which are used by a person. In turn, it assisted distribution of sustainable development conception among all layers of population, in fact all begin to aim to surround itself safe and useful products the production of that does not harmful for environment.

Sustainable development conception envisages concordance three basic components of society development: economic, ecological and social. Coming out from this conception, modern enterprise needs to function a thus, that its activity brings not only profit, but also benefit to society.

Thus activation of social oriented is very necessary and important constituent of further entrepreneurship development, that will assist providing sustainable development in country on the whole. Using the newest scientific and administrative developments gives an opportunity to design, count economic processes, envisage risks, forecast future socio-economic consequences, choose the most optimal variant of actions, not to harm to environment. The social oriented entrepreneurship shows up in social responsibility, that expects the honest business, observance of labour legislation, consumers' protection and responsible relation to environment problems.

Research results of domestic enterprises activity lead to conclusion, that in most cases attention paid only to one component of sustainable development conception. Thus, questioning of respondents from different Ukrainian regions in relation to the presence of social programs on enterprises, where they work, shows next results [10].

Except the main activity, only 50% Ukrainian enterprises engage in social programs realization of different degree scale. Often attention is concentrated only on charity (28% polled enterprises), a bit less is on employees' social defence (22%). Less attention is spared to social infrastructure development (17%) and projects directed to the improvement of ecological situation (14%). Such data testify about incomprehension of importance observance sustainable development conception by businessmen.

Table 1. Dynamics of population morbidity indexes in Ukraine

Index	Years											
	1993	1997	2000	2003	2005	2006	2007	2008	2009	2010	2011	2012
Amount of first registered cases: New formations, on 1 million of general population	6355	6848	7728	8229	8629	8822	8725	8755	8820	9094	9240	9489
Illnesses of circulation of blood system, on 1 million of general population	27027	29458	47299	49705	51395	51801	52245	53437	52510	51999	51247	50795
Inborn anomalies, deformations and chromosomal violations, on 1 million of population from 0 to 14 from years	4947	5325	7061	7134	7582	7835	7720	7845	8029	8020	8467	8268

Source: expected by authors from data <http://www.ukrstat.gov.ua/>

The special place in research questions of social oriented entrepreneurship belongs to foodstuffs' producers, in fact the results of their activity are directly related to influence on consumers health. "We are what we eat", – the well-known ancient Greek doctor Hippocrates said. His wisdom have not lost actuality today.

Imperfection of legislative base and absence of strict control lead to inobservance norms of content hazardous substances for people's health in most food products. It touches as traditional components of foodstuffs, for example, salt, that in Ukrainian bread twice as much than World Health Organization (WHO) recommends, so such dangerous ingredients, as trans-fats and artificial ingredients of synthetic origin. For example, cacao oil is changed on trans-fats in candies of some home producers, as a result their prime price diminishes in 20-25 times. Trans-fats – the worst allowed food component of modern meal, that predetermines inflammation of vessels, increase thrombus formation in them, extends the risk of atherosclerosis considerably [11].

At the market of foodstuffs there is an increase of "unhealthy" products suggestion such, as sausages, pastry wares, sweet carbonated drinks, chips, dried bread. It costs to mark that these products have high demand sufficiently, in fact producers advertise actively them, encouraging people to purchase. Also population do not have motivation to feed correctly. Reason is ignorance of dietology bases and lack of information in relation to harmful influence of "unhealthy" products on the adults and especially children organism. As a result, in Ukraine excessive body weight

have 51,8% adult population. For comparison, the least prevalence of obesity among the European countries – in Switzerland, Austria, Denmark, Sweden, Italy, Holland, Romania, most – on Malta and in Czech Republic. Specialists, analyzing the problem of excessive body weight in the USA, paid attention that excessive weight and obesity have mainly Americans with low level of income and education. Among well-educated people with high level of income excessive body weight is observed only in 20% persons. In other words there is a necessity for informing population about negative influence of certain products and encouragement to the healthy life-style. It can be useful experience of Great Britain. Program "Change for the sake of life" operates in the country. Television constantly translates video tapes that propagandize healthy eating : "Shorten the consumption of fat", "Watch after the amount of salt in foodstuffs", "Consume 5 various vegetables and fruit per day", "Throw out products that contain much sugar". Only on the division of "feed", according to this program, in Great Britain 1 milliard pound sterling is distinguished on a year [11].

However many Ukrainian families aim to conduct the healthy life-style, to feed correctly, to be ecologically conscious. Exactly on such consumers are oriented ecologically clean products producers. Some businessmen offer quality, safe and useful products, the production of which inflict minimum losses to environment or are harmless in general. Market has provided appearance of certificated production process, in that it is forbidden to use chemically synthesized fertilizers and facilities of plants defence, hor-

mones and antibiotics, genetically modified organisms (GMO), synthetic flavours, preservatives, dyes, others like that and also properly marking products – organic.

Practical realization of sustainable development general conception is passing to the organic production, that allows to satisfy society problems, not putting health and existence of future generations under a threat.

**Organic production as trend of social oriented business.** The idea of organic production (Organic farming) consists in complete abandonment from application GMO, antibiotics, toxic chemicals and mineral fertilizers. It results in increasing natural biological activity in soil, proceeding in balance of nutritives. Renovative properties increase thus, work of living organisms is normalized, increase humus, and as a result increase productivity of agricultural points.

The result of organic production are ecologically safe products without GMO and unusual to the foodstuffs chemical elements. An organic production is now inculcated in more than 150 countries of the world, under it over 37 millions hectares are taken.

As demonstrates undertaken study, the idea of organic production spreads in Ukraine, where organic motion development is engaged by such organizations among them are Organic Federation of Ukraine, Association "Clean Flora", Association "Poltava-organic", International Public

Assosiation of bioproduction participants "BIOLan Ukraine", Club of organic agriculture, Union of organic agroproduction participants "Natureproduct" and some other.

In 2007 it was created the first Ukrainian accredited certification organ "Organic standard" [12] that conducts the certification of organic production in Ukraine.

In general, organic motion arose up in Great Britain in 40th of XX century. Then term "organic" was first used in scientific work of well-known woman-agriculturist and scientist Eve Balfour "Living earth" [13]. Also the necessity of sustainable development is reflected in this work, attention is concentrated that person blights nature as a result of out-of-control activity development, and it can be an inevitable catastrophe for all humanity. In 1972 there was founded one of the biggest and most considerable organization in the world International Federation of Organic Agricultural Movements (IFOAM) [14], that unites participants from more than 100 countries.

In Ukraine in 2012 counted already 164 certificated organic farms, and the general area of the certificated organic agricultural earth laid down 278 800 hectares [15]. Data for 2002-2011 demonstrate stable development of organic production. For ten years (2002 – 2012) the amount of farms increased in 5,3 times, and the area of agricultural earth grew on 70% (table 2).

**Table 2. Dynamics of indexes that characterize development of organic production in Ukraine**

Index	Years									
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Area of the agricultural earth taken under an organic production, hectares	164449	239542	240000	241980	242034	249872	269984	270193	270226	270320
Amount of farms, that engage in the production of organic goods, units	31	69	70	72	80	92	118	121	142	155
Middle size of farms that engage in the production of organic goods, hectares	5305	3472	3429	3361	3025	2716	2288	2233	1903	1744

Source: www.organic.com.ua

Analysing the indexes of table 2, obviously, that, at the same with the dynamic increase amount of farms and earth taken under an organic production, the middle area of one organic certificated farm in the last years diminished from 5305 in 2002 to 1744 hectares in 2011. It is foremost related to specialization of farms expansion of products assortment that produced (fruit and vegetables) by them, and also bringing in to the organic production less after area farms. Such tendency is a positive step to the social orientation entrepreneurship, as possibility appears to work for small and middle farms in this segment. In turn, it creates terms to market entry for small producers that offer quality and well-known organic products in a certain region. The owners of such productions open small brandname stores, where the complete assortment of products is presented. Such method of sales organization is effective, because in consumers consciousness these products are associated as more useful and more fresh. Main advantage is products delivery directly from production to brandname store without mediators.

The most Ukrainian organic farms are located in Vinnyts'kiy, Zakarpat's'kiy, L'vivs'kiy, Odes'kiy, Poltav's'kiy, Ternopil's'kiy, Kherson's'kiy, Khmel'nyts'kiy origins.

It is necessary to mark that organic production answers conception of sustainable development, in other words in the process of economic activity economic, ecological and social effects are arrived. They consist in the following:

- economic – predefined by the willingness of consumers to pay a bigger price for organic products, cost lowering of material resources (agrochemicals and fuel-lubricating materials from 30 to 97%). At the same time, this direction needs considerable investments for production, also prime cost grows through the decline of productivity in a conver-

sion period [16] and in case of not high level of soils' fertility, natural productivity of animals and seeds;

- social – predefined by the considerable volume of hand labour that does possible an organic production for small agricultural producers with own labour. For example, in France, where 4,5% farms and 3,6% agricultural earth are organic, in organic farms are hired 2,4 average annual workers, while in traditional – 1,5 [17];

- ecological – predefined by gradual renewal of landed resources quality, brought over to the production process through the observance of crop rotations, application of green fertilizers and methods of biological fight against wreckers, technologies of soil till, turning to minimum interference, declining of soils compression, and also lowering contamination of reservoirs and atmospheric air through limitation of synthetic agrochemicals application, maintenance local biovariety through prohibition to apply GMO.

The characteristic feature of organic agricultural production is severely regulated terms and rules presence of production process, accordance of which is determined by the certification result of production (can last two years) and periodic inspection (production, processing and turnover of organic products control). At the terms of standards observance of organic production products take title positioned at the market under a brand "organic" [18].

The organic production in the world is characterized by dynamic development. Thus, the amount of organic products producers of the world in 2000-2011 grew in 6 times (from 0,3 to 1,8 millions). More than three fourths of organic producers are in Africa, Asia, Latin America, consumption of organic products in these countries considerably below than

in the Europe and North America. Leaders from the quantity of organic producers are India, Uganda and Mexico.

