A B S T R A C T S

GEOLOGY

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THE USE OF OIL-GAS DEPOSIT FORMATION WATER AS HYDROMINERAL RAW MATERIALS FOR BROMINE

Formulation of the problem. The southeastern part of Dnieper-Donets Basin is one of the most developed regions in Ukraine where a number of hydrocarbon deposits are located, their underground (reservoir) waters and brines are characterized by high contents of various microelements, including bromine. According to this, the study of groundwater geochemistry to determine the possibility of its industrial extraction is an actual problem.

The purpose of the article. The article makes an attempt to determine the possibility to use underground waters of Carboniferous and Permian deposits of the southeastern part of Dnieper-Donets Basin as a hydro-mineral raw material for bromine mining.

Methods. In the work, a hydrogeochemical prospecting method has been used, taking into account geological, hydrogeological and hydrogeochemical features of the area. The authors collected and systematized a large actual (stock) material, which allowed them to make up a database of the groundwater chemical composition in the study area.

Results. In the course of the work, the geochemistry of bromine in underground waters of Carboniferous and Permian sediments was studied. It is emphasized that chloride-sodium waters and brines with salinity of 5-10 to 250 g / dm3 formed in the Paleozoic deposits at a depth of more than 800-1000 m. It is noted that inverse hydrogeochemical zoning (inversion) is often found on anticlinal structures. It was revealed that bromine content in groundwater was controlled by the amount of mineralization and the total chemical composition (geochemical type) of the waters. It is shown that groundwater enrichment with an element increases with the aquifers depth. Underground waters, enriched with various trace elements, and primarily bromine, are most often unloaded in the arched parts of the anticlinal structures controlled by disruptive disturbances. Moreover, the main factors of bromine accumulation in groundwater are heat and mass transfer processes, as well as exchange reactions in the hydrogeochemical system "rock-water". It is determined that the bromine content on individual structures achieves industrial concentrations required for economically efficient extraction of the element from aqueous solutions.

Scientific novelty and practical significance In the course of the studies, the feasibility of using reservoir waters of oil and gas deposits in the southeastern part of Dnieper-Donets Basin as a hydromineral raw material for bromine mining is substantiated.

Keywords: bromine, hydrogeochemistry, Dnipro-Donetsk basin, hydromineral raw materials, oil and gas deposits, brines, hydrocarbons, heat and mass transfer, formation water.

References

1. *Babinec, A.E. (1961). Podzemnye vody yugo-zapada russkoj platformy [Underground waters of the south-west of the Russian platform]. Kyev: Nauk. Dumka, 377.*
2. *Bondarenko, S.S., Kulikov, G.V. (1984). Podzemnye promyshlennye vody [Underground industrial water]. Moskva: Nedra, 358.*
3. *Burakov, Ju.G. (2014). Sovmestnoe osvoenie uglevodorodnogo i gidrotermal'nogo syr'ja na mestorozhdenijah nefti i gaza [Joint development of hydrocarbon and hydrothermal raw materials in oil and gas fields]. Problems of development of gas, gas condensate and oil-condensate fields, 4 (20), 59-68.*

4. *Gavrilyuk, O.V. (2015). Paleogidrogeoximicheskie osobennosti nakopleniya broma v yugo-vostochnoj chasti Dneprovsko-Doneckoj vpadiny [Paleohydrogeochemical features of the accumulation of bromine in the southeastern part of the Dnieper-Donets basin]. Visnyk of ONU. Series: Geographical and Geological Science, 20 (3), 145-156.*
5. *Gavrish, V.K. (1986). Zalozhenie, razvitie Dneprovsko-Doneckoj vpadiny i problema ee krupnomasshtabnogo tektonicheskogo rajonirovaniya [The location, development of the Dnieper-Donets basin and the problem of its large-scale tectonic zoning]. Geological Journal, 4, 3-16.*
6. *Kabyshev, B.P., Shpak, P.F., Bilyk, O.F. et. al. (1989). Geologiya i neftegazonosnost' Dneprovsko-Doneckoj vpadiny. Neftegazonosnost' [Geology and oil and gas content of the Dnieper-Donets basin. Oil and gas potential]. AN USSR In-t geologicheskix nauk. Kyev, Nauk. dumka, 204.*
7. *Gucalo, L.K., Krivoshej, V.A. (1969). Obshhie regional'nye geoximicheskie osobennosti podzemnyx vod Dneprovsko-Doneckoj vpadiny [General regional geochemical features of the underground waters of the Dnieper-Donets Basin]. Geology and geochemistry of fossil fuels, 19, 75-86.*
8. *Ibragimov, R.L. (2011). Ocenka ispol'zovaniya podzemnyx vod neftyanyx mestorozhdenij respubliki Tatarstan v kachestve gidromineral'nogo syr'ya [Assessment of the use of groundwater in the oil fields of the Republic of Tatarstan as a hydromineral raw material]. Georesources. Geoenergetics. Geopolitics, 2(4), 9.*
9. *Kolodij, V.V. (1983). Podzemnye vody neftegazonosnyx provincij i ix rol' v migracii i akkumulyacii nefti [Underground waters of oil and gas bearing provinces and their role in migration and accumulation of oil]. Kyev: Naukova dumka, 248.*
10. *Krajnov, S.R., Shvec, V.M. (1992). Gidrogeoximiya [Hydrogeochemistry]. Moscow: Nedra, 463.*
11. *Kryuchenko, N.O., Zhovinskij, E'.Ya., Kuxar, M.V., Dmitrenko, K.E. (2013). Galogeny podzemnyx vod neftegazonosnyx rajonov Dneprovsko-Doneckoj vpadiny [Halogen of underground waters of oil and gas bearing areas of the Dnieper-Donets basin]. Geotechnical Mechanics, 112, 163-172.*
12. *Ksenzenko, V.I., Stasinevich, D.S. (1995). Ximiya i texnologiya broma, joda i ix soedinenij [Chemistry and technology of bromine, iodine and their compounds]. Moscow: Chemistry, 432.*
13. *Kudel'skij, A.V., Kozlov, M.F. (1970). Geoximiya, formirovanie i rasprostranenie jodo-bromnyx vod [Geochemistry, formation and distribution of iodine-bromine waters]. Minsk: Science and Technology, 144.*
14. *Myrovoj rynok broma [World market of bromine]. (n.d.). ukrchem.dp.ua. Aviable athttp://ukrchem.dp.ua/2012/03/21/mirovoj-rynok-broma-2011-god.html. – Zahl. s ekrana.*
15. *Obzor rynka broma y bromystykh soedynenyj v SNH [Review of the market of bromine and bromide compounds in the CIS]. (n.d.). Aviable athttp://dotsplaier.ru/31673951-Obzor-rynka-broma-i-bromistyh-soedineniy-v-sng.html. – Zahl. s ekrana.*
16. *Suyarko, V.G. (2003). Geoximiya podzemnyx vod vostochnoj chasti Dneprovsko-Doneckogo avlakogena [Geochemistry of groundwater in the eastern part of the Dnieper-Donets aulacogene]. Kharkov: Karazin Kharkiv National University, 225.*
17. *Sujarko, V.G. (2006). Osoblyvosti formuvannja gazogeohimichnoi' zonal'nosti u Pivnichno-Zahidnomu Donbasi [Features hazoheohimichnoyi forming zones in the North-Western Donbass]. Visnyk Kharkiv National University, 736, 67-72.*
18. *Sujarko, V.G. (2006). Prychyny gidrogeohimichnoi' inversii' ta i'i' zv'jazok iz zonamy gazonakopychennja [Reasons hydrogeochemical inversion and its relation to areas hazonakopychennya]. Problems of Oil and Gas Industry, 4, 62-64.*
19. *Sujarko, V.G., Gavryljuk, O.V. (2014). Pro dzherela nadhodzhennja ta migraciju bromu v pidzemnyh vodah [On sources of bromine and migration in groundwater (for example, the Dnieper-Donets avlakogene)]. Journal of Kharkov National University VN Karazin. Series: "Geology. Geography. Ecology", 41 (1128), 70-75.*
20. *Sujarko, V.G., Zagnitko, V.M., Lysychenko, G.V. (2010). Strukturno-geohimichni kryterii' prognozuvannja skupchen' vuglevodniv (na prykladi Zahidno-Donec'kogo grabenu) [Structural and geochemical criteria forecasting accumulations of hydrocarbons (for example, West-Donetsk Graben)]. Kyev: Salyutis, 83.*
21. *Suyarko, V.G. (1997). E'kologiya podzemnoj gidrosfery Donbassa [Ecology of Donbass's Underground Hydrosphere]. Kyev, 69.*
22. *Chirvinskaya, M.V., Sollogub, V.B. (1980). Glubinnaya struktura Dneprovsko-Doneckogo avlakogena po geofizicheskim dannym [The deep structure of the Dnieper-Donets aulacogene from geophysical data]. Kyiv: Scientific Thought, 178.*
23. *Shvarcev, S.L., Alekseev, S.V., Vaxromeev, A.G., Alekseeva, L.P. (2012). Perspektivy ispol'zovaniya promyshlennyx rassolov Sibirskoj platformy dlya izvlecheniya litiya i broma [Prospects for the use of industrial brines of the Siberian platform for extraction of lithium and bromine]. Materials VIII International. Confer. «Subsurface use. Mining. New directions and technologies for prospecting, exploration and development of mineral deposits». Novosibirsk, 2, 29-32.*

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THERMOBARIC CONDITIONS OF OIL AND GAS CONTENTS AND PREDICTING OF HYDROCARBON PHASE STATE (ON THE EXAMPLE OF THE BILCHE-VOLYTSA OIL- AND GAS-BEARING AREA)

Formulation of the problem. This paper illustrates the use of the dimensional analysis to assess a hydrocarbon phase state. It is known that the phase state establishment of the hydrocarbon system has an important role in prospecting and exploration of oil and gas fields. Information about the hydrocarbons phase state is required in hydrocarbons supplies counting and planning of measures in respect of the increase in the coefficient of their extraction.

The purpose of the article. To create the methodology to establish the hydrocarbons phase state in a geological environment, to increase the efficiency of oil and gas indices measuring based on fundamental for the dimensional analysis π-theorem.

Methods. Estimation of hydrocarbon phase state was based on dimensional analysis of their physical and chemical properties and thermobaric conditions of free gases, condensates and oils occurrence from more than 200 objects that gave fluid inflex in the fields of Bilche-Volytsa oil- and gas-bearing area. To describe the environment we used: temperature and pressure in the stratum, depth of bedding of stratum, the average density and average molar mass of stable hydrocarbons mixture.

Results. The distribution of thermobaric parameters of hydrocarbon deposits within the Bilche-Volytsa oil- and gas-bearing area was analyzed. The character of a change in the coefficient of hydrostatics was shown to be dependent on peculiarities of the structural-tectonic construction of the investigation area. As a result, we obtained two dimensionless parameters: the criterion of "compression" Z_1, which shows the ratio of hydrocarbon energy compression system to the energy of thermal motion and equals one for ideal gas and "hypsometric" criterion Z_2 – the ratio of the potential energy of the mass raised to the height to the energy of thermal motion. The areas of numerical values Z_1 and Z_2 criteria, that describe the phase state of hydrocarbon, were identified.

Scientific novelty and practical significance. It has been found that dimensionless criteria Z_1 and Z_2 allow, with the available information about the depth of the deposit, density and molar mass of hydrocarbons and reservoir temperature and pressure, to set the phase state of the hydrocarbons system in the oil- and gas-bearing sedimentary complex. The established Bilche-Volytsa oil- and gas-bearing area has two different geothermic regions: more heated north-west and less heated south-east.

Keywords: Bilche-Volytsa oil- and gas-bearing area, hydrocarbon system, thermobaric conditions, coefficient of hydrostatics, hydrocarbon phase state, π- theorem, dimensional analysis.

References

1. *Brusilovskiy, A. I. (2002). Fazovyie prevrascheniya pri razrabotke mestorozhdeniy nefti i gaza [Phase changes at oil and gas digging]. Izdatelskiy dom "Graal", 579.*
2. *Lapshin, V. I., Volkov, A. N., Konstantinov, A. A. (2014). Fazovyie prevrascheniya uglevodorodnyih neftegazokondensatnyih sistem [Phase changes of hydrocarbonaceous petrogas condensate systems]. Nauchno-tehnicheskiy sbornik "Vestnik gazovoy nauki", 2 (18), 120-128.*
3. *Kalashnikov, O. V. (2003). Modelirovanie fazovogo povedeniya uglevodorodov: vyibor uravneniya sostoyaniya [Modeling of phase behavior of hydrocarbons: a select of an equation of state]. Ekotehnologii i resursosberezhenie, 1, 22-30.*
4. *Oreshkin, I. V., Postnova, E. V., Pyataev, A. A. (2013). Obosnovanie kriteriev prognoza fazovogo sostoyaniya plastovyih uglevodorodnyih smesey [Substantiation of measure of the prognosis of a phase state of tabular hydrocarbonaceous mixtures]. Teoreticheskie osnovyi i tehnologi poiskov i razvedki nefti i gaza, 4, 29-33.*
5. *Vanyushin, V. A., Zavyalova, L. M., Korobeynik, G.S. (1984). Otbor prob i analIz prirodnih gazov neftegazonosnyih baseynov [Sample drawing and the analysis of natural gases of petrogas basins]. Moscow, Russia: Nedra, 239.*
6. *Fedishin, V. O. ed. (1998). Atlas rodovisch nafti i gazu Ukrayini. Zahidniy naftogazonosniy region [The atlas of oil fields and gas of Ukraine. Western petrogas region region]. Lviv, Tsentr Evropi, 277.*

7. *Novosiletskiy, R. M., Polutranko, A. Yu. (1991). Geotermicheskiy rezhim i neftegazonosnost nedr Ukrainyi [Geothermic condition and oil-and-gas bearing of bowels of Ukraine]. Geotermicheskie modeli geologicheskih struktur, 142–152.*
8. *Osadchiy, V. G., Lure, A. I., Erofeev, V. F. (1976). Geotermicheskie kriterii neftegazonosnosti nedr [Geothermic criteria of oil-and-gas bearing of bowels]. Kiev, Ukraine: Naukova dumka, 144.*
9. *Kolodiy, V. V. (1979). Geotermobaricheskie usloviya i neftegazonosnost vodonapornyih basseynov [The thermobaric requirements and oil-and-gas bearing of the water-pressure basins]. Geologiya i geohimiya goryuchih iskopaemyih, 2 (52), 3–8.*
10. *Kolodiy, V. V. (2009). Naftogazova gidrogeologiya [Hydrogeology of oil and gas]. Fakel, 184.*
11. *Krupskiy, Yu. Z. (2001). Geodinamichni umovi formuvannya i naftogazonosnist Karpatskogo i Volino-Podilskogo rayonu Ukrayini [Geodynamic conditions of formation and oil-and-gas bearing of Karpatsky and Volyno-Podolsk's regions of Ukraine]. UkrDGRI, 144.*
12. *Novosiletskiy, R. M. (1975). Geogidrodinamicheskie i geohimicheskie usloviya formirovaniya zalezhey neftey i gaza Ukrainyi [Geohydrodynamic and geochemical conditions of formation of reservoirs of oil and gas of Ukraine]. Nedra, 228.*
13. *Kovalchuk, N. R., Filyas, Yu. I. (1973). Prognoznaya otsenka fizicheskih parametrov plastovyih neftey na glubinah 4000-7000 m v Predkarpatskom regione [Look-ahead estimate of physical properties of in-place oil on depths of 4000-7000 m in Prekarpatsky region]. New data of geology and oil-and-gas bearing of USSR, 1973, 74-79.*
14. *Gurevich, G. R., Brusilovskiy, A. I. (1984). Spravochnoe posobie po raschetu fazovogo sostoyaniya i svoystv gazokondensatnyih smesey [The handbook by calculation of a phase state and properties of gas condensate mixtures]. Moskow, Russia: Nedra, 264.*
15. *Kutas, R. I., Gordienko, V. V. (1971). Teplovoe pole Ukrainyi [Termal field of Ukraine]. Kiev, Ukraine: Naukova dumka, 140.*
16. *Cimaszewski, L. (1976). Akumulacja weglowodow pochodna naturalnoj termodynamiki [Accumulation of the hydrocarbons – thermodynamics aspects]. Nafta, 2, 37–41.*
17. *Petrenko, V. I., Zinovev, V. V., Zlenko, V. Ya. (2003). Geologo-geohimicheskie protsessyi v gazokondensatnyih mestorozhdeniyah i PHG [Geologo-geochemical processes in gas condensate fields and UGS]. Moskow, Russia: Nedra, 511.*
18. *Kutateladze, S. S. (1986). Analiz podobiya i fizicheskoe modelirovanie [The analysis of a similarity and physical modelling]. Science, 295.*
19. *Rozovskiy, L. B. (1969). Vvedenie v teoriyu geologicheskogo podobiya i modelirovaniya [The introducing in the theory of a geologic similarity and modelling]. Nedra, 127.*
20. *Sedov, L. I. (1977). Metodyi podobiya i razmernosti v mehanike [Methods of a similarity and dimensionality in the mechanic]. Science, 440.*

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SANDY COLLECTOR OF B-25-26 HORIZON, BEREZIVSK GAS CONDENSATE FIELD, BASED ON CORE STUDY

The aim of this work is to study the petrographic and petrophysics methods of sandstones samples in the borehole 150 of Berezivsky deposit and compare them with sandstone of horizon B-25-26 Kotelevsky and horizon C-5 Berezivsky fields to establish the identity of their petrographic type, as well as prospects for the proliferation of this type of sandstone at lateral within adjacent structures.

Despite the proven productivity of horizon B-25-26 in Berezivsky deposit and the drilling of six exploration wells on the horizon, the actual composition, structure and properties of reservoir rock core was unknown, as neither of the horizon was supported by the core material. Only after coring in estimated operating well 150 it became possible to come to certain conclusions. In the neighboring Kotelevsky field it has been established that the collectors of this horizon are specific, virtually single mineral quartz sandstones with re-

generation of quartz cement, which could keep a good capacitive-filtration properties under intensive catagenetic transformations. In the preparation of the horizon exploration projects in Berezivsky deposit it was found out that the sandstones characteristic of the Kotelevskaya Deposit can be developed here, however, it was confirmed only now.

It has been confirmed that high debit collectors of horizon B-25-26 in Berezivsky deposit are the same quartz sandstones, which form the horizon on Kotelevsky field. Where they disappear, the flow rates decrease like in the sandstones of horizon C-5 of the Berezivsky Deposit. It can be argued that these sandstones belong to a single petrographic type of rocks, fairly widespread in the lower Carboniferous. A feature of this species is atypical behavior in the catagenesis compared to the sandstones with clay cement, for which a scheme of catagenetic transformations was developed. Rocks of this type are significantly better resisant to external influences and can keep good capacitive-filtration properties at great depths.

Keywords: core analysis, reservoir properties, quartz sandstones, quartzarenite, the sustainability of catagenesis, a lot of depth, "plate" in drilling.

Referenses

1. *Lagutin, A. A. Poverenniy, S. F. (2002). Usloviya formirovaniya i litofizicheskie svoystva porod-kollektorov glubokozalegayuschego produktivnogo gorizonta V-25-26 Kotelevskogo mestorozhdeniya po dannyim izucheniya kerna. [Conditions of formation and lythophysical properties of reservoir rocks of deep productive horizon V-25-26 in Kotelevsky field according to the core study]. Pitannya rozvitku gazovoyi promislovosti Ukrayini. Geologiya gazovih i gazokondensatnih rodovisch; Zb. nauk. prats, XXX; Harkiv, UkrNDIgaz, 69-75.*
2. *Benko, V. M., Dyachuk, V. V., Oleksyuk, V. I., A.V.Lizanets, A. V., ta in. (2005). Ukrayinsko-Berezivska zona pidnyat – odin z nayperspektivnishih ob'ektiv poshukovo-rozviduvalnih robit na glibokozalyagayuchi nizhnovizeyski gorizonti. [Ukrainian-Berezivska uplift area – one of the most promising objects of prospecting for deep-seated niggas horizons]. Zb. naukovih prats UkrNDIgazu «Pitannya rozvitku gazovoyi promislovosti Ukrayini», Harkiv, UkrNDIgaz, 1, 35, 7-13.*
3. *Benko, V. M. Maevskiy, B. Y., Lagutin, A. A., Homin V. R. (2013). Osoblivosti geologichnoyi budovi i perspektivi naftogazonosnosti glibokozanurenih gorizontiv Dniprovsko-Donetskoyi zapadini. [Features of a geological struc-?ure and petroleum prospects of deep horizons of the Dnieper-Donets basin]. MonografIya za red. Maevskogo B.Y., Ivano-Frankivsk, IFNTUNG, 208.*
4. *Dits, R. A., Borovik, M. V., Poverenniy, S. F., Fuglevich, O. M., Mesha, V. (2014). Burinnya Intervaliv z anomalno nizkoyu burimistyu. [Drilling intervals with abnormally low burity]. Pitannya rozvitku gazovoyi promislovosti Ukrayini. Geologiya gazovih i gazokondensatnih rodovisch. Zb. nauk. Prats, UkrNDIgaz , Harkiv, Vip.XXXHI,79-85.*
5. *Poverenniy, S. F., Dits, R. A., Borovik, M. V, Piddubna, O. V. (2014). Sklad, budova i vlastivosti piskovikiv z anomalno nizkoyu burimistyu [The composition, structure and properties of sandstones with abnormally low burity].«Naftogazova galuz Ukrayini», 3, 23-26.*
6. *Poverenniy, S. F., Machuzhak, M. I., Lizanets, A. V. (2016). Viznachennya mehanichnoyi mitsnosti porid-kolektoriv metodom zustrichnih sferichnih indentoriv [Determination of mechanical strength of reservoir rocks method of colliding spherical indentors]. Pitannya rozvitku gazovoyi promislovosti Ukrayini. Geologiya gazovih i gazokondensatnih rodovisch. Zb. nauk. prats, UkrNDIgaz, Harkiv, XLIV, 3-12.*
7. *Makogon, V. V. (2007). Litologiya i paleogeografiya vizeyskih vidkladiv tsentralnoyi chastini Dniprovsko-Donetskoyi zapadini [Lithology and paleogeography of deposits of the Central part of Dnieper-Donets basin]. (U zv'yazku z naftogazonosnistyu). Disertatsiya na zdobuttya naukovogo stupenya kandidata geologichnih nauk., K., 150.*
8. *Baranova, T. A. (1989). O prirode poristosti glubokozalegayuschih nizhnekamennougolnyih terrigennyih kollektorov [On the nature and porosity of deep-seated lower Carboniferous terrigenous reservoirs]. (Na primere Kotelevsko-Berezovskoy strukturno-tektonicheskoy zonyi DDV). Neftyanaya i gazovaya promyishlennost, 1, 17-18.*
9. *Milanovskiy, E. E. (1987). Geologiya SSSR [Geology of the USSR], 1. M., Izd-vo MGU, 416.*
10. *Zaritskiy, A. P., Zinenko, I. I., Terdovidov, A. S., Lizanets, A. V. (2005). Vzaimosvyaz vertikalnoy gidrogeologicheskoy zonalnosti Dneprovsko-Donetskoy vpadinyi s zonalnostyami osnovnyih elementov osadochnogo chehla [The relationship of vertical hydrogeological zoning of Dnieper-Donets basin with zoning of the main elements of the sedimentary cover]. Geologicheskiy zhurnal, 3, 83-88.*
11. *Baranova T. A., Bodnarchuk A. P. (1990). Struktura porovogo prostranstva glubinnyih kollektorov DDV [The pore space structure of deep reservoirs of DDV]. (Na primere produktivnoy tolschi Kamyishnyanskoy i Berezovskoy ploschadey), Neftyanaya i gazovaya promyishlennost, 3, 16-18.*
12. *Blank, M. I., Eryomin, V. I., Krivosheya, V. A., Truhachyv, Yu. V. (1982). Stroenie i kollektorskie svoystva peschanikov verhneserpuhovskih otlozheniy Kotelevsko-Berezovskoy strukturno-tektonicheskoy zonyi [Structure and reser-?oir properties of Verhneserpukhovsky sandstone deposits Kotelevsky-Berezivskaya structural-tectonic zone]. Neftyanaya i gazovaya promyishlennost, 1, 7-9.*
13. *Krivosheya, V. A., Truhachyov, Yu. V., Teslenko-Ponomarenko, V. M. (1986). O neftegazonosnosti glubokozalegayuschih otlozheniy Kotelevsko-Berezovskoy zonyi [On oil and gas potential of deep deposits in Kotelevsky-Berezivskaya area]. Neftyanaya i gazovaya promyishlennost, 4, 9-11.*

14. Geologo-ekonomichna otsinka zapasiv gazu i kondensatu vizeyskih (V-21-26) ta turneyskih (T-1) vidkladiv Berezivskogo GKR Harkivskoyi oblasti [Geological-economic evaluation of gas and condensate reserves Vise stage (V-21-26) and Tournai stage (T-1) deposits Berezovsky's gas condensate field in Kharkiv region], (2012). Zvit o NDR. TOV «Geo-sfera», N. Ovcharenko ta in., Poltava, 1121.

15. Krivulya, S. V. (2014). Kriteriyi dorozvidki velikih rodovisch vuglevodniv u nizhnopermsko-verhnokam'yanovugilnih vidkladah Dniprovsko-Donetskoyi zapadini [Criteria for the exploration of large deposits of hydrocarbons in nizhnyohirske-verhnekam enoughly sediments of the Dnieper-Donets basin]. Monografiya, za zagaln. red. avtora. Harkiv, 174.

16. Abelentsev, V. M., Lur'e, A. Y., Mischenko, L. O. (2014). Doslidzhennya neodnorodnosti porovogo seredovischa plastiv-kolektoriv z metoyu optimizatsiyi viluchennya vuglevodniv [Research of geterogenuous porous medium of the reservoir to optimize hydrocarbon recovery]. Zb. «Visnik Harkivskogo natsionalnogo universitetu imeni V.N. Karazina», 1128, 41, Harkiv, 9-14.

7. Proekt dorozvidki nizhnovizeysko-turneyskih vidkladiv Berezivskogo GKR. Zvit o NDR [Exploration project of niggas-tarnasky deposits Berezovsky GKM] (2015). Latishev S., Minosyan O., Avdeeva A. ta in. Harkiv, 117.

18. Makogon, V. V. (2001). Litologiya ta epigenetichni zmini nizhnovizeyskih terigennih kolektoriv pivnichnoyi pribortovoyi zoni DDZ, [Lithology and epigenetic changes niggasi terrigenic collectors North priborovo zone DDV]. Zb. «Visnik HNU imeni V.N. Karazina», 521, Harkiv, 25-26.

19. Zaritskiy, O. P. (2009). Naftogazonosnist glibinnih zon rozuschilnennya porid Dniprovsko-Donetskoyi zapadini [Petroleum potential of the deep zones of rocks decompaction of Dnieper-Donets basin], Naftova i gazova promislovist, 2, 12-13.

20. Grigorchuk, K. G. (1989). Evolyutsiya kollektorskih svoystv v litogeneze [Evolution of reservoir properties in lithogenesis] (na primere turneyskih otlozheniy DDV), Geologiya nefti i gaza, 7, 25-28.

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CHEMICAL COMPOSITION OF UNDERGROUND WATERS OF KHARKIV REGION AS A HEALTH RISK FACTOR OF THE POPULATION

The article discusses the results of public health risk assessment caused by the groundwater use without preliminary water treatment for residents of Kharkiv region. Within Kharkiv region the main aquifer used for centralized water supply is Palaeogene (usually Buchatskiy-Kanev, less Mezhygirska-Obukhiv), aquifer-loamy chalk strata of the Upper Cretaceous and Cenomanian-Inferior Cretaceous aquifer.Water quality has a direct impact on the incidence of local residents. Most of the rural population routinely uses water from their own wells or boreholes. In most of them water is low quality. Increased concentrations of Tl, Hg, Cd, Pb, As, Al, Ba, Sr, Fe, Mn have been found in untreated natural water sources in different parts of the region. As a rule, levels of most of the trace elements listed above are not reduced before drinking water reaches a consumer. The analysis of macro- and microcomponent composition of drinking underground waters of Kharkiv region has been carried out. Based on the chemical composition of groundwater in the main aquifers used for water supply purposes averaged over a large number of samples over a long period of observation, the main substances for assessing the health risk of the population were identified. Subject to applicable laws of chemical elements distribution in groundwater were received average concentrations of substances in each aquifer complex. All analyzes were carried out using modern water standard techniques quite widely used today to assess the quality of drinking water. The average daily doses of elements in the human body with consumed groundwater and the indices of non-carcinogenic effects for human health are calculated. Priority substances contained in groundwater and having a health hazard index of more than 0.05 are related to thallium, mercury, cadmium, lead, arsenic, barium, strontium, iron, and manganese. By the value of the total hazard ratio, a comparative analysis of the water quality of various aquifers has been carried out and a conclusion has been reached on the acceptability of the level of risk to human health.

Keywords: Chemical composition, groundwater, Kharkiv region, public health, risk assessment, hazard ratio.

Referenses

1. Kopylevych, V. A., Voytenko, L. V., Balakyreva, A. D. et al. (2009). Aktual'nie problemi kachestva pyt'evoy vodi v Ukrayne. Voda i vodoochysni tekhnolohiyi, 10. 7–12.

2. Vasylevskaya, L. S., Orlova, S. V. (2004). Mykroelementi v medytsyne, 5, 4, 25-26.
3. Vstup do medychnoyi heolohiyi, T. 1. (2010). Za redaktsiyeyu H. I. Rud'ka, O. M. Adamenka. K., «Akadempres», 736.
4. Prokopov, V. O., Zorina, O. V., Hulenko, S. V. et al. (2012). Hihiyenichnyy analiz stanu vykorystannya system doochyshchennya pytnoyi vody v Ukrayini. Hihiyenichna nauka ta praktyka: suchasni realiyi: Materialy KhV z"yizdu hihiyenistiv Ukrayiny. 20-21 veresnya 2012 roku (L'viv). L'viv, Drukarnya LNMU imeni Danyla Halyts'koho, 299-302.
5. Honcharuk, V. (2009). Khimiya vody i problemy pytnoho vodopostachannya. Svitohlyad, 4, 18–27.
6. Hryshchenko, S. V., Nahornyy, I. M., Svestun, R. S. (2009). Terytorial'ni zakonomirnosti tekhno-hennoho zabrudne - nya navkolyshn'oho seredovyshcha v Ukrayini. Vestnyk hyhyeni y epydemyolohyy, 13, 2, 243–248.
7. Kobylyans'kyy, V. Ya. (2009). Kontrol' yakosti pytnoyi vody v XXI stolitti: (prosto i tochno). Vodopostachannya ta vodovidvedennya, 2, 19–21.
8. Kopylevych, V. A., Voytenko, L. V. (2010). K voprosu normyrovanyya kachestva vodi dlya raznikh vydov vodop- ?treblenyya. Voda i vodoochysni tekhnolohiyi, 5–6, 17–20.
9. Novykov, S. M. (1998). Problemi otsenky kantserohennoho ryska vozdeystvyya khymycheskykh zahryaznyteley okruzhayushchey sredi. Gigiena i sanitariya, 1.
10. Onyshchenko, H. H., Novykov, S. M., Rakhmanyn, Yu. A. (2002). Osnovi otsenky ryska dlya zdorov'ya naselenyya pry vozdeystvyy khymycheskykh veshchestv, zahryaznyayushchykh okruzhayushchuyu sredu. M., NYY EChyHOS, 408.
11. Onyshchenko, H. H., Rakhmanyn, Yu. A., Karmazynov, F. V. (2010). Benchmarkynh kachestva pyt'evoy vodi. SPb., Noviy zhurnal, 432.
12. Prybylova, V. M. (2016). Porivnyal'na kharakterystyka normatyviv yakosti pytnoyi vody, shcho zastosovuyut'sya v okremykh krayinakh svitu. Visnyk KhNU imeni V.N. Karazina, seriya «Geolohiya-Geohrafiya-Ekolohiya», 44, 55-62.
13. Prybylova, V. M. (2016). Osoblyvosti formuvannya yakosti pytnoyi vody ta faktory, shcho na neyi vplyvayut'. «Hidroheolohiya: nauka, osvita, praktyka», 3, KhNU imeni V.N. Karazina, Kharkiv, 2-4 lystopada 2016 r. Kharkiv, 125-128.
14. Prybylova, V. M. (2016). Stratehiya vykorystannya pidzemnykh vodnykh resursiv Kharkivs'koyi oblasti. Rehion – 2016: Stratehiya optymal'noho rozvytku: mizhnarodna naukovo-praktychna konferentsiya. Kharkiv, 2-4 lystopada 2016 r. Kharkiv, 297-300.
15. Stratehiya vykorystannya resursiv pytnykh pidzemnykh vod dlya vodopostachannya: u 2t. (2011). Za red. E. A. Stavyts'koho, H. I. Rud'ka, Ye. O. Yakovlyeva. Chernivtsi, Bukrek, 1, 348.
16. Stratehiya vykorystannya resursiv pytnykh pidzemnykh vod dlya vodopostachannya: u 2t. (2011). Za red. E. A. Stavyts'koho, H. I. Rud'ka, Ye.O. Yakovlyeva. Chernivtsi, Bukrek, 2, 500.
17. Shestopalov, V. M., Ovchynnykova, N. B. (2003). Podzemnie vodi y zdorov'e. Ekolohiya dovkillya ta bezpeka zhyttyediyal'nosti, 1, 19-32.
18. Yakist' pytnoyi vody ta yiyi vplyv na zdorov"ya naselennya (2015). Dopovid' pro stan navkolyshn'oho pryrodnoho seredovyshcha v Kharkivs'kiy oblasti v 2015 rotsi. Min-vo okhor. navkol. pryr. sered. Ukrayiny, Derzh. upr. okhor. navkol. pryr. sered. v Khark. obl. Kh., 68-67.
19. Guidelines for Drinking-Water Quality (2008). Third Edition Incorporating the 1-st and 2-nd Addenda, 1. Recommendations. WHO, Geneva, Switzerland.

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PLANNING OF THE INDUSTRIAL AND HYDROGEOLOGICAL RESEARCH AT THE FINAL STAGE OF HYDROCARBON DEPOSITS DEVELOPMENT

Formulation of the problem. The article focuses on monitoring the wells' operation at the final stages of hydrocarbon deposits development. It is known that at the final stages of the field development wells operation is characterized by a number of complications associated with the depletion of the reservoir energy and flooding with stratal waters. According to the program "20/20" gas production in JSC "Ukrgasvydobuvannia " is expected to increase to 20 billion m3 per year. One way to achieve this goal is to intensify the production on the operating fields. Consequently, flooding of the wells is likely to aggravate. However, there has been a mismatch between quantitative and qualitative indicators of industrial and hydrogeological studies of the wells. Control measurements of the water factor at the wellhead do not fix the fluid flow, and the samples selected by the field geological service are reservoir water.

The purpose of the article. To determine the causes of the indicated differences in the conditions of wells' operation and the results of industrial and hydrogeological research in Yuliyivske field in 2016.

Methods. The author's own achievements as well as the research results of domestic and foreign investigators made the methodical basis for the article.

Results. In 2016 we operated wells No. 57, 61, 73, 77 without the signs of water flooding in Yuliyivske field. Well No.7 began flooding from April, and by the end of the year it had acquired an intensive character. Analysis of the opearational water usage of well No.50 showed that it began flooding. The degree of water flooding is found to be not heavy, further increase in the flow rate of formation water is not expected. The data, especially industrial ones (gas flow rate and water factor) suggest possible start of wells No. 60 and 63 flooding. In 2017 they will be the priority for industrial and hydrogeological studies. Wells No. 56 and 83 are operating in the field conditions of non-intensive income and outcome of stratal waters.

Scientific novelty and practical significance. It has been found out that among the twelve wells which were controlled on water flooding, only two meet the conditions of passing liquid to the surface. Considering this fact, it has been proposed to divide field wells into two groups before the beginning of industrial and hydrogeological studies. In the first group it is advisable to carry out hydrogeochemical control of associated water composition only. The second group includes the wells where it is appropriate to carry out control measurements of water factor in the estuary.

Keywords: water flooding of wells, water factor, the minimum required flow rate of gas.