The world market of organic products demonstrates a positive dynamics. Thus, after 2000-2011 it increased on 44,9 milliards of dollar (from 17,9 to 62,8 milliards of dollars), or in 3,5 times [21]. Thus 96% incomes from realization organic products are got in totality in North America (50%) and Europe (46%). On the USA is 44% retail turnover of organic products, on the EU countries – 41% (in thereby on Germany – 14%, France – 8%, the United Kingdom – 4%, Italy – 3%), Canada – 4%, Switzerland – 3%, Japan – 2%. On other entire countries of the world is only 6% world retails of organic products [19].

For today in many countries of the world next basic ways of organic production development are formed:

- big wholesale investment provided agricultural organic production (The USA);
- small-scale agricultural or other organic production with subzero investment material well-being, export orientation and high social value of such activity (Africa);
- small, middle agricultural and other organic production at the terms of considerable sponsorship for producer from state institutes (European countries, foremost EU);
- mainly organic stock-raising on the pasture system (Oceania and Australia);
- mixed forms, that is determined by favourableness of state support, internal demand (in some countries – by tourists demand), export capacities [20].

If we consider situation in Ukraine, then for us an organic production and market of organic products have begun to develop without the proper normatively-legal basis. Only on September, 3, 2013 The Verhovna Rada passed the Law "About production and turnover of organic agricultural products and raw material". In accordance with transitional positions, it has been entered into by January, 09, 2014 [22]. This document determines legal, economic, social and organizational frameworks of organic agriculture conduct, requirement in relation to growing, production, redoing, certification, attaching labels, transportation, storage and realization of organic products and raw material. The settlement of control events and supervision is also statutory after such activity. It is directed to providing just competition and proper functioning of organic products and raw material market, improvement indexes of population health, natural environmental preservation, rational use of soils and recreation of natural resources.

Another obstacle on the way of active development organic production is that national standards are not worked out in relation to this type of production and products. Therefore the organic products of home production, presented at the market, are certified on the standards confessed at the international market. Thus, the Ukrainian certification company LTD "Organic standard" is included to the official list of the certification organs confessed in EU and Switzerland, and carries out certification on standards "BIOLan" (by the private Ukrainian standards). Standards of organic agricultural production and marking of products and foodstuffs "BIOLan" were worked out on the basis of Base Standards of the International Federation of organic agriculture, Resolution of Advice (EEC) № 2092/91 in relation to the organic production of agricultural products and Standards of BIOSWISS (Association of Swiss organizations of organic products producers) [23]. In this connection it is impossible to organize the system of accreditation and bring activity over of certification organs to the only norms. As a result, Ukraine yet could not be positioned on international markets as an exporter of organic products, although it is envisaged (article 5) in the Law.

**Main factors of organic production development.** It is very important to distinguish external and internal factors that restrain development of organic agricultural production in Ukraine [24]. To external are taken:

I. Factors of demand (a market capacity, rates of its increase or reduction, pattern of demand on products) :

1. From 2009 the rates of increasing realization volumes of organic products have begun to go down through financial crisis (for example, in 2009 decline laid down 7,5%).

2. Among consumers there is a mistrust to the organic foodstuffs as a result of the illegal marking or unfair competition.

3. Insufficient amount of organic foodstuffs.

4. Home market absent of organic vegetables and fruit, meat and dairy products.

II. Factors of competition (amount of basic competitors, commodities-substitutes presence at the market, height of entrance barriers to the market and exit from it, distribution market parts between the basic participants):

1. Wide assortment of agricultural products that are grown after the traditional system.

2. Plenty of competitors-producers of traditional products at the internal market.

3. The developed production and promotion of foreign origin organic products.

III. Factors of sale (mediators amount, presence of distribution networks, supply condition):

1. Difficulties in realization organic products at the internal market over processing and sale enterprises shortage.

2. Possible changes of organic products market situation as a result of world food crisis and price advance.

3. Deceleration of market increase rates through population standard of living decline.

4. Home producers limit access to organic products market, necessity of collaboration with traders.

5. Instability of agricultural produce home markets.

6. Exceeding of organic products export above realization at the internal market.

IV. Economic factors (currencies course, inflation rate, change of population income level, public tax policy and others):

1. Price advance on agricultural technique, fertilizers and plants defence facilities.

2. Demand falling through decline population income level.

3. Unstable tax policy in Ukraine.

V. Political and legal factors (level of political stability in country, level of population legal literacy, level of law-abiding citizens, level of corruptibility) :

1. Absence of corresponding legislative and normative base of organic agricultural production.

2. Absent governmental strategy and programs for organic agricultural production support and development.

3. Organic agricultural production does not has the functioning state checking system, that would be accredited on national and international levels and embraced control of both operators of organic sector and products.

4. Absent state rules of organic agricultural production conducting.

5. Uncompleted land reform and absent transparent and civilized market of agricultural earth.

VI. Scientific and technical factors (level of science development, introduction of innovations, state support of science development): absent state support of scientific and technical researches in organic agricultural production.

VII. Social-demographic factors (quantity and sexual-age-old structure of population, level of birth-rate and death rate, level of employment):

1. Insufficient level of food provision.

2. Low level of people incomes.

VIII. Socio-cultural factors (traditions and system of society values, existent culture of commodities and services consumption, present stereotypes of people behavior):

advertisement absent of organic foodstuffs, while "un-healthy" products are actively advertised in MASS-MEDIA.

1. High level of using alcohol and drugs.
2. Prevalence of smoking both among men and women.

3. Useless products prevail in the population ration, absence of healthy eating popularization.

4. Worsening of nation's psychical health as a result of political and economic instability in our country.

IX. Natural and ecological factors (climatic zone, environmental condition, relation of public to environment defence):

1. To 90% croplands in Ukraine have different level of degradation, that resulted in the decline of their fertility.

2. Losses of harvest and products quality worsening though unfavorable weather terms and natural phenomena of catastrophic character.

Internal factors are:

I. Organization (level of participants qualification, their personal interest in organic production development, presence of cooperation between participants):

1. Research, education and advising from organic production questions in Ukraine are on the initial stage.

2. Information as to situation and reasons of certain phenomena is insufficient: scale and market potential of separate commodities; lack of home skilled specialists, modern research farms, insufficient system of farmers preparation and inspectors.

3. Undeveloped entrepreneurial qualities of producers reduce organic production viability and efficiency.

4. Low level of regional and local councils collaboration, research institutes and institutes on questions from organic agricultural production with organizations and public institutions on state and local levels.

5. Developed infrastructure absence of organic raw material storage and processing.

II. Production (production capacities, quality of equipment, quality of produced products, presence of patents and licenses, prime cost, reliability of supplying raw material and materials channels):

1. Reduction of vegetable points productivity.

2. Part of area under organic vegetables in Ukraine does not exceed 4,2% from the general area of ploughland with organic status.

3. Imperfect methods of the organic plants growing and animals breeding in accordance with natural and climatic terms.

4. Necessary transitional period from 1 to 3 years.

III. Finances (production cost, capital availability, speed of capital turnover, business profitability and others):

1. Home producers don't have enough financial resources for organic production development and introduction of innovative technologies.

2. The cost of organic products certification presents from 300 dollars per day and depends on the area of agricultural lands.

3. Low level of vegetable points profitability.

IV. Innovations (frequency of new products introduction, level of their novelty, terms of money recoupment invested in innovations): statistical null information in relation to: innovations in organic production; their use by domestic producers; transfer of technologies and now-how.

V. Marketing (quality of products from consumers point of view, trade mark popularity, assortment plenitude, price's level, efficiency of advertisement, producers' reputation, distribution efficiency, qualification of serving personnel):

1. Social responsible marketing approach is absent for producers and marketing organizations, salespeople and other participants, that is the mortgage of basic principles

observance for organic production, which are needed for market relations' establishment, collaboration and others.

2. Undeveloped advertisement politics, order of going into market and sale: the national logotype of the Ukrainian organic products is absent; population is not enough acquainted with the aims of organic economy; organic production and organic products promotion is poorly developed; insufficient collaboration with agricultural produce producers, that not well-informed in relation to organic agriculture.

3. Consumers and farmers aren't informed about positive influence on environment and wild-life of organic production.

4. Internal market and absent state support worsen home producers positions in the world organic products market.

5. Prices on home organic products on 50-300% higher than traditional.

6. Insufficient qualification of sales personnel in organic products stores.

Without regard to imperfection of the normatively-legal basis in organic production field and existent retentive external and internal factors, in Ukraine there are factors that assist to its development. To them it is possible to take:

- dissatisfied demand on organic products in countries with developed economy that predetermines their personal interest in relation to develop organic production in Ukraine. For example, institutional support of national organic production in Ukraine is got from Switzerland – the biggest organic products per capita consumer in the world. In Ukraine projects are realized within the framework of international technical help of Swiss Confederation "Certification in organic agriculture and organic market development in Ukraine" (2005-2011) and "Sustainable development of agrarian production in Ukraine" (2003-2010). In 2012 within the framework of its technical help a new project is begun "Organic market development in Ukraine";

- successful experience of resource saving agriculture in separate domestic agricultural enterprises, that counts about 40 years. Thus, in the Poltava area that is marked old traditions of the ecologically directed agricultural production, in 2010 Center of organic agriculture was created on base of private enterprise "Agroecology" and Poltava state agrarian academy. It tasks are scientific researches and advising from this range of problems, and also directly production of organic goods [25];

- presence of considerable agricultural lands areas suitable for organic production conducting. Agricultural lands on which organic production technologies introduction is ecologically possible and economically expedient present about 8 millions hectares. It, foremost earth of North-Poltavskogo, Vinnytsko-Prykarpats'kogo, South-Podils'kogo and North-Eastern-Luhans'kogo regions [26];

- natural and climatic terms: approximately 40% Ukrainian territory is occupied by fat lands that not contamination to the dangerous limits and where it is possible growing ecologically clean products at the level of the most strict world standards potentially; high maintenance of humus (3-5%) and loamy mechanical composition of black earth, which provides the high productivity, especially grain and oil-bearing crops [24];

- productive potential of Ukrainian agriculture, that is used only on 30%, allows to produce in 10 times more (so-called "Podoluns'kiy Law");

- potentially considerable capacity of internal market.

After Organic Federation of Ukraine researches, the internal consumer market of organic products constantly grows: in 2008 it was estimated in 600 thousand euro, in 2009 – 1,2 million euro, in 2010 – 2,4 million euro, in 2011 – 5,1 million euro, in 2012 – 7,9 million euro. In the last three years there is a tendency of filling internal market by own

organic products due to adjusting organic raw material processing on domestic enterprises. In particular, there are groats, juices, syrups, jams, dried fruits, honey, meat and dairy products [15].