References

1. *Svitlitskiy, V.M. (2014). Do pitannya pIdvischennya produktivnostI naftogazovih sverdlovin [About increasing oil and gas wells flow]. Oil & gas industry of Ukraine, 1, 12-17.*
2. *Kachmar, Yu.D., SvItlitskiy, V.M., Sinyuk, B.B., YaremIychuk, R.S. (2004). IntensifIkatsIya priplivIv vuglevodnIv u sverdlovinu [The intensification of inflow of hydrocarbons into the well]. Lviv: Center of Europe, 352.*
3. *Sosnok, A. (2016). O vnedrenii tekhnologii gidrorazryva plasta v «Belorusnefti» [On the introduction of the technology of hydraulic fracturing of the formation in "Belorusneft"]. Bulletin of Belneftekhim, 7(126), 46-51.*
4. *Doroshenko, V. M., Doroshenko, S.V. (2015). Rozvitok metodIv obmezhennya priplivu plastovih vod u sverdlovinu v umovah piznoyi stadiyi rozrobki rodovisch [Development of methods of the restriction of the formation waters inflow into well on the late stage of fields development]. Oil & gas industry of Ukraine, 5, 34-38.*
5. *Boyko, V.S., Boyko, R.V., Keba, L.M., SemInskiy, O.V. ed. (2006). Obvodnennya gazovih I naftovih sverdlovin [Hydration gas and oil wells]. Kiev, International economic foundation, 1, 792.*
6. *Pravila razrabotki gazovyh i gazokondensatnyh mestorozhdenij [Rules for the development of gas and gas condensate fields]. (1971). Moscow: Nedra, 104.*
7. *Dyachuk N.S., Uhrynovs'kyy A.V. (2009). Kontrol' za obvodnennyam hazovykh i hazokondensatnykh pokladiv i sverdlovyn). [Control of flooding and gas condensate reservoirs and wells]. Prospecting and development of oil and gas fields, 4 (33), 104-109.*
8. *Zorkin, L.M., Akulinchev B.P. ed (1997). Tehnologiya gazopromyislovyih gidrogeologicheskih issledovaniy [Technology of gas hydrogeological research]. Moscow, Nedra, 300.*
9. *Kanevskaya, R.D. (1999). Matematicheskoe modelirovanie razrabotki mestorozhdeniy nefti i gaza s primeneniem gidravlicheskogo razryiva plasta [Mathematical modeling of the development of oil and gas fields using hydraulic fracturing]. Moscow, Nedra, 212.*
10. *Stroganov, A.M., Iskrin, A.Yu., Kamenskiy, A.V., Stroganov, M.A., Usov, S.V. (2013). K voprosu ogranicheniy vodopritokov v neftyanoy skvazhine posle provedeniya GRP [On Controlling the Water Inflow to Oil Wells After Hydro–fracturing]. Oil.Gas.Novation, 7(174), 18-26.*
11. *Sarancha, A.V., Fedorov, V.V., Mitrofanov, D.A., Zotova, O.P. (2015). Effektivnost provedeniya gidravlicheskogo razryiva plasta na vyingapurovskom mestorozhdenii [Efficiency of hydraulic fracturing at Vyngapur deposit]. Basic research, 2-12, 2581-2584.*
12. *Lea, J., Nickens, H., Wells, M. (2008). Jekspluatacija obvodnjajushhihsja gazovyh skvazhin. Tehnologicheskie reshenija po udaleniju zhidkosti iz skvazhin [Operation of water-flooded gas wells. Technological solutions for removing fluid from wells]. Moscow, «Premium Engineering Ltd», 384.*
13. *Boyko, V.S., Ivanov, S.I., Burachok, O.V. (2004). Komp'yuterna metodyka optymizatsiyi roboty obvodnenykh hazovykh sverdlovyn na osnovi vykorystannya danykh pro debit hazu [Computer optimization technique of flooded wells on the basis of data on the flow rate of gas]. Prospecting and development of oil and gas fields, 2(11), 60-63.*
14. *Kondrat, R.M., Kondrat, O.R., Marchuk, Yu.V., Khomyn, I.I. (2007). Pidvyshchennya produktyvnosti nyz'kodebitnykh obvodnenykh hazovykh i hazokondensatnykh sverdlovyn [Increasing productivity of low debit flooded gas and gas condensate wells]. Prospecting and development of oil and gas fields, 3(24), 14-17.*
15. *Bulka, S.V., Sobol', V.V., Stetsyuk, S.M., Vakulenko, N.S. (2010). Otsinka stiykoyi roboty hazokondensatnykh sverdlovyn na prykladi Bil's'koho rodovyshcha [Assessment of sustainable condensate wells for example Bielsk field]. Problems of gas industry development in Ukraine, XXXVIII, 151-155.*
16. *Volovets'kyy, V.B., Kotsaba, V.I., D'omin, A.V. (2016). Sposoby rehulyuvannya roboty hazokondensatnykh sverdlovyn v umovakh periodychnoyi ekspluatatsiyi [Methods for regulation of gas condensate wells in conditions of periodic operation]. Problems of gas industry development in Ukraine, XLIV, 131-136.*
17. *Valeev, A.F., Solovev, N.A., Shuer, A.G. (2013). Kontseptsiya sovershenstvovaniya tehnologicheskih rezhimov*

rabotyi sistemyi «plast-skvazhina-shleyf» v usloviyah obvodneniya gazovyih skvazhin i sposob eyo realizatsii [The concept of improving the technological operating modes of the "reservoir-well-trail" system in conditions of watering gas wells and the way of its realization]. Electronic scientific journal "Oil and gas business", 4, 136-149.

18. *Lupsheev, V.A., Vasyanovich, M.M., Tsiku, Yu.K. (2013). Odin iz sposobov prodleniya bezvodnogo perioda ekspluatatsii dobyivayuschih skvazhin [One way to extend the anhydrous period of operation of production wells]. International research journal, 7(14), 5, 117-121.*
19. *Boyko ,V.S., Kondrat, R.M., Yaremiychuk, R.S. ed. (1996). Dovidnyk z naftohazovoyi spravy [Handbook of oil and gas business]. Lviv, 620.*
20. *Samoilov, V.V. (2014). Promyslovo-hidroheolohichni doslidzhennya – skladova kontrolyu za rozrobkoyu hazokondensatnykh rodovyshch [Industrial-hydrogeological study – component control over development gas-condensate field]. Visnyk of Karazin Kharkiv National University, 1098, 46-48.*

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NEW APPROACH TO CRUDE OIL CLASSIFICATION PROBLEM

Formulation of the problem. The problem of crude oil classification has existed since the beginning of oil production. Presently, there is a lot of available information about chemical composition and physical-chemical properties of crude oil found in various petroleum- bearing regions around the world, however, the problem with oil typification still exists and there is no uniform classification. Primarily, this is connected with significant differences in chemical composition of oil and absence of a proven set of key criteria that such classification can be based on.

The available classifications can be relatively divided into three categories: chemical, genetic and process. However, there is no classification that would approach oil regarding its production problems. When choosing a recovery technique and development strategy for a particular oil deposit, one has to refer to several classifications simultaneously and, in some cases, one classification may contradict another.

The aim of the investigation. To develop a new industrial crude oil classification.

Methods. In order to determine the key factors affecting physical and chemical properties of oil, 150 oil reservoirs of Dnieper-Donets basin containing oil with various composition have been studied using well operation and testing data.

Results. Obtained results have confirmed the relationship between the three key oil content components - asphaltenes and waxes, sulfur and resins, which affect specific physical-chemical properties of oil. None of the existing classifications account for this relationship, nor they take into consideration quantitative correlation of such components.

Scientific novelty and practical significance. Based on the relationship determined between the main components, a new oil production classification have been developed allowing to choose sustainable field development strategy and production methods as early as at the initial exploration stage, extend time between workovers in wells by mitigating production problems, minimizing geological risks related to bringing wells back on production after scheduled repair or workover operations, and increasing cost efficiency of oil and gas deposits development.

Keywords: crude oil, classification, exploitation, deposit, oil well, asphaltenes and waxes, sulfur, resins.

References

1. Biletskiy, V.S. (2007). Mala hirnycha entsyklopediia. Donbas, 652.
2. Norman, J.H. (2014). Dictionary of Petroleum Exploration, Drilling and Production. PennWell Corporation, 769.
3. Botneva, T.D. (1987). Geneticheskie osnovy klassifikacii neftej. Nedra, 196.
4. Pankina, R.G. (1978). Geohimija izotopov sery neftej i organicheskogo veshhestva. Nedra, 248.
5. Petrov, A.A.(1984). Uglevodorody nefti. Nauka, 264.
6. Petrov, A.A.(1974). Himija alkanov. Nauka, 244.
7. MacLaren, D.D. (1975) Chemical technology. 594.
8. Gol'dberg, I.S. (1981). Prirodnye bitumy SSSR (Zakonomernosti formirovanija i razmeshhenija) Nedra, 195.
9. Klubov, B.A. (1995). Principial'naja model' obrazovanija tverdyh bitumov. Kondensirovannoe nekristallicheskoe sostojanie veshhestva zemnoj kory, 85-90.
10. Kurbskij, G.P. (1987). Geohimija neftej Tatarii. Nauka, 168.
11. Nametkin, S.S. (1955). Himija nefti. Izd-vo AN SSSR, 799.

12. Shevchenko, E.F., Gabinet, L.M., Karpenko, G.M. (1971). Fiziko-himicheskie svojstva neftej i gazov Ukrainy. Moscow: Nedra, 408.
13. Sjunjaev, Z.I., Batueva, I.Ju., Gajle, A.A. (1984). Himija nefti. Lviv: Himija, 360.
14. Saranchuk, V.I., Iliashov, M.O., Oshovskyi, V.V., Biletskyi, V.S. (2008). Khimiia i fizyka horiuchykh kopalyn. Donetsk: Skhidnyi vydavnychyi dim, 600.
15. Bondarenko, V.I., Varlamov, H.B., Volchyn, I.A., Karp, I.M. (2006). Enerhetyka: istoriia, suchasnist i maibutnie. Kyiv: Vid vohniu ta vody do elektryky, 300.
16. Uspenskij, V.A., Radchenko, O.A., Glebovskaja, E.A. (1961). Osnovnye puti preobrazovanija bitumov v prirode i voprosy ih klassifikaciiю. Lviv: Gostoptehizdat, 314.
17. Gol'dberg, I.S. (1982). Proishozhdenie bitumov i zakonomernosti formirovanija ih mestorozhdenij. Neftebituminoznye porody. Perspektivy ispol'zovanija, 48–54.
18. Safieva, R.Z. (2004). Himija nefti i gaza. Neftjanye dispersnye sistemy: sostav i svojstva. – Moscow: RGU nefti i gaza im. I.M. Gubkina, 112.
19. Proskurjakov, V.A., Drabkin, A.E. (1995). Himija nefti i gaza. SPb, Himija, 448.
20. Ivanova, L.V., Koshelev, V.N., Sokova, N.A., Burov, E.A., Primerova, O.V. (2013). Neftjanye kisloty i ih proizvodnye. Poluchenie i primenenie. Moscow: Trudy RGU nefti i gaza imeni I.M. Gubkina, 1, 68-80.
21. Lur'e, M.A., Shmidt F.K. (2013). K voprosu o proishozhdenii nefti. Geterokomponenty, izotopija ugleroda i sery neftej kak geneticheskie pokazateli. Irkutsk: Izd-vo Irkut. gos. un-ta, 209.
22. Saranchuk, V. I., Iliashov, M.O., Oshovskyi, V.V., Biletskyi, V.S. (2008). Donetsk: Skhidnyi vydavnychyi dim, 600.
23. Chernykh, V.P., Zimenkovskyi, B.S., Hrytsenko, I.S. (2008). Orhanichna khimiia. Kharkiv: Vydavnytstvo NFaU «Oryhinal», 752.
24. Jelektronnyj nauchnyj zhurnal «Neftegazovoe delo». Available at: http://ogbus.ru/issues/3_2014/ ogbus_3_2014_p17-32_RaupovIR_ru.pdf

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ON CONNECTION OF MODERN GEODYNAMIC PROCESSES IN CARBONATE ROCKS WITH TECTONIC ACTIVIZATION OF PETRIVS'K-KREMINNA FAULT

The given paper considers the connection of modern geodynamic processes in carbonate rocks with the tectonic activation of Petrivs'k-Kreminna fault. It is emphasized that faults in the region are the channels of the upward heat and mass transfer.

The unloading of deep formation waters and endogenous fluids in the area Petrivs'k-Kreminna and other faults results from heat and mass transfer, which is brought about by the motions of lithospheric blocks of Donets'k folded structure.

The present tense dynamic state of the geological system manifests itself in the constant uplifting of the hanging wings of Svyatohirs'k brachyanticline at a speed of 1,3-2,5 mm a year. Earthquakes with the focal depth of ~10 km are associated with periodic geodynamic stress relaxation in the Archean-Proterozoic basement complex in the ancient geologically closed submeridional fault that intersects within Svyatohirs'k structure with the Petrivs'k-Kreminna fault. The modern and most recent tectonic activation of the latter is evidenced in the formation of hypogenic hydrogeochemical anomalies, accompanied by hydrochemical inversion. The groundwater here exhibit alkaline reaction (pH up to 8,2), an increased temperature (19-27 °C) in the range of 0-300 m and a high content of hypogenic trace elements, among which carbon dioxide takes pride of place.

The presence of CO_2 increases the aggressiveness of underground water towards carbonate rocks, resulting in a chemical geodynamic process referred to as karst. Furthermore, abnormal physical and chemical properties of groundwater bring about suffusion processes in loamy, chalk strata of rocks. These geodynamic processes are associated with geological risks for buildings of Svyatohirs'k monastery.

The study found that: 1) the tectonic activation of the Petrivs'k-Kreminna fault in various and, above all, the modern and contemporary periods of Alpine tectonogenesis is the dominant energy basis of geodynamic processes, including seismic activity; 2) carbon dioxide as atmospheric and deep genesis present in the groundwater of different types, is the major factor in the development of carbonate karst in Svyatohirs'k brachyanticline; 3) the isotopic analysis of $\delta^{13}C$ and $\delta^{18}O$ in aragonite chalk powder clearly showed that recrystallization of chalk into aragonite occurred involving deep formation waters saturated with endogenous (metamorphogenic or mantle) CO_2.

Keywords: fault, geodynamic processes, fluid-dynamic system heat and mass transfer, hydrogeochemical anomalies, tectonic activation, brachyanticline, carbonate rocks, suffusion, karst.

References

1. *Belokon', V. G. (1968). Neotektonicheskie dvizhenija v Donbasse i ih svjaz' so strukturnymi jelementami. V kn. "Materialy po geologii Doneckogo bassejna". M., Nauka, 11–15.*
2. *Belokon', V. G. (1981). O glubinnom istochnike jenergii ugleobrazovanija formacii Doneckogo bassejna. Geologicheskij zhurnal, 41, 6, 88–99.*
3. *Belokon', V. G. (1984). Bassejn r. Severskij Donec kak geodinamicheskaja sistema, otrazhajushhaja processy bol'shih glubin. Geologicheskij zhurnal, 34, 5, 11–27.*
4. *Beskrovnyj, N. S., Kudrjavceva, E. I., Lobkov, V. A. (1975). Izotopnyj sostav ugleroda prirodnyh gazov Kamchatki. Geohimija, 11, 1660–1667.*
5. *Garrels, R. M., Krajst, Ch. L. (1968). Rastvory, mineraly, ravnovesija. M., Mir, 368.*
6. *Degens, Je. T. (1974). Biogeohimija ustojchivyh izotopov ugleroda. V kn. "Organicheskaja geohimija". L., 207–226.*
7. *Kaljuzhnyj, V. A. (1978). Sovremennoe sostojanie problemy «Uglerod i ego soedinenija v jendogennyh processah mineraloobrazovanija (po vkljuchenijam v mineralah). V sb. «Uglerod i ego soedinenija v jendogennyh processah mineraloobrazovanija (po dannym izuchenija fljuidnyh vkljuchenij v mineralah»)». K., Naukova dumka, 3–16.*
8. *Kissin, I. G., Pahomov, S. I. (1969). K geohimii uglekisloty v glubokih zonah podzemnoj gidrosfery. Geohimija, 4, 460–471.*
9. *Konashov, V. G. (1983). Mezozojskij jetap tektogeneza v Doneckom bassejne. Geologicheskij zhurnal, 3, 96–102.*
10. *Lazarenko, E. K., Panov, B. S., Pavlishin, V. I. (1975). Mineralogija Doneckogo bassejna, II. K., Naukova dumka, 502.*
11. *Lushhik, A. V., Lisichenko, G. V., Jakovlev, E. O. (1988). Formirovanie rezhima podzemnyh vod v rajonah razvitija aktivnyh geodinamicheskih processov. K., Naukova dumka, 164.*
12. *Mejson, B. (1971). Osnovy geohimii, M., Nedra, 312.*
13. *Naboko, S. I. (1980). Metallonosnost' sovremennyh gidroterm v oblastjah tektonomagmaticheskoj aktivizacii. M., Nauka, 199.*
14. *Nacional'nij atlas Ukraïni (2009). K., DNVC «Kartografija», 440.*
15. *Skarzhinskij, V. I. (1973). Endogennaja metallogenija Donbassa. K., Naukova dumka, 203.*
16. *Sokolov, D. S. (1962). Osnovnye uslovija razvitija karsta. M., Gosgeoltehizdat, 321.*
17. *Sukhov, V. V. (2012). O rezul'tatah jeksperimentov po izucheniju vlijanija processov zamerzanija i tajanija kapilljarnyh i treshhinnyh vod na gornye porody. Materiali nauk.-prakt. konf. «Region – 2012. Strategija optimal'nogo rozvitku». Harkiv, 309–312.*
18. *Sukhov, V. V., Sujarko, V. G., Serdjukova, O. O. (2015). Gidrogeologichni osoblivosti karbonatnogo karstu. Science Rise, 7/1 (12), 23–27.*
19. *Sujarko, A. V. (1968). Rol' zon razgruzki glubinnyh vod v vyjasnenii prirody geotermicheskih anomalij i rudnoj mineralizacii v Zapadnom Donbasse. II geol. konferencija «Stepanovskie chtenija». Artemovsk, 161–163.*
20. *Sujarko, V. G. (1984). Osobennosti formirovanija vertikal'noj gidrogeohimicheskoj zonal'nosti v mezozojskih strukturah Doneckogo progiba. Geologicheskij zhurnal, 44, 1, 127–130.*
21. *Sujarko, V. G. (2006). Geohimija podzemnyh vod vostochnoj chasti Dneprovsko-Doneckogo avlakogena. Har'kov, KhNU imeni V. N. Karazina, 225.*
22. *Sujarko, V. G., Sukhov, V. V. (2015). Konceptual'na sinergetichna geologo-gidrogeologichna model' rozvitku sufoziї ta karstu u karbonatnih porodah na teritoriї Svjatogirs'kogo monastirja. Visnyk KhNU imeni V. N. Karazina, serija «Geologija. Geografija. Ekologija», 1157, 63–68.*
23. *Fil'kin, V. A. (1986). Opyt sostavlenija karty sovremennyh dvizhenij zemnoj kory po territorii Donbassa. Sovremennye dvizhenija zemnoj kory. K., Naukova dumka, 216–221.*
24. *Fournier, F. (1960). Climatel erosion. Press Universitaries de France. Paris, 120.*
25. *Sukhov, Valeriy (2015). Forecast of potential natural risks for the historical and architectural sights of the Holy Mountains Lavra (Sviatohirsk Monastery).Young Scientist USA, 4. Lulu, USA, 126-130.*
26. *Wiebe, R., Gaddy, V. L. (1940). The solubility of carbon dioxide in water at various temperature from 12 to 40o and at pressures to 500 atmospheres. Critical phenomena. J. Am. Ckem. Soc., 62, 815–817.*

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THE METHODS TO IDENTIFY COMPACTED SATURATED HYDROCARBON ROCKS (ON THE EXAMPLE OF SOUTHERN DNIEPER-DONETS BASIN MARGIN)

Formulation of the problem. The article focuses on the study of one variety of unconventional sources of saturated hydrocarbon compacted rocks. It is known that in the last 5-7 years Ukraine started to pay close attention to the issue of unconventional hydrocarbons. The vector of additional prospecting industry refocused on existing fields of implementation and the involvement of new, advanced technologies. Following the example of countries that have successfully extracted gas and oil from compacted rocks we can say with confidence that the chosen direction is the most relevant and promising for our country.

The purpose of the article. To survey the results of Pereschepynskii-Ulyanivskii deposits, and considering the research results of leading countries to show the feasibility study of compacted deep saturated hydrocarbon species within Dnieper-Donets basin.

Methods. In writing this article the authors used the experience of domestic and foreign authors as well as their own research data.

Results. In the early 70's XX century the US has carried out exploration work during which four large pools of compacted rocks were revealed.

Due to the rapid growth of steel production the USA became a world leader with almost 40% of gas accounted for non-traditional sources (25% - gas condensed explosive rocks).

Basic research methods are: analysis of material exploration, geological and geophysical surveys; industrial logging operations; tectonic and stratigraphic knowledge of the region; petrophysical features of rocks; preliminary, operational, detailed studies of core and sludge wells; the reinterpretation of GDS and other materials.

For example, the survey results of Pereschepynskii and Ulyanovskii deposits located in the southern area alongside Dnieper-Donets depression (PPD) suggest that prospective compacted rock strata are associated with traditional anticlinal traps and are in direct contact with intervals of productive strata. The area has prospects for industrial flow of gas from reservoir compaction. The highest probability to find hydrocarbons in compacted rocks can be expected with rhythmic siltstone layering. In their further study gas-saturated rocks should be considered comprehensively.

Scientific novelty and practical significance. Earlier studies of dense sand strata in siltstone of Pereschepynskii and Ulyanivskii areas were not considered as potential sources of hydrocarbons. We can assume that most likely carbon deposits should be considered regionally. Distribution of hydrocarbons was traced both horizontally and vertically. It is possible that in the future there will be increase in the number of carbon productive horizons in the deposits. Upon confirmation of carbon saturation in the thick compacted rocks they can be considered and recommended as a potential source of siltstone gas.

Keywords: hydrocarbon-saturated rocks, compacted rocks, deposits, DDB, geological and technological studies (GTS).

References

1. *Vysochans'kyy, I.V., Omel'chenko & et. (2006). Do problemy poshukiv pokladiv vuhlevodniv u ne sklepinnykh pastkakh Dniprovs'ko-Donets'koyi zapadyny [The problem of finding hydrocarbons in no vaulted traps Dnieper-Donets basin]. Ivano-Frankivs'k, Fakel, 25.*
2. *Vakarchuk, H.Y., Vynnychenko, H.L., Kononenko, L.P. & et. (1989). Heolohyya y neftehazonosnost' Dneprovsko-Donetskoy vpadyny. Stratyhrafyya [Geology and oil and gas content of the Dnieper-Donets basin. Stratigraphy]. Kiev, Naukova dumka, 112.*
3. *Zarytskyy, A.P., Zynenko, Y.Y., Lyzanets, A.V. (2007). Sootnoshenye osnovnoy y hlubynnoy zon neftehazonakoplenyya Dneprovsko-Donetskoy vpadyny. [The ratio of the main and deep zones of oil and gas accumulation in the Dnieper-Donets basin]. Geological journal, 1, 28.*
4. *Lukyn, A.E. (2011). Perspektyvy slantsevoy hazonosnosty Dneprovsko-Donetskoho avlakohena. [Perspectives of the shale gas content of the Dnieper-Donets aulacogene]. Geological journal, 1, 21-41.*
5. *Makarenko, P.V. ed. (1990). Metodicheskoye rukovodstvo po issledovaniyu shlama i kerna [Methodological guidelines for the investigation of sludge and core]. Moscow, 7-20.*
6. *Netradytsiyni dzherela vuhlevodniv Ukrayiny: monohrafiya u 8 knyhakh. [Alternative sources of hydrocarbons Ukraine: monograph 8 books]. Za red. O.Yu. Lukina ta D.S. Hurs'koho. K., Nika-tsentr, 2013, 17-45.*

7. *Mykhaylov, V.A., Ohar, V.V., Zeykan, O.Yu. & et. (2011). Perspenktyvy hazonosnosti slantsevykh vidkladiv Dniprovs'ko-Donets'koyi zapadyny. [Prospects gas content of the shale deposits of the Dnieper-Donets basin]. Geologist Ukraine, 2, 55-59.*
8. *Mykhaylov, V.A., Zeykan, O.Yu., Hladun, V.V. (2012). Perspektyvy slantsevykh vidkladiv Ukrayiny [Prospects for shale deposits Ukraine]. Oil and gas industry, 2, 42-43.*
9. *Vyzhva, S.A., Mykhaylov, V.A., Onyshchuk, D.I., Onyshchuk, I.I. (2013). Petrofizychni parametry netradytsiynykh porid-kolektoriv Pivdennoho naftohazovoho rehionu. [Petrophysical parameters unconventional reservoir rocks southern oil and gas region]. Geoinformatics, 3, 1-3.*
10. *Lukin, O.Yu., Pryharin, T.M., Hladun, V.V. (2011). Resursnyy potentsial Skhidnoho hazonaftonosnoho rehionu Ukrayiny (perspektyvy osvoyennya). [Resource potential oil and gas Eastern region of Ukraine (development prospects)]. Oil and Gas Industry, 4, 7.*
11. *Lukin, A.Ye. (2010). Sovremennoye sostoyaniye problemy slantsevogo gaza (v svete opyta osvoyeniya yego resursov v SHA) [The current state of the shale gas problem (in the light of the experience of developing its resources in the USA)]. Geological journal, 3, 42.*
12. *Heoloho-heokhimichni ta hazokarotazhni doslidzhennya. [Geological and geochemical studies gas logging]. (2016). SOU 09.1-30019775-271:2016 from 25 th January 2016. Kiev, JSC "Ukrgasdobycha", 4-16.*
13. *Sverdlovyny na naftu i haz. Heofizychni doslidzhennya ta roboty v hazovykh ta naftovykh sverdlovynakh. Poryadok provedennya. [Wells for oil and gas. Geophysical studies and work in the gas and oil wells. Conduct] (2011). SOU 11.2-30019775-187:2011 from 21 December 2011. Kiev, JSC "Ukrgasdobycha", 5-12.*
14. *Bilyk, A.O., Vakarchuk, H.I., Ivanyshyn, V.A. (2002). Stratyhrafiya, korelyatsiya i perspektyvy naftohazonosnosti turneys'kykh i vizeys'kykh vidkladiv Dniprovs'ko-Donets'koyi zapadyny. [Stratigraphy, correlation and prospects of oil and gas deposits of the Visean turneyskyh and Dnieper-Donets basin]. Chernihiv, 111.*
15. *Suyarko, V.H., Zahnitko, V.M., Lysychenko, H.V. (2010). Strukturno-heokhimichni kryteriyi prohnozuvannya skupchen' vuhlevodniv. [Structural and geochemical criteria forecasting accumulations of hydrocarbons]. Kiev, Salyutis, 147-148.*
16. *Yevdoshchuk, M.I., Chebanenko, I.I., Havrysh, V.K. & et. (2001). Teoretychni osnovy netradytsiynykh heolohichnykh metodiv poshuku vuhlevodniv. [The theoretical basis of non-traditional geological methods of finding hydrocarbons]. Kiev, 200-210.*
17. *Tereshchenko, V.O. (2016). Netradytsiyni dzherela vuhlevodnevoyi syrovyny. [Alternative sources of hydrocarbons]. Karazin Kharkiv National University, 52-60.*
18. *Kharchenko, M.V., Popova, T.L., Ponomarenko, L.S. (2013). Priorytetni napryamy osvoyennya resursiv vuhlevodniv Hlyns'ko-Solokhivs'koho naftohazonosnoho rayonu Dniprovs'ko-Donets'koyi zapadyny. [Priorities development of hydrocarbon resources, oil and gas regions Glinsko Solohivskoho Dnieper-Donets basin]. Oil and gas sector Ukraine, 3, 6-9.*
19. *Shvydkyy, O., Dovzhok, T., Vakarchuk, S. & et. (2012). Famennian-Tournaisian-Lower Viseanshel seguences as prospective shel gas plays for the Dnieper-Donets basin, Ukraine. Brisbane, Australia, 5.*
20. *Waldo, D. (2012). A Review of Three North American Shale Plays: Learnings from Shel Gas Exploration in the Americas. Search and Discovery Article, 25.*

GEOGRAPHY

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SPACE TRANSFORMATIONS OF URBAN PERIPHERAL AND INDUSTRIAL AREAS IN UKRAINE (ON THE EXAMPLE OF CITIES OF ZAPORIZHIA AND ZHOVTI VODY)

The aim of the study: Given the key role of cities in spatial development, problems of their evolution and transformation turned into extremely important subject of geographical research. Spatial and functional transformations in post-socialist cities of East Central Europe, including the former Soviet Union, constitute a separate layer for scientific conceptualization. Despite the wide range of publications dealing with transformations of post-socialist cities, insufficient attention is paid to spatial transformation in cities that have developed in industrial regions and grow by virtue of industrial production. Therefore, the purpose of this article was to determine the main trends and peculiarities of the spatial transformations in peripheral industrial urban areas in Ukraine.

Research methods: Two cities, Zaporizhia and Zhovti Vody, both located in Dnieper industrial region, were selected to be case-studies. The test areas were selected in the central parts of the studied cities due to the primary interest in the nature of urban space adaptation to the new social values and demands. Residential buildings, non-residential constructions and infrastructure within the test areas were evaluated in terms of their functional profile and condition (level of renewation or modernization).

Results: The following key foci of the spatial transformations were identified: public transport stops and lines, major trade and entertainment facilities, current and former industrial areas, open public spaces, sacral objects and spaces. These foci can be characterized as the agents of spatial transformations, since they trigger further changes in the surrounding urban areas. The data collected made it possible to identify the following integrated socio-spatial processes: socio-spatial polarization, commercialization of public spaces, de-industrialization, revitalization, segregation and gentrification. Most of them were observed in both cities, but have different intensity and manifestations, except for gentrification apparent only in Zaporizhia. The differences between the transformation processes in Zaporizhia and Zhovti Vody are both quantitative and qualitative and generated due to differences in urban population, administrative status, and position in the spatial framework. However, in general, spatial transformations in both cities have the same course and are caused by the similar factors.

Scientific novelty: The paper for the first time represents comparative analysis of trends and peculiarities of the spatial transformations in peripheral-industrial urban areas in Ukraine using original methods.

Practical significance: The obtained results, specifically knowledge on the main spatial transformation agents and their interaction, may be used in urban planning process for more effective solutions in terms of urban areas modernization.

Keywords: spatial transformations, modernization, post-socialist city, industrial city, monofunctional city, socio-spatial processes, Zaporizhia, Zhovti Vody.

References

1. *Bulinina, N. S. (2003). Osobennosti transformatsii gorodskogo prostranstva Nizhnego Novgoroda. Sovremennye problemy nauki i obrazovaniya, 6, 2-8.*
2. *Golubchikov O. Yu., Mahrova A. G. (2013). Faktory neravnomernogo razvitiya rossiyskih gorodov. Moscow University Herald. Geography, 2, 54-60.*
3. *Denysenko, O. O. (2012). Protsesy metropolizatsiyi: svitohospodars'kyy aspect. Kyiv: Institute of Geography of the National Academy of Science of Ukraine.*
4. *Druzhinin, A. G. (2008). Prostranstvennoe razvitie goroda-millionera: tendentsii postsovetskogo perioda. Rostov-on-Don.*
5. *Mezentsev, K. V., Mezentseva, N. I., Bura, T. L. (2011). Transformatsiya publichnykh prostoriv u velykykh mistakh Ukrayiny na prykladi torhovel'no-rozvazhal'nykh tsentriv. Ekonomichna ta Sotsialna Geografiya, 63, 172-184.*
6. *Mezentsev, K. V., Mezentseva, N. I. (2011). Publichni prostory Kyyeva: zabezpechenist' naselennya ta suchasna transformatsiya. Human Geography Journal, 11 (2), 39-47.*

6. *Mel'nyk, L., Oreshchenko, A., Batychenko, S. (2016). Transformatsiyi mis'koho prostoru na prykladi testovoyi dilyanky v misti Luts'k. Bulletin of Taras Shevchenko National University of Kyiv. Geography, 1(64), 53-57.*
8. *Mel'nychuk, A., Kauk, Yu., Pal'chuk, M. (2012). Tendentsiyi transformatsiyi perevazhayuchykh mis'kykh funktsiy v mezhakh Pechers'koho rayonu mista Kyyeva pochatku XXI st. Ekonomichna ta Sotsialna Geografiya, 65, 173-183.*
9. *Turgel, I. D. (2013). «Vtorye» goroda gornozavodskogo Urala: opyt instytutsional'no-evolyutsionnogo analiza. Regional'naya ekonomika: teoriya I praktika, 44 (323), 2-13.*
10. *Sheptukhina, L. I., Yevseev, O. S. (2014). Covremennye tendentsii transformatsii gorodskogo prostranstva. Regionalnoe razvitie, 3, 4, 125-129.*
11. *Bernt, M., Gentile, M., Marcińczak, S. (2015). Gentrification in post-communist countries: an introduction. Geografie, 120(2), 104-112.*
12. *Brade, I., Axenov, K., Bondarchuk, E. (2006). The Transformation of Urban Space in Post-Soviet Russia. New York: Routledge.*
13. *Gentile, M. (2004). Divided post-soviet small cities? Residential segregation and urban form in Leninogorsk and Zyryanovsk, Kazakhstan. Geografiska Annaler: Series B, Human Geography, 86, 2, 117-136.*
14. *Gentile, M., Salukvadze, J., Gogishvili, D. (2015). Newbuild Gentrification, Tele-urbanization and Urban Grows: Placing the Cities of the post-Communist South in the Gentrification Debate. Geografie, 2, 134-163.*
15. *Kovacs, Z., Wiessner, R., Zischner, R. (2012). Urban renewal in the inner city of Budapest: Gentrification from a post-socialist perspective. Urban Studies, 50 (1), 22-38. Doi: 10.1177/0042098012453856*
16. *Marcińczak, S., Sagan, I. (2011). The socio-spatial restructuring of Łodź, Poland. Urban Studies, 48, 9, 1789-1809.*
17. *Melnychuk, A., Kovalchuk, S. (2015). Modern spatial transformation in Holosiivskyi district of Kyiv. Ekonomichna ta Sotsialna Geografiya, 73, 65-75. Doi: 10.17721/2413-7154/2015.73.65-75.*
18. *Melnychuk, A., Khmelnytskyi, O. (2015). Directions and peculiarities of territorial functional changes in a medium size Ukrainian town in the post-soviet period of development (case of Berdychiv). Ekonomichna ta Sotsialna Geografiya, 71, 68-74. Doi: 10.17721/2413-7154/2015.71.68-74.*
19. *Nae, M., Turnock, D. (2011). City profile: The new Bucharest: Two decades of restructuring. Cities, 28 (2), 206-219.*
20. *Scott, J. W., Kuhn, M. (2012). Urban change and urban development strategies in Central East Europe: A selective assessment of events since 1989. European Planning Studies, 20 (7), 1093-1109.*
21. *Sýkora, L., Bouzarovski, S. (2012). Multiple Transformations: Conceptualising the Post-communist Urban Transition. Urban Studies, 49 (1), 43-60.*

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FEATURES OF GEOSPATIAL ORGANIZATION OF RETAIL TRADE SERVICES IN RURAL AREAS

Formulation the problem. The service sector serves as an important component of the economy of any state, region. It became to develop especially rapidly for the last decades due to formation post-industrial society. The service sector plays a significant role in vital activity of society since it provides the population employment, satisfy population's need in services, and ensures filling the local budgets. One of the most dynamic branches of the service sector is retail trade. There are significant transformations of this sector in rural areas, its territorial organization, but there is a lack of human-geographical research on the mentioned topic.

The aim of the article is consideration the human-geographical approach to the study of service sector and retail trade in rural areas in particular.

Research results. The author has analyzed the concept of "territorial systems of services as a set of direct and indirect interconnected enterprises. Territorial systems of services are components of the socio-geographical system. There are direct (links between enterprises in one branch) and indirect (links to the common use of territory, industrial, transport infrastructure, flows of people to satisfying needs, admin-?strative and managerial, economic links) links within the territorial system of services. The specialized territorial system of services (a set of interconnected enterprises in one branch) is highlighted, which is a part of the integrated territorial system of services, it has bodies of sectorial and sectorial-territorial management, it is characterized by incomplete completeness, the specialized territorial system of services is found in its "pure form" very rarely, it is distinguished by a noticeable internal differentiation. Productive, managerial, and competing links plays significantly in formation the specialized territorial systems of services.

The following indicators are used for the study of the territorial system of services: provision of commodity mass, provision of retail space, provision of staff, territorial concentration of trade objects, average radius of the service area of the center (enterprise). The technique of the analysis territorial differen - iation of indicators involves the study the content of the territorial development of a chosen process (phenomena), choice of indicators, delimitation the study area, statistical ordering of indicators, construction the cartographic models, identification spatial dependencies, trends, prospects development.

Keywords: socio-geographical system, territorial systems of services, territorial structure, territorial organization, retail trade, commodity mass, service center, service area.