- it is necessary to form internal demand In Ukraine exactly on the certificated organic products, the basic potential consumers of which are cities' residents. As in Ukraine traditionally "ecologically clean" products that are produced in rural locality in home economies (its volume presents about 50% in the gross agriculture production). Also it should be mentioned, that our consumers don't ready to pay considerable money for organic products, exception is child's food;

- developed public ecological organic motion. Organic products producers and their organizations are active enough at the market and in informative space, forming demand on marking products: organic products fairs, research and practice conferences, seminars, round table are regularly conducted from the range of organic production development problems, provided participating in exhibition events, distributed information in MASS-MEDIA. Such domestic organizations as International Public Organization "BIOLan", Organic Federation of Ukraine, LTD "Organic standard", LTD "YKRAGROFIN" are the members of IFOAM, Allukrainian public organization "Living planet" is the associated member of IFOAM [14].

Perspective of organic production adjusting in Ukraine is predefined by hard regulation of production process across application certain rules and standards, in particular in relation to the proper animals maintenance, using substances and processes of natural origin, except economic effects, gives an opportunity to attain the aims of maintenance and proceeding natural resources, biological variety, activation of production by small producers. As scientists of The National Institute for Strategic Studies [20] mark, for organic production development of agricultural goods in Ukraine it is necessary:

- to accept a Law on questions of settlement agricultural organic produce and raw material production and turnover;

- to settle the question of accreditation certification authorized organs of organic production, and also certifications, inspections of organic production and turnover organic products process by corresponding Resolutions;

- to initiate making alteration to Laws of Ukraine "About plants defence" (from 14.10.1998 № 180-XIV) and "About pesticides and agrochemicals" (from 02.03.1995 № 86/95-VR) in relation to settlement application facilities of plants defence and fertilizers in organic production;

- to work out the national rules of organic production on the international requirements and standards basis;

- to enter and provide register of national organic producers with its promulgation on the web site of Ministry and in official print editions;

- to provide specialists' preparation on questions of organic production conducting by input special programs and courses in basic programs from agriculture specialists and managers preparation in profile Ukrainian universities;

- to complement the state statistical accounting in agriculture complex by special forms to reflect positions from production and turnover of agricultural organic produce and food.

To our opinion, similar actions must be realized for development all spectrum of organic production, because basic principles of organic products creation in sustainable development context are general.

**Conclusion.** Thus, for providing social oriented entrepreneurship – producers of consumer goods, which people

use every day: meal, clothing, facilities of hygiene and cosmetic, furnitures and others – it is needed first of all:

1. To motivate citizens to consume safe and useful products. We are speaking about the necessity of informative influence on consumers' choice to buy "healthy" products. It is necessary to create national ideology of healthy life-style and clean environment thanks to adequate information about correct feed, advantages of using organic products in our everyday life. Realization of special fairs, exhibitions, festivals, conferences will help in this process.

2. To stimulate production of organic products both due to creation favourable fiscal, regulator terms by the state and due to informing producers of economic and social values from such type of activity, development systems of organic production technological support, popularization technologies, consultative support for entrepreneurs. To provide a state help to enterprises in transitional period and during realization certification on accordance to organic products requirements. For the decision of such tasks it is necessary to continue developing legislative base that must cover all types of organic activity.

3. To create internal market infrastructure of organic products. It is related to strengthening the national system of guarantees organic products for Ukrainian consumers defence and mistrust overcoming.

Entrepreneurship social responsibility will find the display through the maximal use in the productive process organic ingredients, and also on introduction different events, that provide ecological, social, economically expedient production of quality goods and raw material. The organic production in harmony with nature will provide population by ecologically safe products, will assist the environment guard and people's health maintenance.

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Надійшла до редколегії 12.06.14

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### ОРГАНІЧНЕ ВИРОБНИЦТВО В УКРАЇНІ: ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ У КОНТЕКСТІ СОЦІАЛЬНОЇ ОРІЄНТОВАНІСТІ ПІДПРИЄМНИЦТВА

*Статтю присвячено дослідженню діяльності українських підприємств сфери виробництва органічної продукції в контексті зміщення акцентів з економічної орієнтованості на соціальну орієнтованість бізнесу. Визначено зовнішні і внутрішні фактори, а також чинники, що сприяють розвитку органічного виробництва. Надано рекомендації щодо стимулювання соціальної відповідальності підприємств та формування моделі, що поєднує інтереси споживачів і виробників.*

*Ключові слова: сталий розвиток, соціальна орієнтованість підприємництва, органічний продукт, органічне виробництво.*

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### ОРГАНИЧЕСКОЕ ПРОИЗВОДСТВО В УКРАИНЕ: ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ В КОНТЕКСТЕ СОЦИАЛЬНОЙ ОРИЕНТИРОВАННОСТИ ПРЕДПРИНИМАТЕЛЬСТВА

*Статья посвящена исследованию деятельности украинских предприятий сферы производства органической продукции в контексте смещения акцентов с экономической ориентированности на социальную ориентированность бизнеса. Определены внешние и внутренние факторы, а также факторы, способствующие развитию органического производства. Даны рекомендации по стимулированию социальной ответственности предпринимателей и формированию модели, объединяющей интересы потребителей и производителей.*

*Ключевые слова: устойчивое развитие, социальная ориентированность предпринимательства, органический продукт, органическое производство.*

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 72-76

UDC 334.72

JEL O 310

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### INNOVATIVE INFRASTRUCTURE OF ENTREPRENEURSHIP DEVELOPMENT

*The article deals with the actual issues of such forms of innovative infrastructure development as venture capital and clustered formation. Particularities of their functioning in the market conditions and problems of their existent are analyzed in the article.*

*Keywords: innovative infrastructure; clustered formation; innovative cluster; venture entrepreneurship; technopolis.*

**Problem statement.** Nowadays, one of the main tasks of the modern economics is an activation of innovative processes and a transition to the innovative development in prospect. Development of the innovative infrastructure, reinforcement of competitiveness and innovative activities speed-up are an economics occurrence that allows standing against global concurrency and allows matching the claims of national and regional development.

Clustered formations and venture capital can become the main organizational forms of innovative infrastructure.

**Latest research and publications analyses.** The problems related to the clustered formations functioning are highlighted in the national scientific literature by the following national scientists: Varnalii Z.S., Hamashova O.P., Yanenkova I.H., Velyka K.V., Dolhova L.I. et al.

**Aims of the article.** The main aim of the article is to research and analyze innovative tools for business entities development in the market conditions, such as clustered formations and venture capital.

**Unsolved part of the general problem.** However, the aspects of innovative infrastructure elements' development in market economy are still not researched.

**Main research subject treatment.** An economics of post-industrial society is based not only on the telecommunication systems and the Internet, but also on the new organizational forms. Such forms are appeared from unions and complexes and transformed to clustered formations and network structures. Forms and methods of this structures management are different but always determinate by the particular object [1, p.186].

The main task of the clusters formation and support is to increase the labor productivity with minimal investments. Clustered approach is one of the leading approaches in countries' competitiveness strategy formation under the modern international economics conditions. The main difference between clustered formation and territory-producing complex (one of the organizational forms of producing used on regional level in formed USSR) is the shop-floor initiative. Taking to account the principles of market, it can be efficient only in case of shop-floor initiative, when the

enterprises themselves come to unification into the cluster to increase their competitiveness.

The main condition of the new generation research producing creation is the constant process of retraining of the new cluster's managers and developers. That allows considering it as educational organization that provide into production a new institutional schemes of activities.

Forming the cluster's structure assumes several operations in the following functional areas. Technological one assumes the choice of technology which can be created-basing on the fundamental knowledge. This in turns involves necessary methods of interaction between fundamental science representatives and complex technological solution developers. Organizational-producing one assumes the choice of the serial production type, that should be created based on the experimental engineering samples. Marketing one provides the definition of the possible demand on particular product (service) or technology infrastructure, positioning of such enterprises group on market, creating conditions for the work with dealers in the marketing networks systems. Investing one provides the evaluation of project's prospects of making the product (service) or technology, setting of the whole set of organizational projects and alternatives options for particular projects as a

part of the mega-project, risk analyses for the every project and every stage of implementation, constant analyses of stable demand impact on the project implementation result that depends on product cost. While cluster forming the creation of special engineering company for operation implementation is expedient. Staff one assumes training workers which able to work under highly undetermined conditions and technological flexibility of production.

It is important to produce institutional-organizational aspect of cluster formation. In particular, typical cluster assumes co-organization of at least 4 major technological groups, that makes its technological base: leading scientific labs – research productions that developed the fundamental basis of new technologies; development centers that creates working prototypes and technology previews for testing on experimental productions; production-technological groups that able to produce a series of products; marketing groups that able to promote a new type of product on the market and form constant demand [2, p.327].

It should be noted that given classification can be used for practical clustering policy, thus it assumes clusters evaluation from the long-term competitiveness point of view including their branch characteristics.

**Table 1. Types of innovative clusters**

Type of innovative cluster	Description
Truncated	Consists of technologically related enterprises fields, sometimes geographically isolated. The activity is restricted by the set of typical functions (getting resources, processing, etc.). Modern but not leading technologies are used. New technologies are come into production as ready for use product.
Branch	The group of companies working together, that produces typical products or services. Use of new technologies is restricted by quality control and personnel management.
Innovative-branch	The group of companies working together, that produces products or services, that need constant restoration, quality improvement, new functional possibilities implementation. There is permanent cooperation with research centers and educational institutions.
Pro-innovative	Innovative companies' cluster oriented on fast getting necessary knowledge and technology to increase current competitiveness.
Innovative-oriented	It is the companies' cluster that defines industrial, investment and social infrastructure of the region. It creates dynamic companies' groups which use leading knowledge and technologies, involve talented workforce all over the world, consumes and generates venture capital, defines and aims scientific researches of universities and other educational institutions.

Source: [2, p. 328]

Therefore, productivity increasing and activation of innovative activity of small and medium enterprises in clusters' structures makes regions and country able to increase the competitiveness at whole. Among the characteristics of modern clusters are maximum territorial nearness, related technologies, community resource basis, and availability of innovative part. Principles of cluster functioning are economic independence, and responsibility of entrepreneurs, availability private ownership, stability of monetary turnover, competitiveness and free pricing [3, p. 330].

Experience of clusters in foreign countries shows that the results of this process is very significant and lead to stimulation of regional labor productivity increasing, budget incomes increasing, investments returns, and finally gross national product growth.

Innovations and entrepreneurship are the forces of development and growth of the clusters. Most of the clusters had been formed by the entrepreneurially-inclined staff already worked on some employers purposely for diversification of supplying chains, creation of the new market potential or as a back action on staff reduction or companies' liquidation. Despite the fact that educational processes and cultural norms of the region have huge impact on innovations and entrepreneurship, they can be improved by means of reasoned supporting strategies developed and implemented by the government.

Venture enterprise is an important part of the Ukrainian economy that developed by means of venture financing principles usage that based on venture capital. Development of the venture capital inspires innovative and investment processes, that in turn is the factor of growth of scientific-technical progress (STP) speedup. In the period of market transformations of economy wide usage of venture financing mechanisms during the investments processes implementation not only activate innovative activity but inspires economy's structural transformations, deepening of economy's integration processes, and creation of additional workplaces.

As a result of venture capital investments venture investor does not have those guarantees that take place in more traditional forms. Under the conditions of markets globalization prevailing today, Ukraine can make a big step forward through the implementation of existing scientific and technological potential. Development and support of innovations by the government would solve many of the problems arising from the current state of the economy, but a lack of aimed and state finances and domestic investment resources is the motive for the development of a new kind of entrepreneurship activity. As a result, the market has a new type of investors. In this case this is the investors engaged in the financing of innovative projects and at the same time is a part of the venture entrepreneurship.

Venture enterprise is the mechanism that aims to implement that latest researches and achievements of STP into production. Venture entrepreneurship is an activity in the innovative area that directed to risk projects implementation (creating and implementing new technologies, goods and services into production) and their promotion to the market to gain profit as a risk premium.

Elements of venture entrepreneurship are an investor and an enterprise that creates a specific product – innovation. Organizations as well as individuals that provide their capital for venture capital funding can act as an investor.

In abroad sources an investors are so-called venture capitalists because they provide medium and long-term financing in exchange for a part of the share capital of enterprise in which investments are directed. The companies receiving venture capital are often the small and medium enterprises. Venture capitalists do also sometimes not want to participate in the management of invested companies can provide a "quasi-funding", i.e. loans or bonds that entitle the share capital authorized only under certain circumstances. We can speak about the profit of venture capitalist after a few years only, when he will be able to sell the property it shares increased by several times the price compared to the original investment.

Unlike other forms of investment venture form has some specific features:

- direct or indirect shared participation of the investor in the company's capital;
- providing funds for the long term on the basis of irreversibility, charge less, without any guarantee or security;
- active investor role in the management of a project funded [4, p. 47].

The main particularity of venture financing is a high probability of non-returning the funds that are invested in the project if the investment project will not bring the expected results from its implementation.

The object of venture funding is to create an enterprise, technology development and initial marketing strategies for new products (e.g. to market), the launch of commercial production, expansion, acquisition of production facilities in another company and sell the company.

Among the objects of venture financing high-tech company are leading, but the investment structure is constantly changing. Today, the bulk of venture capital investments aimed at sectors such as software, biotechnology, telecommunications, healthcare, retail, internet technology, computers and peripherals, the production of intermediate goods, energy, environmental protection, financial services, electronics, and business services.

Often the need for venture capital occurs in small businesses, researchers and developers that are not able to realize their mercantile interest, a desire to obtain a higher returns on invested capital compared to the interest on a bank deposit or other forms of investment, as the limit of profitability at the level of implementation of innovations is 30-40% on average, thus paying for the risk.

The term "venture (risk) financing" is used in the broad or narrow sense. In a broad sense – it is all contributions to the risk in terms of financial results, projects, primarily in the field of high technologies. In a narrow sense, venture capital – a long- or medium-term investment in the form of loans or investments in shares taken by venture capital funds in order to create and develop small promising companies [5, p. 163].

There are two types of venture capital: external and internal. The external venture capital – is the one that goes into a small venture entrepreneur-intensive company, which was founded by the author of the idea or who owns the rights to patents on certain know-how.

Domestic venture capital is the capital that does not exceed the large enterprise, and is directed only at certain specialized unit whose function is to develop and implement risk ideas or projects.

Venture capital is characterized by the fact that the investor does not receive anything that would guarantee a refund. Typically, small and medium enterprises simply do not have such guarantees; it is therefore unable to use the bank lending. As the guarantee is absent, the investors are more interested in the future return on invested funds right now (i.e. the result of implementing innovations), but not the financial performance of the company over the period. The only "guarantee" for the venture investor is his own ability to correctly assess the risks associated with the transaction [6, p. 88].

The venture capital has been mostly extended and developed in the United States. The US is the home of venture capital where it's appeared in the mid 50's of last century in Silicon Valley. The peak of increasing was observed in the 80 – 90's: the accumulation of venture funds rose from \$ 3.5 billion. in 1978 to over 30 billion dollars. in 1988 In the period 1990-2000 there is observed rapid increasing (30 times) of investment from 3.25 billion dollars. in 1990 to 94.79 billion dollars in 2000 [7, p. 172].

First in Europe the technologies and principles of venture financing have been applied in the UK. In 1979, total venture capital investments in the country amounted to 20 million British pounds. By 1987, this amount increased to 6 billion pounds. Over the past decade, the venture capital business in Europe has accumulated 60 billion EUR, which invested in two thousand private companies. In the twenty European countries there were 500 venture capital funds and companies. The total amount of capital for new funds that were used in a business venture in Europe amounted to 8 billion EUR. And 15% of all investments were directed mainly outside Europe in the so-called "emerging markets", which includes Ukraine [8, p. 34].

Formation of venture financing institutions in Ukraine began in the last decade of the twentieth century and took place very slowly. The feature of venture capital funds has become a large share of foreign capital in the structure of investment flows, sometimes these funds are financed entirely by the capital from other developed countries.

The largest venture capital companies operating in Ukraine are IC Ineko, Euroventures Ukraine Foundation, Dnipro Foundation, WNISEF.

One of the first prototype of venture capital funds in Ukraine was investment company Ineko.

IC Ineko was founded in 1994 as a company that invests in the energy sector. In 1997 the company received the status of an adviser of the Ministry of Energy of Ukraine and took an active part in developing the concept of privatization of the energy sector in Ukraine. Ineko's specialists made a series of presentations of energy complex of Ukraine in Kyiv, Leipzig and Berlin.

Since 1997, IC Ineko constantly included in the top ten investments and brokerage companies. At his own expense Energy Holding was formed, consisting of five companies. Activities of holding covers the entire cycle power plant maintenance, including repairs, construction, and installation works. Starting with energy, IC Ineko continued to develop successfully diversifying its range of investments.

Now IC Ineko works in four main areas directly related to investing activities:

- Organization of investments in enterprises of Ukraine;
- Asset management using capital market instruments;
- Restructuring;
- Work in corporate and financial matters for stock companies.

The company carries out the acquisition of controlling stocks in private companies that dynamically developed by means of buying shares (buyout), or by means of the increasing the share capital of the company. In this case, priority is given to companies operating in traditional industries and has significant prospects for further development, or players who take certain market and need capital for development, and strategic management for full disclosure of the potential.

Funding of development, IC Ineko provides capital to enterprises that are rapidly developing in the form of direct investment to expand operations or through financing acquisitions of competing companies ("horizontal investments") to consolidate market share and create a company leader in the sector. The maximum term investments ranged from 1 to 3 years, depending on the type of financing and development stages of each company. Thus in IC Ineko minimum and maximum volume of the investment is not fixed.

Venture entrepreneurship in Ukraine is quite promising today, as evidenced by the activities of the venture fund Western NIS Enterprise Fund. However, to form an efficient market of venture entrepreneurship in Ukraine the number of complex problems need to be solved, both in terms of legal (statutory definition of venture enterprise, its maintenance and regulation) and in terms of forming an effective infrastructure for venture business. According to venture companies there are more than \$250 million of venture capital investments are already done into Ukrainian companies. Amounts in the coming year that can be directed by venture investment companies, ranging from \$20 million to \$100 million. Considering the availability of large number of markets growing, according to experts, that amount is very small. In the near future the possibility of significant receipts of foreign capital in Ukraine remains low. Some domestic companies that usually do not call themselves venture also try to use the tools of venture capital investment. However, they do not have enough funds for the creation of specialized funds.

Managers of venture capital funds have concluded that over the past two years, the conditions of their operation at the Ukrainian market have changed significantly:

- First, venture capital, which by its nature has specialized in the acquisition of small (49%) of shares after repeated losses of small blocks, had to switch to the control. This in turn led to a significant increase in the amount of one investment (from \$1-3 million to \$7-10 million) and reduced the number of transactions.

- Second, faced with serious problems to ensure the effectiveness of investments, as of late, none of the known Ukrainian market operators could give an example of a large company selling its strategic investor. Venture capital funds today are oriented to work only with companies that have already formed. And so, who can soon become leaders in their markets and thus future simplify the search for a strategic investor.

- Third, most experts are not particularly risk and invest venture capital in Ukrainian enterprises only for 2-3 years. High political, legal and macroeconomic risks in Ukraine does not allow the use of venture capital investments in long-term projects (over 5 years), but venture capital needed most innovative enterprises of Ukraine for implementation (commercialization) of scientific developments it for the long term.

Venture funds now have to work at a relatively small size markets, that at this stage characterizes low competition among producers of goods and services, and enough low solvency of the population. This primarily relates to consumer markets, such as food and building materials, as well as the retail trade. It is therefore necessary to involve Ukraine in the

capital of private and institutional venture capital investors as venture capital stimulates the development of scientific and technological progress and helps accelerate the introduction of new science and technology into production.

However, Ukraine does not have to repeat all the way to the development of venture business for 20-25 years that passed by Western Europe. Using the accumulated international experience, examples of business venture in Western Europe and the U.S., and effectively implementing the necessary reforms, Ukraine could well form a business venture market in 10 years. For example, Finland developed the venture capital and technology in just 10 years, and Israel in 15 years [9-12].