References

1. *Alekseev, A. I., Kovalev, S. A., Tkachenko, A. A. (1991). Geografiya sfera obsluzhivaniya: osnovnyie ponyatiya i metodyi: uchebnoe posobie [Geography of the service sector: basic concepts and methods: tutorial]. Tver, Publishing Tver University, 1991, 117.*
2. *Baranovskiy, N. A. (1993). Territorialnaya organizatsiya peredvizhnyih form obsluzhivaniya selskogo naseleniya Chernigovskoy oblasti [Territorial organization of mobile forms of servicing rural population of Chernihiv region]: Extended abstract of candidate's thesis, specialty 11.00.02 "Human Geography", Kyiv, 22.*
3. *Vitrenko, N. M. (1993). Sotsialnaya infrastruktura Ukrainyi : otsenka urovnya i perspektiv razvitiya [Social infrastructure of Ukraine: assessment of the level and prospects of development]. Kyiv, Naukova dumka, 144.*
4. *Dolishniy, M. I. (1984). Sotsialno-ekonomicheskie problemyi neproizvodstvennoy sferyi [Socio-economic problems of the non-productive sphere]. Kiev, Naukova dumka, 214.*
5. *Dudnyk, I. M. (2014). Heodemohrafichni chynnyky terytorial'noyi orhanizatsiyi posluh. Geopolitika i ekoge-?dinamika regionov [Geopolitics and ecodynamics of regions]. Symferopol', Taurida National V.I. Vernadsky University, 10, 2, 36-39.*
6. *Dudnyk, I. M., Borysyuk, O. A. (2015). Suspil'no-heohrafichna systema yak metodolohichna pidvalyna doslidzhen' rehioniv nyzovoho rivnya. Naukovyy visnyk chernivets'koho universytetu. Seriya heohraphia. [Scientific bulletin of chernivtsi university. Series geography]. Chernivtsi, 744-745, 132-136.*
7. *Dudnyk, I. M. (2002). Terytorial'na orhanizatsiya posluh: kurs lektsiy [Territorial organization of services: lectures course]. – Poltava: PIB MNTU, 100.*
8. *Dudnyk, I. M. (2015). Terytorial'ni systemy medychnykh posluh yak ob''yekt suspil'noyi heohrafiyi. Chasopys sotsial'no-ekonomichnoyi heohrafiyi [Journal of Human Geography]. Kharkiv: V.N. Karazin Kharkiv National Univesity, vol. 18(1), 41-44.*
9. *Zhuk, M. V. (1998). Komertsiyna heohrafiya Ukrayiny: pidruchnyk dlya vuziv [Commercial geography of Ukraine: textbook for universities]/ Chernivtsi, Prut, 359.*
10. *Ishchuk, S. I. (2006). Rozmishchennya produktyvnykh syl i rehional'na ekonomika: navch. posib. [Placement of productive forces and regional economics: tutorial]. Kyiv, Publishing. Palyvoda A. V., 284.*
11. *Kornus, O. H., Niemets, K. A., Niemets, L. M., Kornus, A. O. (2009). Sfera obsluhovuvannya naselennya Sums'koyi oblasti: suspil'no-heohrafichni aspekty: monohrafiya [Sphere of the servicing population of Sumy region: human-geographical aspects: monograph]. Kharkiv, Publishing V. N. Karazin Kharkiv National University, 225.*
12. *Merkusheva, L. A. (1989). Geografiya sferyi obsluzhivaniya naseleniya [Geography of population service sector] – Krasnoyarsk: Publishing Krasnoyarsk University, 184.*
13. *Bandur, S. I., Zayats, T. A., Kutsenko, V. I. ta in. (2006) Sotsial'nyy rozvytok Ukrayiny: suchasni transformatsiyi ta perspektyvy [Social development of Ukraine: modern transformations and perspectives]. Kyiv, Brama-Ukrayina, 758.*
14. *Teoriya prognozirovaniya i prinyatiya resheniy: ucheb. posobie [The theory of forecasting and decision-making: tutorial], ed. by S. A. Sarkisyan. Moscow, Vyisshaya shkola, 1977, 352 p.*
15. *Territorialnaya organizatsiya proizvodstva tovarov i uslug [Territorial organization of production of goods and services], in 2 v., Ed. by A. I. Kocherga, Kyiv, Naukova dumka, 1987, vol 1, [Proizvodstvo i obraschenie tovarov narodnogo potrebleniya], Production and circulation of consumer goods. K., 1987, 262.*
16. *Tymchuk, M.F. (1998). Rehional'na ekonomika (konspekt lektsiy) [Regional Economics (lecture notes)]. Kyiv, Institute of Municipal Management and Business, 51.*
17. *Topchiyev, O. H. (2009). Osnovy suspil'noyi heohrafiyi: pidruchnyk dlya stud. heohraf. spetsial'nostey vyshchykh navchal'nykh zakladiv [Fundamentals of Human Geography: textbook for the students of geographical specialties of higher educational institutions]. Odesa, Astroprynt, 544.*
18. *Shabliy ,O. I. (2003) Osnovy zahal'noyi suspil'noyi heohrafiyi: pidruchnyk [Fundamentals of General Human Geography: Textbook]. L'viv, Publishing Center LNU, 444.*
19. *Yurkovskiy, V. M. (1989). Geografiya sferyi obsluzhivaniya [Geography of Service Sector]. Kyiv, UMKVO, 82.*
20. *Yurchenko, S. A. (2006). Infrastruktura mira: uchebnoe posobie [Infrastructure of the world: a textbook]. Kharkiv, V.N. Karazin Kharkiv National Univesity, 328.*

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COLOUR HARMONY OF LAND COVER AS INTANGIBLE ENVIRONMENTAL RESOURCE (VOOREMAA LANDSCAPE PROTECTION AREA, ESTONIA)

Formulation of the problem. Colours of land cover, as a component of topological visual phenomena of environment, are accessible for study with modern remote sensing, so the problem of the given research is to quantify the colouristic harmony of land cover within the study area in Estonia, using known methods of its assessment.

The purpose of the article. Quantification of colour harmony of land cover, using remote sensing data and substantiated techniques.

Methods. A criterion of colour harmony after Albert Munsell (1921) [21] was applied. He proposed to keep the balance between the colour strength of particular hue (product of value and chroma in his colour system) and the area of this hue.

$$\sum_{n=1}^{M} CS_n \cdot A_n = 0,$$

where M is the total number of colours within some zone or floating circle; CS_n – colour strength, calculated as chroma of colour n × value of colour n; A_n is the area of colour n.

Also criterion after Palmer & Schloss (2011) was applied: colour pairs, more similar in hue and with lower saturation, tend to be harmonious [24].

Results. Maps of spatial distribution of colour harmony of land cover within Vooremaa landscape protection area were compiled after Munsell (1921) and Schloss & Palmer (2011) for summer (14.06.2016) and autumn (20.10.2016) seasons. Water bodies, forests and wetlands have the highest scores of both colour harmonies, while some crop fields (mainly with saturated young or depressed vegetation and open soil) have the lowest colour harmony scores. Maps show the tendency to the decreasing of the colour harmony of land cover with an increasing of colour contrasts in the end of the cropping season.

Scientific novelty and practical significance. Besides numerous studies of colours of perceived environment, there are no attempts to examine the land cover with some colour harmony criteria, using remote sensing data. The proposed techniques allow evidence-based and cost-effective way of monitoring of perceived environment in the context of colour harmony dynamics under the influence of natural and land use factors.

Keywords: colour harmony, land cover, remote sensing, intangible environmental resources.

References

1. *Amer, R., Kusky, T., Reinert, P. C., & Ghulam, A. (2009). Image processing and analysis using landsat etm imagery for lithological mapping at fawakhir, central eastern desert of Egypt. Paper presented at the ASPRS 2009 Annual Conference, Baltimore, Maryland.*
2. *Antrop, M. (2000). Geography and landscape science. Belgeo, (1-2-3-4), 9-36. http://dx.doi.org/10.4000/belgeo.13975*
3. *Bell, S. (2004). Elements of visual design in the landscape. London: Spon Press.*
4. *Chamaret, C. (2016). Color harmony: experimental and computational modeling (Doctoral dissertation, Université Rennes 1).*
5. *Chapana, R. S. H. (2012). The Relative Influence of Solar Radiative and Solar Geomagnetic Variation on the Dynamics of the Polar Upper Mesosphere (Master's thesis, Institutt for fysikk).*
6. *Chervanyov, I. G., & Karasiov, O. O. (2015). The intangible natural resources (INR) in the aspects of natural capital of new geography: some perspectives for Ukraine. Visnyk Kharkivskoho natsionalnoho universytetu imeni VN Karazina, ceriia «Heolohiia. Heohrafiia. Ekolohiia», 42 (1157), 106-110.*
7. *Clay, G. R., & Daniel, T. C. (2000). Scenic landscape assessment: the effects of land management jurisdiction on public perception of scenic beauty. Landscape and urban planning, 49(1), 1-13.*
8. *De Groot, R. S., Wilson, M. A., & Boumans, R. M. (2002). A typology for the classification, description and valuation of ecosystem functions, goods and services. Ecological economics, 41(3), 393-408.*
9. *Déjeant-Pons, M. (2006). The European landscape convention. Landscape Research, 31(4), 363-384.*
10. *Escadafal, R., Girard, M. C., & Courault, D. (1989). Munsell soil color and soil reflectance in the visible spectral bands of Landsat MSS and TM data. Remote Sensing of Environment, 27(1), 37-46.*

11. *Gittings, J. A., Raitsos, D. E., Racault, M. F., Brewin, R. J. W., Pradhan, Y., Sathyendranath, S., & Platt, T. (2017). Seasonal phytoplankton blooms in the Gulf of Aden revealed by remote sensing. Remote Sensing of Environment, 189, 56-66. doi:10.1016/j.rse.2016.10.043*
12. *Granö, J. G. (1997). Pure geography. O. Granö, & A. Paasi (Eds.). Baltimore, MD: Johns Hopkins University Press.*
13. *Hands, D. E., & Brown, R. D. (2002). Enhancing visual preference of ecological rehabilitation sites. Landscape and Urban Planning, 58(1), 57-70.*
14. *Haralick, R. M., & Shanmugam, K. (1973). Textural features for image classification. IEEE Transactions on systems, man, and cybernetics, 3(6), 610-621.*
15. *Irish, R. R. (2000). Landsat 7 science data users handbook. National Aeronautics and Space Administration, Report, 2000, 415-430.*
16. *Jabari, S., Zhang, Y., Suliman, A., & Ieee. (2014). Stereo-based building detection in very high resolution satellite imagery using ihs color system. 2014 Ieee International Geoscience and Remote Sensing Symposium (Igarss), 2301-2304. doi:10.1109/igarss.2014.6946930*
17. *Junge, X., Schüpbach, B., Walter, T., Schmid, B., & Lindemann-Matthies, P. (2015). Aesthetic quality of agricultural landscape elements in different seasonal stages in Switzerland. Landscape and Urban Planning, 133, 67-77.*
18. *Koutsias, N., Karteris, M., & Chuvieco, E. (2000). The use of intensity-Hue-saturation transformation of Landsat-5 Thematic Mapper data for burned land mapping. Photogrammetric Engineering and Remote Sensing, 66(7), 829-839.*
19. *Lengen, C. (2015). The effects of colours, shapes and boundaries of landscapes on perception, emotion and mentalising processes promoting health and well-being. Health & place, 35, 166-177.*
20. *Lessel, J., & Ceccato, P. (2016). Creating a basic customizable framework for crop detection using Landsat imagery. International Journal of Remote Sensing, 37(24), 6097-6107.*
21. *Munsell, A. H. (1915). Atlas of the Munsell color system. Wadsworth, Howland & Company, Incorporated, Printers.*
22. *NASA. (2013). Electromagnetic Spectrum - Introduction. Retrieved 3 June 2017, from https://imagine.gsfc.nasa.gov/science/toolbox/emspectrum1.html*
23. *Pekel, J.-F., Vancutsem, C., Bastin, L., Clerici, M., Vanbogaert, E., Bartholomé, E., & Defourny, P. (2014). A near real-time water surface detection method based on HSV transformation of MODIS multi-spectral time series data. Remote sensing of environment, 140, 704-716.*
24. *Schloss, K. B., & Palmer, S. E. (2011). Aesthetic response to color combinations: preference, harmony, and similarity. Attention, Perception, & Psychophysics, 73(2), 551-571.*
25. *Schüpbach, B., Junge, X., Lindemann-Matthies, P., & Walter, T. (2016). Seasonality, diversity and aesthetic valuation of landscape plots: An integrative approach to assess landscape quality on different scales. Land Use Policy, 53, 27-35.*
26. *Semyonov–Tyan-Shansky, V. P. (1928). Rayon and Strana.*
27. *Stobbelaar, D. J., & Hendriks, K. (2007). Seasonality of agricultural landscapes: reading time and place by colours and shapes. In Seasonal landscapes (pp. 103-126): Springer.*
28. *Swetnam, R. D., Harrison-Curran, S. K., & Smith, G. R. Quantifying visual landscape quality in rural Wales: A GIS-enabled method for extensive monitoring of a valued cultural ecosystem service. Ecosystem Services. doi:http://dx.doi.org/10.1016/j.ecoser.2016.11.004*
29. *Toolson, E. (2017). Human Cone Action Spectra. Retrieved 3 June 2017, from https://www.unm.edu/~toolson/human_cone_response.htm*
30. *USGS (2017). USGS Open-File Report 2006-1195: Munsell Color Code. Pubs.usgs.gov. Retrieved 3 June 2017, from https://pubs.usgs.gov/of/2006/1195/htmldocs/munsellcode.htm*
31. *Zanter, K. (2005). Landsat 8 (L8) data users handbook. LSDS-1574 Version, 1.*

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HYDROLOGIAL REGIME OF THE RIVER UDA AND ITS USE FOR WATER MANAGEMENT YEARS (WITHIN KHARKIV REGION)

Formulation of the problem. Water is the basis of life. Nowadays, with the development of science and technology, man engages more and more types of natural resources in the process of material production which enable the production of goods necessary for life. Water is one of the most important among these natural resources. Therefore, water resources are constantly monitored and accounted at the state level. Howev-

er, at the regional level (regions and districts), this issue still needs several studies, expertise and evaluation work. Relevant questions remain concerning the calculation of the hydrological regime as a whole in Kharkiv region, and in individual rivers.

The purpose of the article is to study the hydrological regime of surface waters of the river Uda (within Kharkiv region) for 30 years and inner- annual flow distribution in the middle of the year for various practical purposes.

Presentation of the main material. The features of the river Uda flow for 30 years are considered in the article. Examining the hydrological regime of the river, it has been found out that the distribution of water flow in the river is uneven throughout the year and this is due to climatic conditions (mainly rainfall and temperature). Analyzing the distribution of flow by seasons, it can be noticed that for the Uda river near the settlement Peresichna spring runoff is 54.3%, while in summer and winter - 10.5% and 24.3%, respectively; near the settlement Bezlyudivka spring runoff is 36.3%, while in summer and winter - 20.2% and 25.11%, respectively.

Rivers are fed primarily by snow with a relatively high degree of soil runoff compared to rain. The deepest water flowing years in the river Uda (within Kharkiv region) during the period from 1981 to 2010 were 1981 - 1983, dry years were 2007 – 2010.

Inner-annual runoff was calculated for the purpose of water supply, so summer - autumn and winter were taken as a limiting period, and winter – as a limiting season.

Conclusions. It has been found out that the biggest flow by the limiting period on the territory of the Uda basin was in 1981, and the lowest flow - in 2009, the lowest flow by the limiting season - r. Uda (settlement Bezlyudivka) was in 2010, in the Uda river at settlement Peresichna - in 2003.

Thus, in consequence of inner- annual flow calculations, we can determine potential water intake rate for the particular year which is very important in terms of ecology.

Keywords: river basin, runoff, the average long-term flow, flow distribution, water management year.

References

1. Vyshnevs'kyy, V. I. (2000). Richky i vodoymy Ukrayiny. Stan i vykorystannya [The river and the reservoir of Ukraine. The status and the use of]. Vipol, 367.

2. Vyshnevs'kyy, V. I., Kosovets', O. O. (2003). Hidrolohichni kharakterystyky richok Ukrayiny [Hydrological characteristics of rivers of Ukraine]. Nika-Tsentr, 324.

3. Vyshnevs'kyy, V. I. (2001). Zminy klimatu ta richkovoho stoku na terytoriyi Ukrayiny i Bilorusi [Climate change and river flow on the territory of Ukraine and Belarus]. Nauk. pr. UkrNDHMI, 249, 89-105.

4. Khil'chevs'kiy, V. K. ed. (2007). Hidroloho-hidrokhimichna kharakterystyka minimal'noho stoku richok baseynu Dnipra [Hydrological-hydrochemical characteristics of the minimum flow of the rivers basin]. K., Nika-Tsentr, 184.

5. Khil'chevs'kyy, V. M. ed. (2007). Zb. nauk. prats' "Hidrolohiya, hidrokhimiya, hidroekolohiya" [Hydrology, gìdrohìmìâ, gìdroekologìâ]. K., VTL Oberih, 5, 400.

6. Hopchenko, E. D., Ovcharuk, V. A., Todorova, E. Y. (2014). Maksymal'niy stok dozhdevikh pavodkov rek Hornoho Krima [Maksimal'nyj stock doždevyh pavodkov rjc Gornji Crimea] Visnyk Odes'koho derzhavnoho ekolohichnoho universytetu, 17, 133-140.

7. Greben, V. V. (2005). Sovremennyie osobennosti vnutrigodovogo raspredeleniya stoka rek Ukrayiny [Modern osobennosti vnutrigodovogo raspredeleniâ stoka Ukraine REC]. Globalnyie i regionalnyie izmeneniya klimata. K., Nika-Tsentr, 391-104.

8. Hrebin, V. V. (2003). Zakonomirnosti vnutrishn'orichnoho rozpodilu stoku ta osoblyvosti zhyvlennya richok baseynu verkhn'oyi Pryp"yati [Laws of vnutrìšn'oričnogo distribution of power and features of the river basin of the upper Building]. Hidrolohiya, hidrokhimiya i hidro ekolohiya, 5, 119-128.

9. Hrebin, V. V. (2004). Suchasni zminy stoku richok Pryp"yat·s'koho Polissya [The modern changes of the flow of the rivers Prip'âts'kogo Polesie]. Hidrolohiya, hidrokhimiya i hidro ekolohiya, 6, 74-85.

10. Danyl'chenko, O. S. (2013). Otsinka antropohennoho navantazhennya na baseyny malykh richok Sums'koho Prydniprov"ya [Estimation of the anthropogenic load on the pools of small rivers Of the Dnieper]. Hidrolohiya, hidrokhimiya i hidro ekolohiya, 4(31), 79-89.

11. Ekolohichni doslidzhennya richkovykh baseyniv Livoberezhnoyi Ukrayiny (2002). [Ecological study of the river basins of the left-bank Ukraine]. Sumy, SumDPU im. A.S. Makarenka, 276.

12. Klymenko, V. H., Kiyko, S. O. (2010). Norma ta minlyvist' stoku [Norm and variability of runoff]. Kharkiv, KhNU im. V.N. Karazina, 14.

13. Loboda, N. S. Sinhronnost kolebaniy godovogo stoka rek Ukrainyi (2001). [Sinhronnost' kolebanij godovogo stoka Ukraine REC]. Mizhvid. nauk. zb. Ukrayiny. Meteorolohiya, klimatolohiya ta hidrolohiya, 43, 250–256.

14. Yatsyk, A. V. ed. (1991). Mali richky Ukrayiny [Mali River Ukraine]. K., Urozhay, 296.

15. Stepanenko, S. M. (2008). Meteorolohiya, klimatolohiya ta hidrolohiya [Meteorology, climatology and hydrology]. Chastyna II. Odesa: Ekolohiya, 50, 452.

16. Hrin', D. S. (2016). Natsional'na dopovid' pro stan navkolyshn'oho pryrodnoho seredovyshcha v Ukrayini u 2014

rotsi [The national report on the State of the environment in Ukraine in 2014]. K., Ministerstvo ekolohiyi ta pryrodnykh resursiv Ukrayiny, FOP, 350.
17. *Snizhko, S. I., Pavel'chuk, Ye. M., Didovets', Yu. S. (2014). Utochnennya norm ta kharakternykh periodiv zminy seredn'oho richnoho stoku richok Zhytomyrs'koyi oblasti [Clarification of the norms and specific periods of change average annual flow of rivers of Zhytomyr Oblast]. Ukrayins'kyy hidrometeorolohichnyy zhurnal, 14, 185-193.*
18. *Snizhko, S. I., Pavel'chuk, Ye. M. (2014). Osnovni zakonomirnosti vnutrishn'orichnoho rozpodilu vodnoho stoku richok Zhytomyrs'koho Polissya [Basic laws of vnutrìšn'oričnogo distribution of water flow the rivers of Zhytomyr Polissya]. Fizychna heohrafiya ta heomorfolohiya, 1(73), 89-94.*
19. *Streltsa, B. I. ed. (1987). Spravochnik po vodnyim resursam [Handbook on water resources]. K., Urojay, 267.*
20. *Ukrayins'kyy hidrometeorolohichnyy tsentr [Elektronnyy resurs]. Aviable at: http://www.meteo.gov/ua/*

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FUNCTIONAL AND COMPONENT STRUCTURE OF THE POPULATION TRADING SERVICE SYSTEM

Formulation the problem. Over the past decade the system of population trading service has seen substantial qualitative changes, particularly the ownership form of retail, restaurant business institutions changed, the range of products expanded, new types of stores, forms of trade (supermarkets, hypermarkets, shopping malls, internet commerce, vending machines etc.) appeared. These changes affect the functional and component structure of population trading service system that has become more complicated. All it needs is detailed study, clarification of the conceptual and terminological apparatus. Scientific literature highlights theoretical and practical aspects of the population trading service. There are many classifications of retail, restaurant business institutions, products. However, there is lack of references regarding system approach to understanding the population trading service.