**Conclusions and suggestions.** So, it should be noted that although Ukraine still lags behind foreign countries in terms of venture capital, venture business in Ukraine is growing but very slowly. Investments made by venture funds feed the country's economy and promote the development of research, development and implementation of new ideas and technologies.

As venture capital directed mainly at small and medium enterprises, it can be argued that venture promotes the formation and strengthening of cooperative relations companies. Venture capital market in Ukraine has great potential – large number of academic institutions with highly qualified and extensive experience in developing new technologies in various fields of science and technology; improved legal security at the capital; improving the legal framework in the field of entrepreneurship. There is no highest element of governance innovative infrastructure such as technopolis, also the elements of financial innovations such as innovative banks and venture funds are still not developed enough. Besides, latest ones don't make their main activity because of legislative restrictions and market conditions in Ukraine. But on the other hand, there are certain conditions that scare foreign venture capitalists to cooperate with our entrepreneurs. The main reason is the lack of guarantees from the government about the fairness and transparency of business activities. In this respect, the law should be modified to makes conditions for investment into Ukrainian enterprises more attractive not only for foreign investors but also to domestic owners of capital.

In terms of competition, one of the most effective means of small and medium sized enterprises development is their association in clusters. Cluster structure is a flexible form of integration and cooperation and can provide higher rates of innovation. All this contributes to the competitiveness of enterprises, which form a cluster and a whole country.

So, the development of innovation infrastructure consists of two components and at the stage of its formation today. The main causes of the problem and even critical state of the innovation infrastructure is the legislative provision. Namely, there is no effective mechanism to stimulate the parts of the production, financial and innovation infrastructure subsystems; weak demand on innovation (research and development) from the manufacturing sector, which makes it inappropriate to establish and develop individual elements of innovation infrastructure.

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Надійшла до редколегії 29.04.14

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### ІННОВАЦІЙНА ІНФРАСТРУКТУРА РОЗВИТКУ ПІДПРИЄМНИЦТВА

*В статті досліджуються актуальні питання розвитку таких форм інноваційної інфраструктури як венчурне фінансування та кластерні утворення, розглядаються особливості їх функціонування в ринкових умовах, аналізуються проблеми їх існування.*

*Ключові слова: інноваційна інфраструктура; кластер; інноваційний кластер; венчурне підприємництво; технополіс*

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### ИННОВАЦИОННАЯ ИНФРАСТРУКТУРА РАЗВИТИЯ ПРЕДПРИНИМАТЕЛЬСТВА

*В статье исследуются актуальные вопросы развития таких форм инновационной инфраструктуры как венчурное финансирование и кластерные образования, рассматриваются особенности их функционирования в рыночных условиях, анализируются проблемы их существования.*

*Ключевые слова: инновационная инфраструктура; кластер; инновационный кластер; венчурное предпринимательство; технополис.*

Bulletin of Taras Shevchenko National University of Kyiv. Economics, 2014, 6(159): 76-81

UDC 331

JEL J 2

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### LABOR RESOURCE INTERNATIONALIZATION AS A FACTOR OF THE SUSTAINABLE COMPETITIVENESS

*The paper studies a role of labor resource in sustainably oriented international competitiveness. Economic development is now more driven by employment, labor resource and social conditions. That cause a change from economic to sustainably oriented competitiveness, reflecting the increasing role of labor resource and social conditions. Labor resource quality and internationalization n have a long-term influence on the sustainable competitiveness. CEE and NIS countries labor resource and social factors input into sustainable competitiveness are considering. The relevance of economic and social factors of Ukraine international competitiveness is assessed.*

*Keywords: labor resource, transitional economies, competitiveness, sustainably oriented competitiveness, competitiveness assessment.*

**Problem setting.** Economic performance is driven, among others, by the factors conditions, including labor resource. Labor productivity is one of the measures of economic efficiency and competitive advantages. The global development becomes more directed towards employment and social results. Social impact of economic growth became more desirable, labor markets reforms playing key role in the economic policies. Labor resource and comparative unit labor cost are important for industries location, global production chains, foreign direct investments and technology transfer. Simultaneously labor internationalization and talents mobility are spreading across countries and transnational corporations.

Respectively labor resource and social factors becomes increasingly important for the competitiveness on all levels. Competitiveness assessment also should take into consideration not only economic factors and become more socially adjusted. This requires new theoretical approaches to competitiveness, role of labor resources and social factors, advancements of the methods of their analysis.

**Analysis of the last research publications.** Competitiveness studies are conducted on different levels such as product, firm, industry and country. Modern researches are focused on the competitiveness factors, measurement, dynamics of the countries competitiveness and its economic implications.

Content, economic role and contradictions of competitiveness are studied by Ukrainian researchers V. Bazylevych, G. Fyliuk, D. Lukianenko, E. Panchenko, A. Poruchnyk, O. Shnyrkov, O. Shvydanenko, Z. Varnalij and others.

Factors, modern drivers, measurements and dynamics of competitiveness on micro- and macro-levels are studied by P. Levine, M. Mott, M. Obstfeld, M. Porter, D. Stiglitz, K. Shwab and others.

Researches outcomes are mostly related to competitiveness modern trends, innovations impact on competitiveness, production factors effective utilization, labor productivity, comparative assessment of countries international competitiveness.

**Not studied parts of overall problem.** Labor resource availability, cost and productivity of labor, employment, socio-economic factors and results become increasingly important for modern global and regional development. It raises an importance to study labor resource and social factors of competitiveness on all levels.

Competitiveness factors and measurements should be reconsidered with respect of labor and social factors, to be more socially adjusted. The overall theoretical and applied approaches should be studied in the long term view as sustainable competitiveness of the firm and country. This requires developing more comprehensive approaches to sus-

tainable competitiveness, labor resources and social factors, analysis of socially-adjusted sustainable competitiveness.

**Research goal and methodology.** The article aim is to study the role of the labor resource as a factor of international competitiveness, its modification towards sustainable competitiveness and its measurement with reflection of labor and social factors.

The research objectives are:

- to identify evolution of research approaches to factors of competitiveness with respect of inclusion of social and labor factors;
- to argue a role of labor resource as a factor of sustainable competitiveness;
- to compare labor and social factors input to the growth and sustainable competitiveness in selected CEE and NIS countries.

The research methodology is based on the application of systemic method to study a complex interaction of factors and implications of competitiveness. It also involves index method for study factors input into sustainable competitiveness assessment, assuming that each of factors have specific measurements so that their systemic impact could be comparably assessed in index form.

The study based on assumption that recent global development should be focused on long-term sustainable socio-economic development, including sustainable competitiveness and effective utilization of labor resource. Economic competitiveness evolution towards sustainable competitiveness requires to study of labor resource development and implications.

**Main results of research.** A complex nature of competitiveness has encouraged different research approaches to its content and structure. Market competitiveness approach is focusing on the country, industry, firm results in comparison with others on the international markets. Economic development competitiveness approach is focusing on the factors and conditions which leading to increase total factors productivity and finally prosperity for population. Innovations competitiveness is considering as capability to generate innovations and adjustments to the changing external environment. Competitiveness also is a structured phenomenon which could be studied on different levels – product, firm, industry, region, country. Factors and institutional competitiveness also could be part of the specific studies.

Competitiveness content, factors and assessment has been modified along with changes in understanding of global and countries development. Development nowadays becomes more dependable and at the same time oriented towards employment and social results. Development results are considering not only in traditional terms of GDP, industrial output and labor productivity, but as socio-economic development with greater inclusion of social factors and important role of social results. Social-economic development becomes more dependent and oriented on the social factors and labor resource. Respectively it requires more focusing on labor resource for competitiveness on all levels.

Labor resource has different aspects studied in economic, social, demographic, behavioral and management researches. Economic literature studies different aspects of labor resource such as labor economics, labor resource structure, labor market, employment, labor productivity etc. Globalization literature studies labor resource internationalization, global labor and talent mobility, international migration etc. Human resource management on the corporate level covering a large number of issues of utilizing labor as a production factor including personnel selection and training, work motivation, job performance, work culture.

Competitiveness studies also covering factors, economic results and international comparison, firm and country competitiveness etc. One of the leading approaches is competitive advantages concept and the theory of the nation's competitiveness founded by M. Porter and extended by other researches. According to M. Porter, competitiveness is determined by a "diamond" of: 1) factors conditions; 2) demand conditions; 3) company conditions – strategy, structure and ability to rivalry; 4) related and supporting industries [12]. Such approach is developed in researches of Levin R., Obstfeld M., Sachs J. D., Sala-i-Martin X., Schwab K., and others. Different conditions such as level of the country's financial systems, innovations, education, social environment are studying as important conditions of firm and country international competitiveness.

Based on the M. Porter approach, the World Economic Forum has introduced analytical model and computation algorithm of the Global Competitiveness Index to measure set of factors and comparative levels of countries competitiveness [9].

Social and labor factors influence on the competitiveness have been presented in the multifactor model developed by D. Cho. In addition to the Porter's factors, such model includes a human resource factors presented in four groups – employees, politicians and bureaucrats, entrepreneurs, professionals (as engineers, scientists etc). [6] Such approach has been further developed by D. Cho and others in the 'double diamond' model of, where Porter's "diamond" represents so-called "physical" factors and second diamond represents four groups of human resource factors [6].

Factor-based interpretation of competitiveness is complementing with functional-institutional approaches. Global economic and labor flows, unstable environment, importance of employment and social cohesion have encouraged studies of socio-economic development, sustainable growth of firms and countries. A. Berg and J. Ostry argue a necessity to account social factors and overcoming of economic inequality for sustainable development [5]. A. Green, J. Preston, G. Junmaat have studies an interdependence of education, better equality and social interaction in the course of sustainable development [11]. Studies of the labor and social factors are supporting development of approaches to long-term competitiveness.

Labor resource could be studied primarily in context of factor and functional competitiveness on different levels – from firm to country. Economic aspects of labor resource input into competitiveness should also be complemented with social aspects.

Economic globalization and labor internationalization are influencing on changing patterns of factor conditions and efficiency. Competitiveness on all levels (product, firm, industry, country) changing over time due to domestic and international factors.

There are some ways to improve competitiveness: 1) based on price competition at the expense of existing factor and investments advantages, and 2) based on quality (non-price) competition at the expense of build-up competitive advantages arising from labor quality, skills, health care, social cohesion, innovations, education, productivity.

Competitiveness could be defined as the capacity and efficiency of the firm, industry and country to create and distribute products and services based on competitive advantages over others, the ability to ensure continuous development in innovations, productivity and quality. Therefore price competitiveness would be considered as arising from limited-term advantages, but other qualitative factors may support long-term and sustainable competitiveness.

Population and labor resource development are key sources and an important purpose of economic growth.

Human development is a time-lengthy process with different characteristics – demographical, educational, productivity, economic, social, cultural and others. Therefore different terms are using to explain individuals participation in economic activity. "Labor force" is considering as those who conduct job in the organizations and get paid for such job. "Human resource" are employees of the organization who are object of management, have applied skills and qualifications, under influence of job motivation. "Human capital" concept has been developed by economists of the "Chicago School" and makes emphasis on the people's knowledge, skills and abilities that ensure labor productivity.

The term "labor resource" is considered more applicable in the context of long-term approach to growth, sustain-

able socio-economic development and competitiveness. In this article labor resource is considering as a people of employable age that possesses skills and knowledge developed over long period of time and used to increase productivity, their employment is due to the job market conditions.

A cross-country overview of labor resource could be approached using the suggested comparative matrix of the human and labor resource development as a factor of international competitiveness. The quantitative and qualitative data of the employable population aged 18 and more could be structured in the labor resource matrix for comparative analysis.

**Figure 1. Human and labor resource dimensions**

Indicators	Labor resource data
Population	– population number – population density – workable age population
Human and labor resource structure	– by age and sex – urban and rural – employment structure
Human and labor resource quality	– educational level – qualification level – life-long training
Labor cost and productivity	– average wage – average cost of labor – labor productivity
Labor market	– unemployment level – unemployment structure – jobs creation
Firm labor resource	– firm employees average number – firm skilled and semi-skilled labor – firm management and professional staff – firm employees rotation ratio – firm average wage
Internationalization of labor resource	– transnational corporations employment – migrant workers number and share in the host countries – migrant workers number and share in the home countries – migrants transfers value and ratio to GDP of home countries

Source: author's composition

Labor resource quality, social conditions and global civilization trends (information technologies, labor mobility, cross-cultural communications) are influencing on the nations competitiveness. Human and labor resource formation is still within national borders, but global imperatives influence getting stronger. At the same time labor resource utilization becomes more internationalized.

Traditionally labor resource is studied on the firm and country levels. Such approach should be more complemented with a study of labor resource internationalization. As result of economic globalization, labor resource formation and utilization should be considered as international process which has many dimensions including increase of non-core nationalities, migration, in country employment by foreign companies, cross-border labor mobility, spillover of international standards of work and living etc. Human and labor resource internationalization becomes a driver of domestic and international competitiveness of firms, industries and countries. Labor resource impact on international competitiveness could be considered in different respects:

1) Labor resource quantitative and qualitative characteristics in countries and regions – availability, quality and cost of labor resource is considered as important factor in the international location of the goods and services production, global networks and value chains. Production of labor and technology intensive goods is moving to the countries with large and relatively inexpensive human resources. In terms of international competitiveness the education and

training in different countries have to meet internationally recognizable standards.

2) Labor international mobility – cross-border labor mobility is skilled workers flows by economic reasons, relocation of talents by educational and professionals motives. International migration is also dependent on the economic conditions in different countries, financial and political vulnerabilities. Respectively migrants money transfers to home countries are significant part of global financial flows.

3) Labor resource of transnational corporations (TNCs) – TNCs have factor- and market-driven production location and employment policies in order to make efficient global value chains. The emphasis is on the combination of high technologies and low-cost labor. TNCs in services and high technologies intensively use international recruitment and professional rotation on cross-countries basis. Negative international spillover arises when TNCs announces large layout programs for 2-3 years usually affecting most of the countries of operations.

4) labor quality internationalization – TNC global networks, modern technologies dissemination, international migration are causing the international transfer of the educational standards, labor skills and employees qualifications, social and environmental conditions;

5) labor international communication – more people have global access to ITC and Internet which gives an opportunities for access to information, communication and adaptability.

**Table 1. FDI and labor resource productivity in the TNCs, mln.USD.**

	1990	2011	2012	2013	2013 to 1990, %
FDI inflows	208	1700	1330	1452	698,1
Sales of TNCs foreign affiliates	4723	28516	31352	34508	730,6
Employment by TNCs foreign affiliates, thousand	20625	63416	67155	70726	342,9
Sales of TNCs foreign affiliates related to 1 employee	0,229	0,449	0,466	0,488	213,1

Source: author's calculations based on [17, p. XVIII]

FDI inflows, sales and assets in TNCs during a long time have been increased in approximately similar pace. At the same time foreign investments are envisaged the modern technology and know-how transfer, better training, which increased labor productivity calculated as sales per 1 employee for more than twice in 1990-2013. So the labor resource internationalization also has increased its input into competitiveness.

Labor resource and social conditions role in competitiveness should be reflected in respective measurements. Actual approaches to measuring labor resource and social conditions progress could be considered within the scope of competitiveness analysis.

Competitiveness analysis use index method that allows adjustment of specific indicators and components into comparable set of indexes. Competitiveness indexes are used for international comparison (for example, International Competitiveness Indexes of the Institute of Management Development in Lausanne) or country analysis (UK Competitiveness Index).

The globally recognized concept and set of measurements of competitiveness has been developed by the World Economic Forum (WEF). WEF defines competitiveness as a set of institutions, policies and factors that determine the level of productivity of a country [9]. Increase of

productivity level provides the sustainable basis of prosperity that the economy can achieve. Thus, more competitive countries based on productivity of their economy can create the conditions for high living standards and social development for their citizens. Productivity level also determines the level of the rates of return of investments in the economy, they are drivers for economic growth potential of the country, therefore the more competitive economies are more likely to have higher growth potential. However, competitiveness should not be only indicated by the economic performance of the country, but should also consider factors such as quality of life, knowledge, education, innovations, environment etc. Based on the above mentioned approach, WEF defines 12 pillars of components that are not only interrelated but also tend to reinforce one another. The actual construction of the WEF Global Competitiveness Index involves the aggregation of the 12 pillars into a single index.

Labor resource and social conditions in the WEF Global Competitiveness Index (WEF GCI) respectively to the individual country stage of economic development. Educational and professional level of labor resource considered as determinants of labor productivity, adaptability to market demands, high technologies and external shocks. WEF GCI assesses different importance of labor resource and social conditions.

**Table 2. Labor and social factors in the WEF Global Competitiveness Index**

Stage of growth	Labor and social factors of competitiveness	Ratio of labor and social factors in the general competitiveness index, %
Factor-driven growth	Public health and primary education	25
Efficiency-driven growth	Total labor and social conditions	44

Source: author's calculations based on [9, p.53]

On the factor-driven growth stage only basic social services related to labor resource such as public health and primary education are accounted in the GCI. On the efficiency-driven growth stage, more factors influencing labor resource quality are included into GCI – higher education and life-long learning, labor market efficiency and technological improvements. The last one is important, because innovations enforcing the requirements to the labor resource quality, retraining and adaptability.

Most of CEE and CIS countries are considered on the transition from efficiency-driven to innovation-driven growth. Innovations require high labor resource quality, life-long learning and talents mobility. Meanwhile, the least developed new EU members Bulgaria and Romania as well as Ukraine are assessed to be on the efficiency-driven stage.

WEF have developed competitiveness measurement with respect to sustainability. The GCI is adjusted with social

and environmental factors and transformed into Sustainability-Adjusted Global Competitiveness Index – GCI [10]. It covers a set of institutions, policies and factors which supports nation's productivity for a long term at the condition of supporting social and environmental sustainability [10]. Sustainability-Adjusted Global Competitiveness Index has two pillars – social and environmental sustainability.

Social sustainability pillar covers a set of institutions, policies and factors which provides to all members of society a possibility to get a health care, inclusion and safety in order to maximize their potential input and reward from the economic wellbeing of the country where they live [10]. Social sustainability pillar sets an interconnection between human and labor resource conditions and their effective utilization for the personal and country benefits.

Access to basic necessities	Vulnerability to shocks	Social cohesion
Access to sanitation	Vulnerable employment	Gini index
Access to quality water	Extent of informal economy	Social mobility
Health protection	Social safety net protection	Youth unemployment

**Figure 2. WEF sustainably-adjusted competitiveness index: social sustainability pillar**

Source: author's composing based on [10]

Components of the social sustainability pillar are covering conditions for development and better utilization of labor resource and development of social cohesion.

Sustainability-Adjusted Global Competitiveness Index is calculating by WEF not for all countries covered by GCI due to the countries information availability. It does not provide possibility for analysis of both indexes co-movements and detailed estimations of social factors input into economic competitiveness.

The comparison of labor and social factors could be assessed based on the Sustainability-Adjusted Global Competitiveness Index. The sub-index of Social Sustainability-Adjusted Global Competitiveness Index (SSACI) reflects the correlation of human and social factors with overall country competitiveness. The last index data for the CEE and CIS countries will be assessed with respect of changes of the countries competitiveness and economic growth.

**Table 3. WEF Social Sustainable-Adjusted Competitiveness Index (SSACI) and Global Competitiveness Index (GCI) in selected CEE and CIS countries, 2012-2013**

Country/ index, year	SSACI 2012	SSACI 2013	GCI 2013 p	SSACI 2013 to 2012
Czech Republic	4,85	4,77	4,43	-0,12
Estonia	4,82	4,93	4,65	0,11
Latvia	4,55	4,80	4,40	0,25
Lithuania	4,52	4,76	4,41	0,24
Kazakhstan	4,53	4,20	4,41	-0,33
Poland	4,32	4,50	4,46	0,18
Russia	4,09	4,20	4,25	0,11
Ukraine	4,04	3,90	4,05	-0,14
Moldova	3,75	3,91	3,94	0,16
Romania	3,71	3,97	4,13	0,26

Source: author's calculations based on: [9, p.6,15,67; 10, p.6, 68, 69]

Social Sustainability-Adjusted Global Competitiveness Index (SSACI) in Ukraine is slightly below of the respective indexes of the Central European countries, but higher than in Romania which is EU member as well.