The aim of the publication is to highlight features of the functional and component structure of population trading service system.

Research results. Conceptual and terminological apparatus to study the system of population trading service forms such as: trade, trading activity, trading complex of the administrative region, population trading service, trade and restaurant industry infrastructure. Functional and component structure of the system of population trading service consists of subsystems of retail trade, restaurant industry, and service enterprises. Retail trade is formed by shops, semi-stationary objects of retail trade, markets, trade not in stores, shopping malls, which have branched structure. Restaurant industry consists of cafes, bars, restaurants, canteens, buffet, snack bars, cafeterias, supply of finished food. Service enterprises are finance and credit, research and design, transport, insurance, logistic, security, maintenance and engineering, accounting, legal, informational, repair and construction, transportation and other ones. The classifications of retail trade and restaurant industry institution were developed by various criteria: by shape, type, degree of sustainability location, ownership, size, service frequency, prices level, product range, location, etc. Goods were classified by frequency demand, frequency and mode of storage, manufacturing site, frequency use, seasonality, raw sign, etc.

Scientific novelty. Based on the concept of the social and geographicl system and system approach in human geography the definition of "system of population trading service" has been proposed as a functional component of the social and geographical system. Based on the model of socioactogenezis the technological scheme of satisfying social needs through the system of population trading service was created by the author which includes four successive stages: social needs awareness, creating the system of goals, formation of the executive system, and getting results. The system of population trading service is a part of the executive system, and a link in the goods movement from producer to consumer, it connects supply and demand of goods.

Keywords: system of population trading service, functional-component structure, retail trade, restaurant industry, institution, needs, goods, socio-actogenesis.

References

1. *Apopiy, V.V., Mishchuk, I.P., Rebytsikyy, V.M. ta in. (2005). Orhanizatsiya torhivli [Trade organization]: textbook, 2nd edition, K., Center of educational literature, 616.*
2. *Holovnya, O.M. (2007). Rehional'ni osoblyvosti rozvytku torhovo-pobutovoyi sfery [Regional features of trade and domestic sphere], extended abstract of candidate's thesis, specialty 08.00.05 «Development of productive forces and regional economics», Kyiv, 20.*

3. *Zhyryaeva, E. V. (2004). Tovarovedenie [Commodity science], 2nd edition, Saint-Peterburg; Moscow; Kh.; Minsk, Piter, 415.*
4. *Illyashenko, S. M. (2005). Marketynhova tovarna polityka [Marketing product policy]. Sumy, VTD "University book", 234.*
5. *Kolosins'kyy, Ye. Yu. (2012). Transformatsiya terytorial'noyi orhanizatsiyi torhovel'noyi sfery rehionu v umovakh rozvytku postindustrial'noyi ekonomiky [Transformation of the territorial organization of trade sector in the region in conditions of the post-industrial economy development]. Extended abstract of candidate's thesis, specialty 08.00.05 «Development of productive forces and regional economy», Uzhhorod, 20.*
6. *Kornus, O. H. (2009), Terytorial'na orhanizatsiya systemy obsluhovuvannya nase-lennya Sums'koyi oblasti ta shlyakhy yiyi vdoskonalennya [Territorial organization of the system of service population in Sumy region], candidate's thesis, specialty 11.00.02 "Human Geography", Kharkiv, 2009, 210.*
7. *Kotler, F. (2007). Osnovyi marketinga. Kratkiy kurs [Fundamentals of marketing. Brief course], translation from English, Moscow, Publishing house «William», 656.*
8. *Mal's'ka, M. P. (1993). Rehional'ni osoblyvosti formuvannya i rozvytku torhovel'noho kompleksu oblasti [Regional features of region's trade complex formation and development]. Extended abstract of candidate's thesis, specialty 08.00.05 «Development of productive forces and regional economy», Lviv, 20.*
9. *Mamchur, O. I. (2010). Suspil'no-heohrafichni problemy formuvannya rynkovoyi infrastruktury L'vivs'koyi oblasti [Human-geographical problems of the market infrastructure formation in Lviv region]. Extended abstract of candidate's, thesis, L'viv, 21.*
10. *Martsyn, V. S. (2008). Ekonomika torhivli [Trade economics]: textbook, 2nd edition, corrected and added, Kyiv, Znannya, 2008, 603.*
11. *Mostova, L. M., Novikova, O. V. (2010). Orhanizatsiya obsluhovuvannya na pidpryyemstvakh restorannoho hospodarstva [Service organization of restaurants industry enterprises]: tutorial, Kyiv, Lira-K, 388.*
12. *Natsional'nyy standart Ukrayiny DSTU 4281:2004 «Zaklady restorannoho hospodarstva. Klasyfikatsiya» [National standard of Ukraine SSU 4281: 2004 "Restaurants industry institutions. Classification"], Order of State Committee for Technical Regulation and Consumer Policy from 31 March 2004. Aviable at: http://zakon.kadrovik01.com.ua/regulations/10637/478269/*
13. *Natsional'nyy standart Ukrayiny DSTU 4303:2004 «Rozdribna ta optova torhivlya. Terminy ta vyznachennya ponyat» [National standard of Ukraine SSU 4303:2004 "Retail and wholesale trade. Terms and definitions"]. Order of State Committee for Technical Regulation and Consumer Policy from 05.07.2004 № 130. Aviable at: http://www.profiwins.com.ua/uk/directories1/dstu4303.html*
14. *Nemets, K. A. (2005). Informatsionnoe vzaimodeystvie prirodnyih i sotsialnyih system [Informational interaction of natural and social systems]: monograph, Kharkiv, Eastern Regional Center of Humanities and Education Initiatives, 428.*
15. *Nemets, L. N. (2003). Ustoychivoe razvitie : sotsialno-geograficheskie aspektyi (na primere Ukrainyi) [Sustainable development: socio-geographical aspects (case study of Ukraine)]: monograph, Kharkiv, Fakt, 2003, 384.*
16. *Orhanizatsiya obsluhovuvannya u zakladakh restorannoho hospodarstva (2011) [Service organization in restaurants industry institutions]. Textbook for higher educational institutions, 2nd edition, corrected and added, by edition N. O. P'yatnyts'ka, Kyiv, Center of educational literature, 584.*
17. *Osipchuk, I.O. (2013). Terytorial'na orhanizatsiya torhovel'noho obsluhovuvannya naselennya Rivnens'koyi oblasti [Territorial organization of the population trade service in Rivne region], Kyiv, 20.*
18. *Pro zatverdzhennya Instruktsiyi shchodo zapovnennya form derzhavnykh statystychnykh sposterezhen' stosovno torhovoyi merezhi ta merezhi restorannoho hospodarstva [On approval Instructions for completing the forms of state statistical observations regarding trading and restaurant industry network]. Order of the State Statistics Committee of Ukraine from 24.10.2005 № 327. Aviable at: http://zakon2.rada.gov.ua/laws/show/z1350-05*
19. *Pro zatverdzhennya Poryadku provadzhennya torhovel'noyi diyal'nosti ta pravyl torhovel'noho obsluhovuvannya naselennya na rynku spozhyvchykh tovariv [On approval the Procedure of conducting trading activities and the rules of trading service in the market of consumer goods]. Decree of the Cabinet of Ministers of Ukraine from 15.06.2006 r. N 833. Aviable at: http://zakon3.rada.gov.ua/laws/show/833-2006-%D0%BF*
20. *Pro zatverdzhennya Pravyl roboty zakladiv (pidpryyemstv) restorannoho hospodarstva [On approval the Rules of work institutions (companies) of restaurant industry], Decree of the Ministry of Economy and European Integration of Ukraine from 24.07.2002. Aviable at: http://zakon2.rada.gov.ua/laws/show/z0680-02*
21. *Prokopenko, O. V., Shkola, V. Yu., Dehtyarenko, O. O., Makhnusha, S. M. (2007). Infrastruktura tovarnoho rynku [Infrastructure of the product market]: tutorial, Kyiv, Center of educational literature, 296.*
22. *Savoshchenko, A. S. (2004). Infrastruktura tovarnoho rynku [Infrastructure of the product market]: tutorial, Kyiv, KNEU, 336.*
23. *Bandur, S. I., Zayats' T. A., Kutsenko, V. I. and others (2006). Sotsial'nyy rozvytok Ukrayiny: suchasni transformatsiyi ta perspektyvy [Social development Ukraine: current transformation and prospects]. Kyiv, Brama-Ukrayina, 2006, 758.*
24. *Shchehlova, E. Ya.(2010). Nekotoryie aspektyi roznichnoy torgovli v Rossii. Geografiya v shkole, 10, 11-14.*
25. *Yahodka, A.H. (2000). Sotsial'na infrastruktura i polityka [Social infrastructure and policy]: tutorial. Kyiv, KNEU, 212.*

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IDENTIFICATION OF DEVELOPMENTAL STAGES IN LANDSCAPE AND TECHNICAL SYSTEMS

The aim of the article is to analyze the development of ideal landscape and technical system, the isolation and characterization of the stages, which will help to identify the stages of the system.

Problems of landscape and technical systems stages development were studied by F.M. Mil'kov, G.I. Denysyk, Iu.V. Yatsentyuk, I.P. Kozyns'ka. In their studies, the authors briefly describe the dynamics of anthropogenic landscapes development, but do not pay attention to the identification of landscape and technical systems stages of development.

Scientific research is based on the use of modeling paradigm in geography. The example of an ideal landscape and technical systems shows specific features of development stages.

The theoretical results of the paper have a basis for the future development of the techniques of field research of landscape and technical systems.

The ability to identify landscape and technical systems stage of development allows for constructive support systems in optimum condition and ensure their long-term operation.

The author analyzes the problem identification of landscape and technical systems development stages. Three stages: «genesis», functioning and «destruction» have been allocated. Each stage consists of three phases. Each stage and phase is analyzed in detail. The role of each of the three blocks (natural, technical and control) is explained at a certain stage of its development.

Stage of «genesis» is starting. At this stage the design, construction and commissioning of engineering facilities are considered. Between natural and technical units of the system stable relations of matter, energy and information exchange are established.

During the functioning stage connection is established between the natural, technical and control units and the category of engineering construction changes in the landscape and technical systems. The system shows signs of the relevant natural area. The phase is characterized by an optimum combination of organic functioning of the three units of the system.

Stage of «destruction» is the ultimate in the development of the landscape and technical system and indicates the «aging» and moves into the category of landscape and technogenic systems. At this stage to return the system to its original state a fully functioning control unit should be established.

The graph shows the duration of the operational stages in the ideal landscape and technical system of the control unit's activity. It was noted that the landscape and technical system developes in several ways. Certain phases or stages can be skipped and moved on to the next category.

Attention is drawn to the fact that each landscape and technical system is unique in its development and requires an individual approach.

Keywords: landscape and technical systems, development, stage, phase, genesis, functioning, destruction.

References

1. *Denysyk, G. I. (1998). Antropogenni landshafty Pravoberezhnoyi Ukrayiny [Antropogenic landscape of Right-Bank Ukraine]. Vinnitsa. Arbat, 292.*
2. *Kozins'ka, I. P. (2013). Promyslovi landshafty regionu vydobutku uranovyh rud v Ukrayini [Industrial landscapes of the region uranium mining in Ukraine]. Avtoref. dis. candidate of geogr. nauk. Kharkov, 21.*
3. *Mil'kov, F. N. (1973). Chelovek y landshafty. Ocherky antropogennogo landshaftovedenyya [Man and landscapes. Essays anthropogenic landscape science]. Moskow, Mysl`, 224.*
4. *Yatsentyuk Iu. V. (2004). Landshaftno-texnichni systemy mist central`nogo lisostepu Ukrayiny (na prykladi mista Vinnyci) [Landscape and technical systems of central forest steppe Ukraine (for example, the city of Vinnitsa)]. Avtoref. dis. candidate of geogr. nauk. Kiev, 19.*

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INFLUENCE OF STREET-ART ON THE FORMATION OF THE CITY IMAGE AND THE PRINCIPLES OF STREET-ART GEOGRAPHIC ZONES

The time when any drawing, inscription in the streets of Kyiv was considered as graffiti has passed, and now the city is covered with the works of good quality as the famous pieces of art. These art projects change the usual images of houses, streets and districts of the city for ordinary citizens. Its space is modified and it seems to get the other way of perception.

The research objective is to study the features of street-art facilities geospatial location in Kyiv, the possibility to use these objects in tourism and recreation, explore how image and silhouette of the city will change with graffiti and other street-art facilities, to offer basic principles of street-art zoning.

The objectives of the article: to analyse street-art artifacts in Kyiv for their artistic value and appropriateness of using them as the components in the formation of urban environment as well as the use of graffiti in tourist activity including the development of sightseeing route network in Kyiv.

The methodological basis is the analysis of in-depth interview, analysis of previous texts and examination of conducted sociological surveys. The interview contains the elements of street-art and their perception by locals and tourists.

This paper investigates the influence of contemporary street-art on formation of the tourist image of the city. The study shows that street-art has a beneficial effect on the tourist image of the city and changes townspeople's impression of the usual space.

Purposive systemic territorial organization of street-art has a great role in forming the city image. Today in the capital of Ukraine this systematization is limited with finding appropriate topics for murals and proper places for their creation. Nobody knows how it will or would look like in the context and process of purposive formation of spatial and territorial image of the city in the nearest future.

Murals could probably be divided into two groups. The first one creates modern urban environment for residents. The other works mainly for tourists. They almost do not coincide geographically. The first group is mainly focused on the residential areas with new buildings, the second – on the central parts of the city. They are losing the resident population and are gradually transforming into a tourist environment.

Keywords: city image, street-art, urban design, graffiti, street-art, street-art districts of the city.

References

1. *Antonov, V. L., Shubovych, S. A. (1999). Arkhitektura kompozytsiya yak systema «seredovyshche-lyudyna» [Architecture composition of the system «man-environment»]. Kyiv, Nyytyah, 72.*
2. *Antonov, V. L., Kryvoruchko, N. I., Chepelyuk Yu. V., Shubovych, S. A. (2000). Eksperement «Naskriznyy navchal'nyy arkhitekturnyy protses» [Experiment «Through the learning process architecture»]. Kyiv, Nyytyah, 39.*
3. *Antsyferov, N. P. (1991). Dusha Peterburha: Obraz mista. Peterburh Dostoyevs'koho. Buval'shchyna i mif Peterburha [Soul of St. Petersburg: The image of the city. Petersburg of Dostoevsky. Fact and Myth Petersburg]. Nauka, 103.*
4. *Barkhyn, B. H. (1986). Misto. Struktura i kompozytsiya [City. The structure and composition]. Nauka, 264.*
5. *Boychuk, A. V. (2013). Prostir dyzaynu [Space design]. Nove slovo, 367.*
6. *Buhayevs'kyy, O. (1998). Znaky na stini. Artline, 5-6, 17-20.*
7. *Vyhotskyy, L. S. (1987). Psykholohiya mystetstva [Psykholohiya mystetstva]. Pedahohika, 344.*
8. *Holub', E., Musienko, N., Ykovenko, P. (1988). Burzhuaznaya massovaya kultura: novye vremena, starye problemy [Bourgeois mass culture, new times, old problems]. Kyiv, Mystectvo, 143.*
9. *The electronic directory psychology «World psychology». Available at : http://www.psyworld.info.*
10. *Ikonnykov, A. V. (1986). «Funktsiya, forma, obraz v arkhitekturi» [Function, form, image architecture]. Stroyyzdat, 288.*
11. *The history of graffiti. Graffiti is art and raise its standards. Available at : \www/ URL: graffitimarket.ru*
12. *Communal Organization «Kievgenplan». Available at : http://genplan.kiev.ua*
13. *Linch, K. (1986). Doskonala forma v mistobuduvanni [Perfect form in urban planning] Pereklad z anhliys'koyi. Stroyyzdat, 264.*
14. *Lynch, Kevin (1984). Good City Form. MIT Press, 514.*

15. Lynch, Kevin (1960). The Image of the City. Technology Press, 194.
16. Lynch, Kevin (1980). Managing the Sense of a Region, MIT Press, 241.
17. Stolper, J. H. (1977). Colour induced physiological response. Man En-viron. Syst., 7, 2, 101-108.

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TOURIST AND ECONOMIC POTENTIAL OF THE CARPATHIAN REGION AS A DOMINANT COMPONENT OF ITS EFFECTIVE USAGE

Formulation of the problem. This article is devoted to the study of the Carpathian region's touristic and economic potential as a dominant component of its effective usage, which is accordant to its purpose. It has been discovered that the peculiarity of the economic potential of the region is interdependence and interrelationship of components in its local potentials. Synergetic effect, which appears along with it, stipulates the mutual enhancement of local potentials and development of the economic potential of the region in general.

The purpose of the article. To clarify the peculiarities of the tourist and economic potential of the Carpathian region as the dominant components of its effective usage.

Methods. The author's own achievements as well as empirical method of research, mainly observation and analysis in compound with statistical method of research.

Results. To reach this purpose, the following objectives have been examined in this article: to characterize the regions, which are part of the Carpathian region, i.e.Lviv, Ivano-Frankivsk, Transcarpathian and Chernivtsi regions; to describe the tourist and recreational resources of the Carpathian region; to show the dynamics of touristic facilities in the Carpathian region during 2006-2015; build up the model of tourism influence on socio-economic development of the Carpathian region; to figure out the main ways of the Carpathian region's development; to work out the ways to increase the effective usage of tourist and recreational potential of the Carpathian region; to suggest the type of tourism that is "green", which is especially important for the development of the economic potential of the Carpathian region; to outline the development and hindering factors of the tourist and economic potential of the Carpathian region; to reveal the main preconditions and reasons, which make the development of the rural tourism in the Carpathian region of priority.

Scientific novelty and practical significance. As a result of the conducted research, it has been established that the main task of public institutions in Ukraine and in the parts of the Carpathian region in regulating and managing the tourist and recreational complex today is to establish a favourable market environment for socially effective, economically beneficial and ecologically reasonable development of the tourist business. The author has discovered that tourism, in particular the "green", is aimed at developing settlements with weak production and where there are no other sources of budget income and increase of social state of population. If the state policy towards "green tourism' is effective, the Ukrainian village will be able to function and develop, which is the main priority of socio-economic development. The conducted research has made it possible to conclude that the tourist and economic potential of the Carpathian region is really the dominant component in the effective use of this region. It is stipulated by natural wealth of the Carpathian region, peculiarities of its location and significant human potential which is the tourist and economic component to be developed as it can become the basis of the economic potential of the Carpathian region.

Keywords: economic potential, "green tourism", rural tourism, recreation, hotel and restaurant business, tourist flows, socio-economic development.

References

1. *Byrkovych, V. I. (2008). Silskyj zelenyj turyzm – priorytety rozvytku turystychnoyi galuzi Ukrayiny [Green tourism - tourism development priorities Ukraine]. Strategichni priorytety. Naukovo-analitychnyj shhokvartalnyj zbirnyk, 1 (6), 138-143.*
2. *Galych, O. A., Shevchenko I. V. (2010). Zelenyj turyzm: sut ta perspektyvy rozvytku na Poltavshhyni [Green tourism, nature and prospects of development in Poltava]. Naukovi praci Poltavskoyi derzhavnoyi agarnoyi akademiyi «Ekonomichni nauky», 1(1), 38-45.*
3. *Ekologichnyj pasport Zakarpatskoyi oblasti. Available at : http://www.menr.gov.ua/protection/protection1*
4. *Ekologichnyj pasport Ivano-Frankivskoyi oblasti. Available at : http://www.menr.gov.ua/protection/protection1*
5. *Ekologichnyj pasport Lvivskoyi oblasti. Available at : http://www.menr.gov.ua/protection/protection1*

6. *Ekologichnyj pasport Cherniveczkoyi oblasti. Available at : http://www.menr.gov.ua/protection/protection1*
7. *Karchevskaya, E. Chto takoe agroturyzm? Available at : http://www.tourlib.columb.net.ua/statti.htm*
8. *Kijko, O. A. (2009). Klasternyj analiz lisovogo kompleksu karpatskogo regionu [Cluster analysis of the forest complex Carpathian region] RVV NLTU Ukrayiny, 7. Available at : http://www.nbuv.gov.ua/old_jrn/ chem_biol/nplanu/2009_7/107_Kijko_LAN_7.pdf*
9. *Koncepciya rozvytku turyzmu do 2022 r. Available at : http://zakon.rada.gov.ua/cgi-bin/laws*
10. *Malaxova, S. O., Radomskyj, S. S. (2013). Silskyj zelenyj turyzm – osnova rozvytku turystychnoyi industriyi Zakarpattya [Green tourism - the basis of the tourism industry Transcarpathia]. Naukovyj visnyk NLTU Ukrayiny, 23.16, 129-133*
11. *Migushhenko, Yu. V. (2013). Napryamy pidvyshhennya efektyvnosti vykorystannya turystychno-rekreacijnogo potencialu silskyx girskyx terytorij Zaxidnoyi Ukrayiny [Directions efficiency of the tourism potential of rural mountain areas of Western Ukraine]. Socialno-ekonomichni problemy suchasnogo periodu Ukrayiny, 6, 332-341.*
12. *Papp, V. V. (2015). Turystychnyj potencial nacionalnyx pryrodnyx parkiv (na prykladi Zakarpatskoyi oblasti) [Tourism potential of national parks (for example, Transcarpathian region)]. Biznes Inform, 9, 223-229.*
13. *Saviczka, O. P., Novostavska, O. I., Saviczka, N.,V. (2015). Formuvannya konkurentnogo potencialu turystychnyx pidpryyemstv v umovax stalogo rozvytku [Formation of the competitive potential of tourism enterprises in terms of sustainable development]. Naukovyj visnyk NLTU Ukrayiny, 25.9, 166-172.*
14. *Skrypnyk, V. V. (2015). Problemy rozvytku turystychnogo ta gotelno-restorannogo biznesu regionu na prykladi Cherniveczkoyi oblasti [The problems of the tourism, hotel and restaurant business in the region by the example of Chernivtsi region]. Visnyk Cherniveczkogo torgovelno-ekonomichnogo instytutu. Ekonomichni nauky, 2, 96-104.*
15. *Spilka spryyannya rozvytku silskogo zelenogo turyzmu v Ukrayini. Available at : http://www.greentour. com.ua*
16. *Statystychni dani Golovnogo upravlinnya statystyky u Zakarpatskij oblasti. Available at : http://www.uz.ukrstat.gov.ua/*
17. *Statystychni dani Golovnogo upravlinnya statystyky u Ivano-Frankivskij oblasti. Available at : http://www.ifstat.gov.ua/*
18. *Statystychni dani Golovnogo upravlinnya statystyky u Lvivskij oblasti. Available at : http://www.lv.ukrstat.gov.ua/*
19. *Statystychni dani Golovnogo upravlinnya statystyky u Chernvieczkij oblasti. Available at : http://www.cv.ukrstat.gov.ua/*
20. *Strategiya rozvytku turyzmu i kurortiv, zatverdzhennya rozporyadzhennyam Kabinetu Ministriv Ukrayiny vid 6.08.2008 r., №1088-r: Zakonodavstvo Ukrayiny. Available at : http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi? nreg=1088-2008-%F0*
21. *Shaxrayuk-Onofrej, S. I., Lakusta, G. Yu. Problemy ta perspektyvy kompleksnogo rozvytku ekonomiky Karpatskogo regionu Available at : http://www.rusnauka.com/13_NMN_2011/Economics/13_86485.doc.htm*
22. *Athanasopoulos, G., Hydman, R. J. (2006). Modeling and forecasting Australian domestic tourism// Department of Econometric and Business Statistics, Monash University, Melbourne*
23. *De Mello, M., Nell, K. S. (2001). The forecasting ability of a cointegrated var demand system with endogenous vs. exogenous expenditure variable // Universidade de Porto.*
24. *The Travel & Tourism Competitiveness Report 2009. World Economic Forum. Available at : http://www.weforum.org/ report/travel-tourism-competitiveness-report-2009*

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URBAN AREAS SPACE TRANSFORMATIONS IN TNE SUBURB CITIES OF THECAPITAL

The aim of the article is to analyze the urban space transformation processes in the capital's suburban areas. The objectives of the work are as follows: 1) analysis of the population dynamics in towns and comparisons of natural population growth during the study period; 2) the modernization and transformation assessment of Kyiv urban suburbs; 3) comparison of sectoral and functional structures of the cities; 4) identification of the transformation processes features by the local population within test plots of model cities and civic engagement of local residents.

Based on already existing Pityurenko's research, we conducted our own research in which we use comparative geographic method and the population survey method. The expert estimations is used while determining the level of modernization and the transformation presence in the cities researched.

According to the results of the research we found out the level of modernization of existing test sites and transformation processes within them. Based on comparative geographical analysis of test plots in model cities Bucha, Boryspil and Ukrainka common features of transformation processes that are specific to the satellite cities and the suburbs have been revealed. They are as follows: the population in urban areas is growing; basic functions of the test areas are residential and the population service; public service facilities are located mainly on the ground floors of residential buildings which are located on the main road of the city. There is the expansion of residential areas in the satellite towns by building new housing estates mainly in recreational areas; there are gentrification processes of various kinds, as well.

The research of such content in the cities mentioned above has been carried out for the first time. It has been done by using a case method.

The result of the study is to obtain objective, coherent information "pictures" of the transformation processes in the satellite towns. Analyzing that, we can see the current state of urban development, changes in the towns' structure planning and predict future changes.

Keywords: transformation, functional transformation, modernization, gentrification, suburban area, satellite towns, survey.

References

1. *Mezentsev K., Brade I., Mezentseva N. (2012). New Social and Economic Processes in Kyiv's Hinterland. Chasopys social'no-ekonomichnoji gheoghrafiji, 12(1), 156-160.*
2. *Denysenko, O. O. (2012). Protsesy metropolizatsii: svitohospodarskyi aspekt [Metropolisation procesces : the world economy aspects]. K., 193.*
3. *Dnistrjansjka, N. I., Dnistrjansjkyj M. S. (2013). Duzhe mali misjki poselennja Ljvivsjkoji oblasti: suspil'no-gheoghrafichnyj potencial ta perspektyvy rozvytku [Very small urban settlements Lviv region: social -geographic potential and development prospects] Ljviv, LNU imeni Ivana Franka, 198.*
4. *Dotsenko, A. I. (2011). Osnovni napriamy sotsialno-ekonomichnoho rozvytku malykh monofunktsionalnykh mist Ukrainy [The main direction of socio-economic development of small monofunctional cities in Ukraine]. Ukrainskyi geografichnyi zhurnal, 1, 51–55.*
5. *Dronova, O. L. (2014). Geourbanistyka : navch. posib. [Geourbanistics: Tutorial]. K., Vydavnycho-polihrafichnyi tsentr Kyivskyi universytet, 419.*
6. *Zavarika, Gh. M. (2012). Transformacija rozselennja Lughans'koji oblasti [Transformation of Lugansk region setting system]. Lughansjk, Noulidzh, 179.*
7. *Rudych, F. M. ed. (1971). Istorija mist i sil URSR: Kyjivs'ka oblast' [The history of USSR towns and villages: Kyiv region]. K., Ghol. red. URE, 792.*
8. *Kljujko, T. I. (2013). Prymisjka zona ta mista-suputnyky jak ob'jekty suspil'no-gheoghrafichnogho doslidzhennja [Suburban area and towns-satellites as object of human-geographical researches]. K., Ekonomichna ta social'na gheoghrafija, 2(67), 207-213.*
9. *Manshylina, T. I. (2015). Suspil'no-gheoghrafichne doslidzhennja rozvytku mist-suputnykiv ta prymis'koji zony Kyjeva [Human-geographical studies of the development of satellite towns and suburban area of Kyiv].KNU imeni Tarasa Shevchenka, 20.*
10. *Mezentsev, K. V., Kljujko, T. I. (2015). Prostorovi transformaciji zhytlovykh funkcij u prymisjkij zoni Kyjeva [Spatial transformation of residential functions in Kyiv's suburban area]. K., Chasopys social'no-ekonomichnoji gheoghrafiji, 18(1), 87-93.*
11. *Mezentsev, K. V., Pidgrushnyi, H. P., Mezentseva, N. I. (2014). Regionalnyi rozvytok v Ukraini: suspilno-prostorova nerivnist i poliaryzatsiia [Regional development in Ukraine: socio-spatial inquality and polarization]. K., DP Print servis, 132.*
12. *Mezentsev, K. V. (2013). Trendy rozvytku mis'kykh poselen' v Ukrajini: stijki ta vrazlyvi mista [Trends in urban settlements development in Ukraine: strong and vulnerable cities]. Visnyk Kyivskogo natsionalnogo universytetu, Geografiya, 1(61), 31-36.*
13. *Melnyk, L., Oreshchenko, A., Batychenko, S. (2016). Transformaciji mis'kogho prostoru na prykladi testovoji diljanky v m. Luc'k [The urban space transformation of Lutsk as an example]. K., Visnyk Kyivskogo natsionalnogo universytetu, Geografiya, 1(64), 53-57.*
14. *Pertsyk, E. N. (2009). Geourbanystyka : uchenyk [Geourbanistics: Tutorial]. M., 432.*
15. *Pidghrushnyj, Gh.P., Denysenko, O.O. (2013). Kyjiv ta pryleghla terytorija v systemi centro-peryferijnoji vzajemodiji [Kyiv and surrounding territory in the center – peripherial interaction]. Ukrajinsjkyj gheoghrafichnyj zhurnal, 2013, 27-34.*
16. *Pitjurenko, Ju. I. (1972). Rozvytok mist i misjke rozselennja v Ukrajins'kij RSR (osoblyvosti rozvytku i rozmishhennja, typologhija, terytorial'ni systemy i perspektyvy) [Urban development and urban settlement in the Ukrainian SSR (features of development and placing, typology, territorial system and prospects)]. K., 187.*
17. *Rudenko, L.Gh. ed. (2015). Funkcyy ghorodov y ykh vlyjanye na prostranstvo [City functions and their influence on the place]. K., Fenyks, 292.*
18. *Official the Kyiv Regional State Administration web page [electronic resource]. Aviable at: http://koda.gov.ua/kiivshhina/statistichni-dani/*

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HISTORICAL CUT OF NATURAL GEOGRAPHICAL RESEARCH FORMATION IN KHARKIV SOCIETY OF NATURALISTS IN THE SECOND HALF OF XIX – EARLY XX CENTURY

Problem Statement and Purpose. The aim of the article is, in the historical screening cut of scientific and social activities in the field of natural geography in the society of scientists in the first university on the territory of Ukraine (the second half of XIX – early XX century).

Data & Methods. Research data were collected from libraries of I. I. Mechnikov Odessa National university and P.Tychyna UGPU, and these were the main sources of information. Scientific works (monographs, encyclopedias, articles and electronic resources at various levels) by the famous Russian scientists, scientists from the former Soviet Union and Ukraine (1906–2014) were alo widely used.

In writing this research, we used methods of retrospective studies, historical, geographical and scientific methods of analysis to summarize the processed materials.

Results. A retrospective analysis of a large number of materials, has led us to the main results of our research.It was found out that the formation of natural geography of Ukraine was attended by experts from different fields of knowledge.

As a result, the research has confirmed that:

1. Naturalists of Kharkiv Society have played a leading role in the formation and development of the natural geographical area of expertise in Slobozhanschyna at Kharkiv University, where geography as an academic discipline was introduced in 1889 thanks to the activity of members of the public association.

2. Science in the process of its development is based on its respective fields. At their intersection there are new research areas and «young» science, like bio-geographical areas of natural geography and ecology, which are now being intensively developed and enrich researchers with new knowledge about the nature of the Earth.

Keywords: Kharkiv Society of Naturalists, natural geography, soil science, biogeography.

References

1. *Bahaley, D. Y., Myller, D. P. (1912). Ystoryya horoda Khar'kova za 250 let eho sushchestvovanyya (XIX – nachalo XX veka). [The history of the city of Kharkiv for the 250 years of its existence (XIX - early XX century)], Kharkov : Typohrafyya M. F. Zyl'berberha, 973.*
2. *Bahaley, D. Y., Sumtsov, N. F. (1906), Kratkyy ocherk ystoryy Khar'kovskoho unyversyteta za pervыe sto let eho sushchestvovanyya (1805 – 1905). [A brief sketch of the history of the University of Kharkov in the first hundred years of its existence (1805 - 1905)], Typ. un-ta, 329.*
3. *Wikipedia, Bryo Aleksandr Spyrydonovych, Available at: https://ru.wikipedia.org/wiki/Bryo,_Aleksandr_Spyrydonovych. [Accessed 20 January 2017].*
4. *Wikipedia, Pylchykov Nikolai_Dmitrievich, Available at: https://ru.wikipedia.org/wiki/Pylchykov,_ Nikolai_Dmitrievich. [Accessed 20 January 2017].*
5. *Wikipedia, Sobolev Dmitri Nikolai, Available at: https://ru.wikipedia.org/wiki/ Sobolev,_Dmitri_Nikolai. [Accessed 20 January 2017].*
6. *Wikipedia, Edelstein, Jacob Samoylovich, Available at: the site: https://ru.wikipedia.org/wiki/ Edelstein,_Jacob_Samoylovich. [Accessed 20 January 2017].*
7. *Vikipediya, Hurov Aleksandr Vasyl'evych, Available at: https://ru.wikipedia.org/wiki/ Hurov,_Aleksandr_Vasyl'evych. [Accessed 20 January 2017].*
8. *Vikipediya, Levakovs'kyy Ivan Fedorovych, Available at: https://uk.wikipedia.org/wiki/ Levakovs'kyy_Ivan_Fedorovych. [Accessed 20 January 2017].*
9. *Vikipediya, Somov Mykola Mykolayovych, Available at: https://uk.wikipedia.org/wiki/Somov_Mykola_Mykolayovych. [Accessed 20 January 2017].*
10. *Hel'fyenbeyn, L. L. (1965). Kharkivs'ke tovarystvo doslidnykiv pryrody ta yoho vnesok u rozvytok vitchyznyanoho pryrodoznavstva [Kharkov Society of Naturalists and its contribution to the natural sciences], Narysy z istoriyi pryrodoznavstva i tekhniky, 5, 13–136.*
11. *Dodonov, G. (2011). Naukova diyal'nist' ukrayins'kykh universytetiv druhoyi polovyny XX – pochatku XX st. [Science Ukrainian universities in the second half of XIX – early XX century]. Mandrivets, Science journal, 4, 25–29.*
12. *Zhupans'kyy, Ya. I. (1997). Istoriya heohrafiyi v Ukrayini: navch. posibnyk. [History Geography in Ukraine: teach. manual], L'viv, Svit, 264.*

13. *Zvonkova, H. L. (2002). Naukovi ta tekhnichni tovarystva Kharkova v XIX – na pochatku XX st. [Scientific and Technical Society of Kharkov in XIX - early XX century]. Narys z istoriyi pryrodoznavstva i tekhniky [Essay on the History of Science and Technology], Kiev, Tsentr doslidzhen' naukovo-tekhnichnoho potentsialu ta istoriyi nauky im. H. M. Dobrova NAN Ukrayiny, 155–164.*
14. *(1966), Kratkaya heohrafycheskaya эntsyklopedyya : dopolnenyya, Tom 5 [Short geographical encyclopedia: Additions, Tom 5.], Moscow , Sovetskaya entsyklopedyya, 544.*
15. *Levchenko, I. Naukova diyal'nist' pryrodnychykh naukovykh tovarystv na terenakh Ukrayiny v druhiy polovyni XIX – na pochatku XX st. [Natural Science scientific societies in Ukraine in the second half of XIX – early XX century], Zbirnyk naukovykh statey «Naukovi zapysky z ukrayins'koyi istoriyi», 34, 112–118.*
16. *Oliynyk, Ya., Krasnopol's'ka, N. (2007). Heohrafichna nauka v Ukrayini: stanovlennya i rozvytok. [Geographical Science in Ukraine: formation and development], Kiev, Nika-Tsentr, 148.*
17. *Pavlenko, Yu. V., Ruda, S. P., Khorosheva, S. A. (2001). Naukovi tovarystva – fenomen prosvitnytstva i kul'tury [Scientific community – education and cultural phenomenon] Pryrodoznavstvo v Ukrayini do pochatku XX stolittya v istorychnomu, kul'turnomu ta osvityans'komu kontekstakh [Science in Ukraine until the early twentieth century in the historical, cultural and educational contexts], Kiev, Akademperiodyka, 420.*
18. *Pavlenko, Yu. V., Ruda, S. P., Khorosheva, S. A. (2001). Pryrodoznavstvo v Ukrayini do pochatku KhKh st. v istorychnomu, kul'turnomu ta osvitn'omu kontekstakh [Science in Ukraine to the early twentieth century. in the historical, cultural and educational contexts], Kiev, Vydavnychyy dim «Akademperiodyka», 420.*
19. *Potebnya Andriy Oleksandrovych (1983) [Potebnya Andrey Oleksandrovych] Ukrayins'ka radyans'ka entsyklopediya : 12-ty t., 2-he vyd [Ukrainian Soviet Encyclopedia : 12-ty t., 2-he vyd.], Kiev, Holovna redaktsiya URE, 370.*
20. *V. N. Karazin Kharkiv National University. Faculty of Geology, geography, recreation and tourism, Available at: http://geo.karazin.ua/about/history/ [Accessed 20 January 2017].*

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ESTIMATED-PREDICTIVE MODELING OF GEODEMOGRAPHICAL SYSTEM, CASE STUDY OF KHARKIV REGION

Formulation of the problem. Forecasting and modeling of certain areas of public life do not lose their relevance in underlying programs and regional development plans. Responding to the social demand, human geography expands research tool as an interdisciplinary science providing combination of research results of spatial analysis and forecast with measures of the societal management monitoring. The human-geographical concept of the region's geodemographic system provides its modeling development. There are various methods and techniques of forecasting and modeling a number, composition and movement of the population. We believe that their addition by the estimated-predictive model of the geodemographic system significantly expands opportunities for the scientifically based results.