Comparative assessment provides information for some considerations as for countries general and socially-adjusted competitiveness trends.

Parallel increase of countries general and socially-adjusted competitiveness could be interpreted as an implication of general interdependence of economic and social development. At the same time in Czech Republic, Kazakhstan and Ukraine the SSACI decreased in 2013 which could be attributed to influence of post-crisis economic slowdown.

Some CEE countries which are more economically advanced, have higher SSACI in comparison with overall competitiveness index GCI. It could be interpreted as substantial influence of the labor resources and social conditions on competitiveness.

At the same time less economically developed CIS countries, Moldova and Romania have lower levels of SSACI.

Comparative assessment by the WEF Social Sustainable-Adjusted Competitiveness Index shows that CEE countries being the EU members are more competitive in social terms. It reflects better provision of social services and conditions for the labor resource according to the EU requirements. But few CEE countries could be considered as less socially sustainable as CIS countries – non-EU members. It raises an issue of improving methodology and data for the better assessment of the economic and socially-sustainable competitiveness and growth.

**Conclusions.** Economic growth volatility in the global instability raises importance of sustainable development and competitiveness.

Labor resource formation and utilization should be considered not only on the country level, but as international process which has many dimensions including increase of non-core nationalities, migration, in country employment by foreign companies, cross-border labor mobility, spillover of international standards of work and living etc. Labor resource internationalization becomes a driver of domestic and international competitiveness of firms, industries and countries.

Sustainable long term competitiveness under current global instability become more driven by labor and social

factors. It takes to fostering the international comparison of the human resource development and internationalization. The index analysis of social factors of competitiveness should be combined with development of the methodology the overall evaluation of the socio-economic progress.

Sustainability policies should be developed as a part of the corporate and nation-wide strategies. Sustainable competitiveness on the all levels – firm, industry, country – should be laid out as a foundation of the economic, regulatory and social reforms.

Human resource larger input into sustainable competitiveness could be achieved under provision of economic and structural reforms.

Health protection could be reformed on the economic ground of the compulsory medical insurance, health care technological and organizational modernization, improved access to medical services.

Educational reform should be based on the schools and universities optimization, reforming of state budgeting, research-oriented transformation of universities, implementation of life-long learning on all levels.

Labor market reforms should motivate new jobs creation, labor quality and mobility, improved motivation for labor quality and productivity.

Structural reforms should be coordinated with fiscal, budget and regional management reforms in order to effective utilization of resources for social development.

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Надійшла до редколегії 12.05.14

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### ИНТЕРНАЦИОНАЛИЗАЦИЯ ЛЮДСКИХ РЕСУРСОВ ЯК ФАКТОР СТИЙКОЇ КОНКУРЕНТОСПРОМОЖНОСТІ

*Стаття розглядає роль людського ресурсу у формуванні стійкісно-орієнтованої конкурентоспроможності. Економічний розвиток все більше визначається зайнятістю, людським ресурсом та соціальними умовами. Узагальнено теоретичні підходи до аналізу ролі людського ресурсу в системі розвитку конкурентоспроможності. Розкрито значення соціальних і людських факторів міжнародної конкурентоспроможності в сучасних умовах. Виявлено вплив людського ресурсу на міжнародну конкуренцію. Визначено співвідношення рівнів соціально-адаптованої конкурентоспроможності в окремих країнах Центральної Європи, СНД та України. Накреслено шляхи посилення реформ для реалізації потенціалу людського ресурсу в інтересах національної конкурентоспроможності.*

*Ключові слова: людський ресурс, трансформаційні економіки, конкурентоспроможність, соціально-адаптована конкурентоспроможність, індекси конкурентоспроможності.*

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### ИНТЕРНАЦИОНАЛИЗАЦИЯ ЧЕЛОВЕЧЕСКИХ РЕСУРСОВ КАК ФАКТОР УСТОЙЧИВОЙ КОНКУРЕНТОСПОСОБНОСТИ

*Экономическое развитие все более определяется занятостью, человеческим ресурсом и социальными условиями. Обобщенно теоретические подходы к анализу роли человеческого ресурса в системе развития конкурентоспособности. Раскрыто значение социальных и человеческих факторов международной конкурентоспособности в современных условиях. Обнаружено влияние человеческого ресурса на международную конкуренцию. Обнаружено влияние человеческого ресурса на международную конкуренцию. Определенно соотношение уровней социальноадаптированной конкурентоспособности в отдельных странах Центральной Европы, СНГ и Украины. Начерчены пути усиления реформ для реализации потенциала человеческого ресурса в интересах национальной конкурентоспособности.*

*Ключевые слова: человеческий ресурс, трансформационные экономики, конкурентоспособность, социальноадаптированная конкурентоспособность, индексы конкурентоспособности.*

**ANNOTATION AND REFERENCES (IN LATIN):  
TRANSLATION / TRANSLITERATION / TRANSCRIPTION**

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**NATURE OF INTELLECTUAL PROPERTY INSURANCE AND ITS ROLE IN MODERN ECONOMY**

*We consider important aspects of Kyiv climate change because of natural influences (growing population and level of household consumption accompanied with mounting volumes of waste) and anthropogenic factors (shrinking forests and green spaces, inefficient use of natural resources, increased use of fossil fuels, uneconomical use of energy and water for production and business activities, outdated production technology.) The study exposes major negative effects of the climate change, examines the dynamics of trends and the relationship among population growth, consumption of energy resources, emissions of substances to air and waste production in Kyiv during 2000-2013. The environmental conditions in the city are under careful examination and compared with the environmental situation in the largest European capitals. The key scientific and methodological, organizational, economic, technological steps are outlined in the context of Ukraine's integration into the European economic space to counteract climate change in Kyiv.*

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### SYSTEM PRINCIPLES OF THE SOCIALLY RESPONSIBLE INVESTING OF POWER PROJECTS OF UKRAINE

*The new direction of modern investment projects was researched – socially responsible investing. We consider the system principles of social investment, including the selection of the best options for risk analysis, assessment and minimization. The methods of estimation of social projects in the energy sector of Ukraine for every type of risk were examined. The expert estimation of three power projects was analysed. The regressive model of estimation of competence of every expert was built and the type of projects according to environmental and social principles of analysis has been established.*

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### CASE STUDY IN OPTIMAL TELEVISION ADVERTS SELECTION AS KNAPSACK PROBLEM

*In this research paper, we shall consider the application of classical 0-1 knapsack problem with a single constraint to selection of television advertisements at critical periods such as prime time news, news adjacencies, break in news and peak times using the WINQSB software. In the end of this paper we shall formulate the task of investigation of the post optimality solution of optimal Television Adverts Selection with respect to time allocated for every group adverts.*

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## DEVELOPMENT OF TRANSNATIONAL CORPORATIONS IN THE ASPECT OF GLOBALIZATION

*This article analyses the main world transnational companies (TNCs) and the impact of globalization on their activities. Globalization is a powerful real aspect of the new world system and it represents one of the most influential forces in determining the future course of the planet. In this process TNCs play an important role. Last researches are analyzed and they show that number of TNCs increased every year. Investments in offshore financial centers (OFCs) remain at historically high levels. By joining each other TNCs create global value chains (GVC). From one hand it iës the different processes in different parts of the world that each add value to the goods or services being produced. Positive and negative impact of GVCs is shown. The KOF index of globalization in the world and in Ukraine is investigated. The main regional trends, which could involve into regional industrial development compacts, are analyzed.*

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## ECO-INTELLIGENT TOOLS – A NECESSITY FOR SUSTAINABLE BUSINESSES

*Many of the challenges associated with sustainable development can be traced in the way modern society produces and consumes. Production, distribution and supply of goods and services require material and energy consumption, having an impact on natural resources both quantitatively and qualitatively, generating waste, pollution and disrupting ecosystems.*

*Eco-business intelligence is the capacity of people, processes and applications / tools to organize business information, to facilitate consistent access to them and analyse them in order to improve management decisions, for better performance management of the organizations that are increasingly pressed to synchronize their processes and services with a sustainable development agenda, through the development, testing and implementation of decision support software.*

*By adopting sustainable practices, eco – intelligent companies can gain added value, increase market share and boost shareholder value. Moreover, the growing demand for "green" products has created new markets and the visionary entrepreneurs already reap the rewards of approaching sustainability. Large and small companies are learning that sustainable business practices not only help the environment but also can improve profitability by pursuing higher efficiency, fewer harmful side-effects, and better relationships with the community and more.*

*Gaining competitive advantage is a core concern of the companies and the existence of systems of identification, extraction and analysis of available data in a company, but also from the external environment, to provide real support for business decisions, is an essential ingredient of success.*

*This paper highlights the necessity of eco-intelligent tools that help determining the organization's strategies, identifying the perceptions and capabilities of the competitors, analyzing the effectiveness of current operations, deploying long-term prospects for environmental action and establishing indicators and key variables for organizational health, security and natural growth of its assets. The proposed tool is a decision support system that will be implemented in an online environment, tested and integrated with the information systems of the organizations. The eco-intelligent business tool can be used to obtain competitive advantages by the organizations that seek to contribute to a better quality of life in the present without compromising the development and life quality of future generations.*

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## INNOVATION CONSTITUENT OF SUSTAINABLE DEVELOPMENT

*The paper substantiates an innovation constituent of sustainable development along with environmental, social and economic pillars of the concept. Determining of implementation details of innovation activity by J. Schumpeter is a theoretical prerequisite to understanding of innovation constituent. An innovator-entrepreneur provides a customer with an information image of 'new combinations.' The image is created by identifying customer's future needs, which outline business aims, subject and appropriate means for creating the innovation products. However, consumer choice is largely motivated by values and specific rules of behavior. The rules of consumer society that in the industrial age become the motive, morality and institution, did not consider the reproductive capabilities of the environment. This disagreement was previously presented in *The Limits to Growth* by the Club of Rome and was reflected in the concept of sustainable development, which gained immense significance after the report of the World Commission on Environment and Development in 1987 (*Our Common Future*). The study highlights importance for establishment of new social values that motivate innovators to change their thinking, comprehend their responsibility not only to consumers but also to the environment and future generations. The Rio+20 Corporate Sustainability Forum: Innovation and Collaboration for the Future We Want, organized by the UN Global Compact, demonstrates the interest of entrepreneurs in practical implementation of the concept of sustainable development, through an effective innovation activity. The paper summarizes management tools for implementing business commitments to action in priority areas of ensuring sustainable development: Energy & Climate, Water & Ecosystems, Agriculture & Food, Economics & Finance of Sustainable Development, Social*

***Development, and Urbanization & Cities. Main stages of changes in companies are outlined for making responsible innovation solutions and implementing the innovation constituent of sustainable development.***

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#### FINANCING MECHANISMS FOR INVESTMENT PROJECTS IN THE AGRICULTURAL SECTOR OF UKRAINE'S ECONOMY INVOLVING ANGEL INVESTORS

***The challenges connected with attracting foreign investments into the agricultural sector of the Ukrainian economy as well as diversification of forms of international investments are actual due to the immediate needs of realization of innovative development, technological upgrading and strengthening of agricultural sector attractiveness on the world market.***

***Current situation and problems connected with attracting foreign investments into the agricultural sector of the Ukrainian economy are revealed. It is detected that level of attracting foreign investments into the agricultural sector of Ukraine and into AIC together don't meet the needs of its innovative potential.***

***The following factors of agricultural sector attractiveness have been considered: high soil fertility and favorable weather conditions for growing crops; export capacity; high yield of the Ukrainian farming companies; undervalued assets and low level of capitalization of agricultural companies; attractive tax regime for agricultural producers. It is recommended that agricultural producers should indicate these factors in investment proposals and projects that they present to potential international investors.***

***State investment policy in the agricultural sector is viewed to consolidate the resource base and the sources of investment have been determined.***

***Suggestions to expand the financing mechanisms for investment projects in the agricultural sector involving angel investors have been justified. Economic feasibility of attracting foreign investments for financing of innovation activity of farming companies has been revealed. The key requirements and main stages of investments of angel investment association have been described.***

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### MODELING IN THE PROCESSES OF CHOICE OF THE COMPANY DELIVERING BOTTLED WATER BY THE CONSUMERS ON THE BACKGROUND OF REFLEXIVE MANAGEMENT

*In this work the problem of high quality drinking water provision is described and analyzed. It is shown that a person may obtain such water by various ways one of which is bottled water delivery by specialized companies. The existence of numerous players on drinking water market stipulates the occurrence of the number of problems – in particular, the choice of the delivering water company by the consumer and fight of such companies for the consumer. The work proposes to apply a reflexive approach in order to influence the choice of the consumer, which allows the company to make him take the "right" decision. For solving the problem the classical and fuzzy model of reflexive management are described.*

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### STUDYING BUSINESS CYCLES SYNCHRONIZATION

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### LABOUR MARKET IN UKRAINE: AN EMPIRICAL DYNAMIC ANALYSIS USING ERROR CORRECTION MODEL

*The labor market background in Ukraine has not only economic but also significant social value, and therefore is an important element of social and economic policy. The effectiveness of the state socio-economic regulation mechanisms requires profound analysis, modeling and forecasting of the processes of the labor market by means of modern flexible econometric tools, taking into account the short-term dynamics of economic processes and features that are characteristic of the unstable economic development of our country. As a result of empirical research on relationships between the macroeconomic indicators of the labor market in Ukraine, we developed a set of dynamic econometric models using an error-correction mechanism which take into account the long-run equilibrium relationships, as well as provide an opportunity to model the short-term effects of several factors such as the rate of change of wages, size of the labor force, employment and unemployment. The developed model is used to predict future trends of the labor market, as well as to describe the dynamics of its operation under various alternative scenarios of economic development. The application of the developed specifications in the structure of an integral macroeconomic model of Ukraine will allow us to carry out a comprehensive analysis of economic processes in the national economy and its prospects both in the short term and in the long run.*

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### ENVIRONMENTAL SECURITY: INTEGRAL ASSESSMENT (CASE OF UKRAINE)

*Environmental security is a key issue in the context of the national security evaluating of each state and the world in whole. The lack of universality in the term definition, not to mention the technology of an assessment of environmental security, encourages researchers to develop and improve methods and approaches to assess integrated index of environmental safety at the level of the country and its regions. The main scientific results of this study include the following: given the analysis of the strengths and weaknesses of well-known techniques and approaches to the evaluation of ecological security in the world and in Ukraine, represented the authorial approach to the calculation of the integral index of environmental security of Ukraine and its regions, with the option of cross-state comparison; calculated integral index of ecological safety of Ukraine (1996 – 2013); held the comparative analysis of the ecological security of Ukraine and other selected countries; proposed the system of indicators for ranking of regions of Ukraine at the level of its environmental security.*

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### ORGANIC PRODUCTION IN UKRAINE: PROBLEMS AND PROSPECTS IN CONTEXT OF SOCIAL ORIENTED ENTREPRENEURSHIP

*Practical realization of sustainable development general conception is passing to the organic production, that allows to satisfy society problems, not putting health and future generations' existence under a threat. At this entrepreneurs, which work in the consumer products' field, must displace accents from economic oriented to social oriented entrepreneurship. The article is dedicated to research negative and positive factors that influence on social oriented Ukrainian enterprises in the sphere of organic goods production. The special attention is attended to the analysis of foodstuffs producers' activity, the results of which have considerable direct influence on consumers' health. The value of informative influences on consumers and producers is analyzed. State support directions of organic goods production, creation of internal market ecologically safe products infrastructure are defined. Recommendations are given according to research results in relation to stimulation social responsibility of businessmen and model forming, which combines interests of consumers and producers, environmental preservation, population health refinement and ecological situation improvement.*

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## INNOVATIVE INFRASTRUCTURE OF ENTREPRENEURSHIP DEVELOPMENT

*The article deals with the actual issues of such forms of innovative infrastructure development as venture capital and clustered formation. Particularities of their functioning in the market conditions and problems of their existent are analyzed in the article. Special attention is devoted to the different types of innovative clusters such as truncated, branch, innovative branch, pro-innovative and innovative oriented ones. Also the foreign experience of cluster's formations functioning in different conditions are researched according to use it in current conditions in Ukraine. The specific features of the venture investments forms are mentioned with the aim of different purposes to make venture investments. Two types of venture capital such as internal and external are researched in the article too. Formation of venture financing in Ukraine is researched from the beginning to present days. The prospects of venture entrepreneurship in Ukraine are characterized; three tendencies of venture funds in Ukraine over the last years are noticed. Also in the article the abilities, restrictions and prospects for venture capital development in Ukraine are listed. Ukrainian small business has very significant problems with using venture financing because of infrastructure and continuously changing legislation. It's necessary to create the conditions for stimulation the investments flow therefore developing the venture financing and domestic economic growth. The problems of Ukrainian legislation have to be solved as soonest to simulate the domestic production with the usage of venture financing. Also the significant meaning for innovative development has the state innovative policy which has to be aimed to making innovations especially in current conditions.*

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### LABOR RESOURCE INTERNATIONALIZATION AS A FACTOR OF THE SUSTAINABLE COMPETITIVENESS

*The paper studies a role of labor resource in sustainably oriented international competitiveness. Economic development is now more driven by employment, labor resource and social conditions. That cause a change from economic to sustainably oriented competitiveness, reflecting the increasing role of labor resource and social conditions.*

*Labor resource quality and internationalization n have a long-term influence on the sustainable competitiveness. CEE and NIS countries labor resource and social factors input into sustainable competitiveness are considering. The relevance of economic and social factors of Ukraine international competitiveness is assessed.*

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## 2<sup>d</sup> INTERNATIONAL CONFERENCE

"THE GLOBAL CHALLENGES FOR ENVIRONMENTAL AND RESOURCE ECONOMICS  
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10. Green Growth and sustainable energy and their contribution to security and stability
11. Perspectives of Environmental Strategic Security
12. Strategic alliances in different sectors and industries

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#### **Invited speakers**

Mosad Zineldin (Linnaeus University, Sweden)  
 Razvan Sorin Serbu (University "Lucian Blaga" of Sibiu, Romania)  
 Hami Alpas (Middle East Technical University, Ankara, Turkey)  
 Eugenia Severyanina (CRDFGlobal – Ukraine)  
 Sabit Zeyniyev (Environmental and Labour Protection Department, "Tamiz Shahar" JSC, Baku, Azerbaijan)

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- Prof. H. Bachev (Institute of Agricultural Economics, Sofia, Bulgaria)
- Prof. V. Bazylevych (Taras Shevchenko National University of Kyiv, Ukraine)
- Prof. C. Batzios (Aristotle University of Thessaloniki, Greece)
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- Prof. J. Martinavicius (Vilnius University, Lithuania)
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- Dr. E. Stoica (University "Lucian Blaga" of Sibiu, Romania)
- Dr. E. Strautiu (University "Lucian Blaga" of Sibiu, Romania)
- Prof. Tagirov E. (UNESCO Institute for peace problems, MGA "Europe-Asia", Rep. Tatarstan)
- Prof. V. Vitlinsky (National Economic University of Kyiv, Ukraine)
- Prof. M. Zineldin (Linnaeus University, Sweden)

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- Assist., Dr. V. Shpyrko (Taras Shevchenko National University of Kyiv, Ukraine)
- Asist. S. Rybalchenko (Taras Shevchenko National University of Kyiv, Ukraine)
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**КИЇВСЬКОГО НАЦІОНАЛЬНОГО УНІВЕРСИТЕТУ ІМЕНІ ТАРАСА ШЕВЧЕНКА**

**ЕКОНОМІКА**

**Випуск 6(159)**

**Друкується за авторською редакцією**

**Оригінал-макет виготовлено Видавничо-поліграфічним центром "Київський університет"**

Автори опублікованих матеріалів несуть повну відповідальність за підбір, точність наведених фактів, цитат, економіко-статистичних даних, власних імен та інших відомостей. Редколегія залишає за собою право скорочувати та редагувати подані матеріали. Рукописи та дискети не повертаються.



Формат 60x84<sup>1/8</sup>. Ум. друк. арк. 11,4. Наклад 300. Зам. № 214-7202.  
Гарнітура Arial. Папір офсетний. Друк офсетний. Вид. № Е6.  
Підписано до друку **18.04.14**

Видавець і виготовлювач  
Видавничо-поліграфічний центр "Київський університет"  
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Свідоцтво суб'єкта видавничої справи ДК № 1103 від 31.10.02