The purpose of the article is to assess major trends of regional geodemographic system of Kharkiv region and highlights the results of estimated-predictive modeling.

Methods. In order to show the changes in the geodemographical system balance equation is used. This method describes each settlement or local geodemographical system consisting of regional geodemographical system. The general algorithm of estimated-predictive model of social position and geographical concepts of geodemographical development of the region is displayed.

Results. According to the simulation results for each year of the forecast period (20 years) population distribution by age group, the average population age, the number of migrants for each age group, the entropy information for each object and for each age group were calculated. Three scenario variants of the geodemographical regional system development were reproduced in the model. The first one preserves current vital parameters (beginning 2016), optimistic (with rising birth rates and migration activity) and average (with increased birth). For each option a situation when migrants are hosted by the cities of regional subordination including the regional center was described: 1 (Kharkiv), 2 (Kharkiv and Kupiansk), 3 (Kharkiv, Kupiansk, Izum) and 4 (Kharkiv, Kupiansk, Izum, Lozovaja).

Scientific novelty and practical significance. Estimated-predictive model of the regional geodemographical system is a versatile tool for research and social management and can be used for solving a variety of problems - from assessment and prognosis of the most common trends of regional geodemographical system to a specific demographic of detailed studies of local communities and settlements. Possibilities to apply the estimated-predictive model for regional geodemographical development are designated.

Keywords: population, geodemographical system, modeling, predictive estimated model, Kharkiv region.

References

1. *Nyemets', K., Sehida K., Nyemets', L. (2016). Bahatovymirnyy analiz u suspil'niy heohrafiyi (netradytsiyni metody) [Multivariate analysis in social geography (alternative methods)]. Kh. : KhNU imeni V. N. Karazina, 120.*
2. *Nyemets', K. A., Nyemets', L. M. (2013). Prostorovyy analiz u suspil'niy heohrafiyi: novi pidkhody, metody, modeli [Spatial analysis in human geography: new approaches, methods, models]. Kharkiv, Kharkivs'kyy natsional'nyy universytet imeni V. N. Karazina, 228.*
3. *Sehida, K. (2017). Heodemohrafichna systema yak funktsional'na pidsystema sotsioheosystemy [Geodemographical system as functional subsystems of sociogeosystem]: 2017 internet conference. Trends and prospects of development of science and education in terms of globalization. Pereyaslav-Khmelnytsky (Ukraine), 394, 6-10.*
4. *Strategy of the Kharkiv region till 2020. Available at : kharkivoda.gov.ua/documents/16203/1088.pdf.*
5. *Chmykhalo, M. L. Ed (2003). Kharkivs'ka oblast' u 2002 rotsi [Kharkiv region in 2002]. Kharkov, VD «INZhEK», 604.*
6. *Chmykhalo, M. L. Ed (2004). Kharkivs'ka oblast' u 2003 rotsi [Kharkiv region in 2003]. Kharkov, PP «KrymArt», 643.*
7. *Chmykhalo, M. L. Ed (2005). Kharkivs'ka oblast' u 2004 rotsi [Kharkiv region in 2004]. Kharkov, TOV «Zoloti storinky», 608.*
8. *Chmykhalo, M. L. Ed (2006). Kharkivs'ka oblast' u 2005 rotsi [Kharkiv region in 2005]. Kharkov: TOV «Zoloti storinky», 606.*
9. *Chmykhalo, M. L. Ed (2007). Kharkivs'ka oblast' u 2006 rotsi [Kharkiv region in 2006]. Kharkov, TOV «Zoloti storinky», 562.*
10. *Chmykhalo, M. L. Ed (2008). Kharkivs'ka oblast' u 2007 rotsi [Kharkiv region in 2007]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 590.*
11. *Chmykhalo, M. L. Ed (2009). Kharkivs'ka oblast' u 2008 rotsi [Kharkiv region in 2008]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 578.*
12. *Nikiforova, O. S. Ed (2010). Kharkivs'ka oblast' u 2009 rotsi [Kharkiv region in 2009]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 586.*
13. *Mamontova, O. H. Ed (2011). Kharkivs'ka oblast' u 2010 rotsi [Kharkiv region in 2010]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 568.*
14. *Mamontova, O. H. Ed (2012). Kharkivs'ka oblast' u 2011 rotsi [Kharkiv region in 2011]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 583.*
15. *Mamontova, O. H. Ed (2013). Kharkivs'ka oblast' u 2012 rotsi [Kharkiv region in 2012]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 535.*
16. *Mamontova, O. H. Ed (2014). Kharkivs'ka oblast' u 2013 rotsi [Kharkiv region in 2013]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 492.*
17. *Mamontova, O. H. Ed (2015). Kharkivs'ka oblast' u 2014 rotsi [Kharkiv region in 2014]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 540.*
18. *Mamontova, O. H. Ed (2016). Kharkivs'ka oblast' u 2015 rotsi [Kharkiv region in 2015]. Kharkov, Holovne upravlinnya statystyky u Kharkivs'kiy oblasti, 534.*

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BIOCENTRIC–NETWORKING LANDSCAPE CONFIGURATION OF LEFT-BANK UKRAINE

The aim of the research is to determine the biocentric-networking landscape configuration (BNLK) contemporary structure as an important basis for the landscape planning tools implementation in the region, according to the results of analysis the factors of its formation and development, and structural-morphometric estimation.

The method is based on the results of our mapping modelling of landscape-typological structure of the Left-Bank Dnipro of the Ukraine territory (at the level of landscape types) and the nature reserve fund. The region of the exploration is the Left-Bank of the Dnipro river which is understood as a totality of four administration regions of Ukraine, such as Poltava, Sumy, Kharkiv and Chernigiv. The BNLK contemporary structure was determined by using GIS-parcel MapInfo Professional 10.0.1, and landscape complexes data, including 1 552 objects of nature reserved fund (by 1.11.2016).

The BNLK is understood as a totality of biocenters, biocorridors, interactive elements, buffer zones and "matrix", which all together make a special system that supports the ecological equilibrium in a region.

Thus, for the first time in the region all sorts of BNLK elements were differentiated according to the estimated level of forestation, nature reserve fund and landscape-typological structure. Also, we distinguished 88 biocenters and 51 biocoridors,that present different spatial-hierarchical levels, the mapping model of which also was done. All together, in the Left-Bank Dnipro river of Ukraine territory were determined 12 – national, 12 – regional, and 64 – local biocenters; also 4 – national, 5 – regional, and 41 – local (including 16 – at the I-t level and 25 – at the II-nd level) biocoridors. The results received in a such way could be a good background for choosing distinguishing criteria of landscape planning typological units and for future use in landscape planning.

Keywords: landscape, biocentric-networking configuration, biocenter, biocoridor, interactive element, "matrix", the Left-Bank Dnipro river of Ukraine territory.

References

1. *Bajrak, O. M., Smoljar, N. O., Bulava, L. M. Geoecological characteristic of the regional ecological corridors (on the example of Poltavshina). Available at: geo.pnpu.edu.ua/text/lessonn_plan/ekomereja.doc.*
2. *Varivoda, E. O. (2009). Konstructivno-geographichni osnovi upravlinnja prirodno-zapovidnim fondom v meghakh administrativnikh rajoniv [The constructive-geographical basis of the nature-reserve fund in the administrative regions management]. V.N. Karazin Kharkiv National University. Kharkiv, 20.*
3. *Hrodzinskij, M. D. (1993). Osnovi landshaftnoji ecologii [The basis of landscape ecology]. Ljibidj, 224.*
4. *Hrodzinskij, M. D. (2005). Piznannja landshaftu: mistze i prostir [The landscape cognition: place and space]. VPZ «Kiivsjkij universitet», 1, 431; 2, 503.*
5. *Desjuk, V. S., Svidzinsjka, D. V. (2014). Kartographuvannja ta analiz biotzentrichno-meregevoji konfiguratzii (na priklady Lubensjkogo rajonu Poltavsjkoji oblasti) [Mapping and analysis the biocentric-networking configuration (on the example of Luben district Poltava region)]. Chasopis kartographii, 10, 179-185.*
6. *Domaransjkij, A. O. (2006). Landshaftne riznomanittja: sutnistj, znachennja, metrizatzija, zbereghennja [The landscape diversity: essence, significance, metrization, preservation]. TOV "IMEKS-LTD", 146.*
7. *Maksimenko, N. V., Kvartenko, R. O. (2013). Landshaftne pidgruntja perspektiv rozvitku regionaljnoji i lokaljnoji ecologichnoji mereghi Harkivsjkoji oblasti [The landscape basis of the prosrects the ragional and local ecological network development of Harkiv region]. Visnik HNU V.N. Karazina, 1070, Ecology, 9, 63-73.*
8. *Petin, A. N. and other (2004). Osnovi ecologii i prirodopoljzovanija [The basis of ecology and nature resource management]. MGU, 287.*
9. *Razrabotka kontzeptzii ecologicheskikh koridorov v transgranichnikh uchastkakh bassejna reki Dnepr. Final report [The concept elaboration of ecological corridor in the transboundary areas of the Dnipro river basin] (2002). KNU Taras Shevchenko, 110.*
10. *Rozbudova ecomereghi Ukraini [The Ukraine econetwork improvement] (1999). The project "Econetworks", 127.*
11. *Samojlenko, V. M., Korogoda, N. P. (2006). Geoinformatzijne modeljuvannja ecomereghi [The geoinformational econetwork modelling]. Nika-Centr, 224.*
12. *Samojlenko, V. M., Korogoda, N. P. (2009). Optimizatzija vimirjuvannja rozrakhunkovikh pokaznikiv pri modeljuvanni basejnovoji ecomereghi [The optimization of measuring calculation indexes due to modelling the basin econetwork]. Hydrology, hydrochemistry and hydroecology, 17, 15-26.*
13. *Samojlenko, V. M., Korogoda, N. P. (2010). Viznachennja rozrakhunkovikh pokaznikiv pri modeljuvanni ecomereghi v basejnakh richok na riznikh teritorialjnikh rivnjakh proektuvannja [The measuring calculation indexes of the econetwork determination in the rivers basins at the different territorial levels of projection]. Physical geography and geomorphology, 3 (60), 57-62.*
14. *Samojlenko, V. M., Korogoda, N. P. (2010). Kriterii rivnja prirodno-karkasnoji znachuschosty ta stanu objektiv modeljuvannja ecomereghi v richkovikh basejnakh [The criteria of the nature-skeleton meaning level and the objects of econetwork modelling state in the rivers basins]. Hydrology, hydrochemistry and hydroecology, 3 (20), 8-21.*
15. *Sheljag-Sosonko, Ju. R. (2004). Formuvannja regionaljnikh skhem ecomereghi (metodichni rekomendatzii) [The cheme of the regional econetwork formation (methodical recommendations)]. Fitosotziocentr, 71.*
16. *Sheljag-Sosonko, Ju. R., Hrodzinskij, M. D., Romanenko, V. D. (2004). Kontzeptzija, metodi i kriterii sozdanija ecoseti Ukraini [The concept, methods and criteria of Ukraine econetwork creation]. Fitosotziocentr, 144.*
17. *Shischenko, P. H. (1999). Printzipi i metodi landshaftnogo analiza v regionaljnom proektirovanii [Priciples and methods of landscape analysis in the regional projection]. Fitosotziocentr, 284.*
18. *Angelstam, P., Grodzynskyi, M., Andersson, K. (2013). Measurement, Collaborative Learning and Research for Sustainable Use of Ecosystem Services. Landscape Concepts and Europe as Laboratory, AMBIO, 42, 129-145.*
19. *Forman, R. T., Gordon, M. (1986). Landscape Ecology. New York, 619.*
20. *McGarigal, K., Marks, B. J. (1994). FRAGSTATS: Spatial pattern analysis program for quantifying landscape structure. Version 2.0. Corvallis. Available at: https://www.umass.edu/landeco/pubs/mcgarigal.marks.1995.pdf.*

ECOLOGY

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ENVIRONMENTAL-ECONOMIC EFFICIENCY OF LAND USE IMPROVEMENT REASONING

Formulation of the problem. In the conditions of fast development of the industry, energetics and transport communications, intensive mining of minerals, active chemicalixation of agriculture there is a fast increase in the level of environmental pollution and first of all soils, that in turn leads to worsening in their qualitative state.

The soil is an important unit of ecosystems, the destruction of which has multidimensional value for the stability of the environment. Agrarian transformation of soils traditionally was assessed as progressive. However, scientific analysis shows that extensive agriculture, irrational chemical fertilizer and excessive adding of pesticides led to a significant reduction in fertility, and sometimes loss due to erosion, natural soil cover on large areas.

The purpose of the article. The study of intensification of land resources in compliance with environmental principles, which should provide a comprehensive, systematic approach to solving economic, social, environmental and other problems.

Methods. The author's own achievements as well as the research results of domestic and foreign investigators made the methodical basis for the article.

Results. Ecological agriculture nowadays scientists consider a perspective direction, which allows the use of science-based pesticides and fertilizers without reducing the quality of made production, with compulsory advancing ecologization of processing industry.

The result of activation of economic activity in many cases is increasing influence on the environment, ecological balance, soil pollution, depletion of land resources, worsening their useful properties.

According to parameters of the regression model, the increase in all investigated factors other than labor costs with deductions, rendered positive influence on the resultant figure. In our case, most (relative to other factors) contributed to his growth increasing costs of seeds and planting materialbecause each additional spent thousand for this trend intensifying per one hundred hectares of arable land (if not the variability of other factors) predetermined increase yield of gross output of one point eighteen thousand UAH on one hundred hectares of arable land.

Parameters of the given model demonstrated that increase in all studied factors rendered positive impact on a productive indicator.

Scientific novelty and practical significance. One of the main mechanism for regulating ecologisation of land resources is the detection, evaluation and implementation of the highest possible reserves of increase efficiency of this process. This is a reduction of unproductive losses in resource use and saving mode, and the possibility of using scientific and technological progress as the main solution. Using regression models, that were built before, depending on the main indicators of ecological and economic efficiency of using of land resources on the arable land from specific costs, were identified reserves of increase in the investigated agricultural enterprises.

Keywords: ecological and economic efficiency, consortium, an edifikator, a subedifikator, extensive agriculture, intensification of the using, complementary cooperation, environmental balance, ecological agriculture.

References

1. *Lavryk, V. I. (1998). Metody matematychnoho modelyuvannya v ekolohiyi [Mathematical Modeling in Ecology], 256.*
2. *Land Code of Ukraine 25.10.2001. № 2768-III. Aviable at: http://zakon2.rada.gov.ua/ laws/show/2768–14/page8.*
3. *On Land Protection: The Law of Ukraine 19.06.2003. № 962–IV. Aviable at: http://zakon4.rada.gov.ua/laws/show/962–15/page2.*
4. *Kuryl'tsiv, R. M. (2006). Ekoloho-ekonomichnyy mekhanizm formuvannya ratsional'noho vykorystannya i okhorony zemel'nykh resursiv [Ecological and economic mechanism of rational use and protection of land resources]. Lviv, 20.*
5. *Koshkalda I. V., Ul'yanchenko, O. V. (2015). Standarty, normy i pravyla yak instrumentariy upravlinnya zemel'nymy resursamy [Standards, rules and regulations as land management tools]. Smuhasta typohrafiya, 60–69.*
6. *Maslak, O. (2012). Derzhavne rehulyuvannya zemel'nykh vidnosyn [State regulation of land relations]. Propozytsiya, 11. 32–36.*
7. *Ul'yanchenko, Yu. O. (2013). Napryamy derzhavnoho rehulyuvannya zemel'nykh vidnosyn v Ukrayini. [Areas of state regulation of land relations in Ukraine], 3, 106–109.*
8. *Zhybak, M. M., Chernyk, D. P. (2013). Orhanizatsiyno-ekonomichni umovy ta pryntsypy ratsional'noho vykorystannya zemel'nykh resursiv sil's'kohospodars'kykh pidpryyemstv [Organizational and economic conditions and principles of rational land use of agricultural enterprises]. Efektyvna ekonomika, 4.*
9. *Popova, O. L. (2009). Stalyy rozvytok ahrosfery Ukrayiny : polityka i mekhanizmy. [Sustainable development agrosphere Ukraine: policy and mechanisms], 352.*
10. *Harmashov, V., Krutyakova, V., Bezpalov, I. (2015). Khimichna skladova v roslynnyts'kiy syrovyni mizerno mala porivnyano zi shkidlyvistyu nepryrodnykh inhrediyentiv pererobky [Chemical raw material component in plant growing is negligible compared to the harmfulness of unnatural ingredients processing], 3, 82–83.*
11. *Andriychuk, V. H. (2002). Ekonomika ahrarnykh pidpryyemstv. [The economy of agricultural enterprises]. KNEU, 624.*
12. *Mazur, F. F. (2005). Sotsial'no-ekonomichni umovy rozvytku rekreatsiynoyi industriyi. [Socio-economic conditions of the recreation industry]. TSNL, 96.*
13. *Borodina, O. S. (2015). Pryntsyp komplementarnosti v mizhdystsyplinarnykh doslidzhennyakh ekonomiky. [The principle of complementarity in interdisciplinary studies of economy], 47–58.*
14. *Ul'yanchenko, O. V. (2008). Upravlinnya resursnym potentsialom v ahrarnomu sektori. [Managing resource potential in the agricultural sector], 38.*
15. *Okhrimenko, I. V. (2009). Vytraty ta sobivartist' sil's'kohospodars'koyi produktsiyi v rehulyuvanni ekonomichnykh vidnosyn sil's'kohospodars'kykh pidpryyemstv. [The costs and the cost of agricultural production in the regulation of economic relations farm]. Lohos, 388.*
16. *Kozakova, I. V. (2014). Efektyvnist' resursooshchadnykh tekhnolohiy vyrobnytstva zerna u sil's'kohospodars'kykh pidpryyemstvakh. [The efficiency of resource saving technologies of grain production in agricultural enterprises], 20.*
17. *Henyk, Ya. V. (2009). Ekoloho-biolohichni osnovy vidnovlennya landshaftiv, porushenykh zvalyshchamy ta polihonamy tverdykh pobutovykh vidkhodiv. [Ecological and biological basis of restoration of landscapes disturbed dumps and landfills]. Ekolohiya dovkillya, 19, 2.*
18. *Kravets', O. P. (2002). Suchasnyy stan ta problemy fitoochyshchennya gruntiv vid radionuklidiv i vazhkykh metaliv. [Current status and problems of recultivation soils from radionuclides and heavy metals], 34(5), 377–386.*
19. *Hyrlya, L. M. (2011). Fitoremediatsiya – efektyvnyy shlyakh znyzhennya vmistu vazhkykh metaliv u gruntakh. [Phytoremediation - an effective way to reduce the content of heavy metals in soils]. T. 152, 57–59.*
20. *Bilets'ka, V. A., Yatsechko, N. Ye., Pavlychenko, A. V. (2013). Doslidzhennya protsesiv transformatsiyi vodorozchynnykh form vazhkykh metaliv pry detoksykatsiyi promyslovykh vidkhodiv pryrodnymy sorbentamy. [Investigation of the transformation of soluble forms of heavy metals in industrial waste detoxification natural sorbents]: Aviable at: http://rr.nmu.org.ua/pdf/2013/20131016-52.pdf.*