НОВІ РЕАЛІЇ СУЧАСНОЇ УКРАЇНИ ТА СВІТУ

Колективна монографія

СГ НТМ «Новий курс»

2023

НОВІ РЕАЛІЇ СУЧАСНОЇ УКРАЇНИ ТА СВІТУ

Колективна монографія

УДК 009:3(082)
Н73

Н73 **Нові реалії сучасної України та світу**: кол. моногр. – Харків: СГ НТМ «Новий курс», 2023. – 224 с.

ISBN 978-617-7886-47-0

Рецензенти

Штулер Ірина Юріївна,
доктор економічних наук, професор,
перший проректор ВНЗ «Національна академія управління»

Погоріла Світлана Григорівна,
кандидат педагогічних наук,
доцент кафедри славістичної філології,
педагогіки і методики викладання
Білоцерківського національного аграрного університету

Харченко Артем Вікторович,
кандидат історичних наук, доцент,
доцент кафедри мистецької освіти та гуманітарних дисциплін
Харківського національного університету мистецтв імені І. П. Котляревського

Рекомендовано до друку редакційною колегією
Соціально-гуманітарної науково-творчої майстерні «Новий курс»
(протокол № 11-мн від 28.08.2023)

Колективна монографія присвячена актуальним питанням розвитку України та світу в нових реаліях трансформації суспільних відносин. Досліджуються сучасні проблеми в сфері педагогіки, психології, соціології, соціальних комунікацій, філософії, культурології, мистецтвознавства, архітектури, історії, філології, фізичного виховання, спорту, географії, рекреації, туризму, економіки, національного та світового господарства, маркетингу, менеджменту, державного управління, політики, юриспруденції, національної та цивільної безпеки. Монографія буде корисною науковцям, викладачам, здобувачам вищої освіти, а також широкому колу осіб, які цікавляться питаннями сучасного розвитку суспільства.

ISBN 978-617-7886-47-0

Зміст

Svitlana Hryshko
Candidate of Geographical Sciences, Associate Professor
Bogdan Khmelnitsky Melitopol State Pedagogical University
Olga Levada
Candidate of Geographical Sciences, Associate Professor
Bogdan Khmelnitsky Melitopol State Pedagogical University
Larysa Prokhorova
Candidate of Geological Sciences, Associate Professor
Bogdan Khmelnitsky Melitopol State Pedagogical University
Oleksandr Nepsha
Bogdan Khmelnitsky Melitopol State Pedagogical University
Tetiana Zavialova
Bogdan Khmelnitsky Melitopol State Pedagogical University

3.3. Physical and chemical properties of chernozem soils in Zaporizhzhia region

The soil cover of Zaporizhzhya region is represented by such zonal soils as ordinary low-humus chernozems, ordinary low-humus low-power chernozems, southern chernozems, dark chestnut and chestnut soils. These soils differ in terms of their occurrence, morphological characteristics and physical and chemical properties. Along with zonal soils, especially along the southern border of the region, there are widely represented solonets and saline soils, and less often solonchaks [1,5] (Figure 1).

Ordinary chernozems, mainly on loess rocks, are among the most common soils in Zaporizhzhia region. They cover watersheds and their gentle slopes in continuous massifs, forming a homogeneous soil cover with almost no surface runoff. According to the depth of the profile, humus content and some other morphological, physical and chemical characteristics, ordinary chernozems are divided into deep chernozems, ordinary chernozems, and shallow chernozems [2,6].

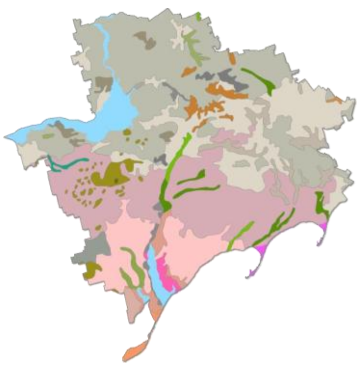


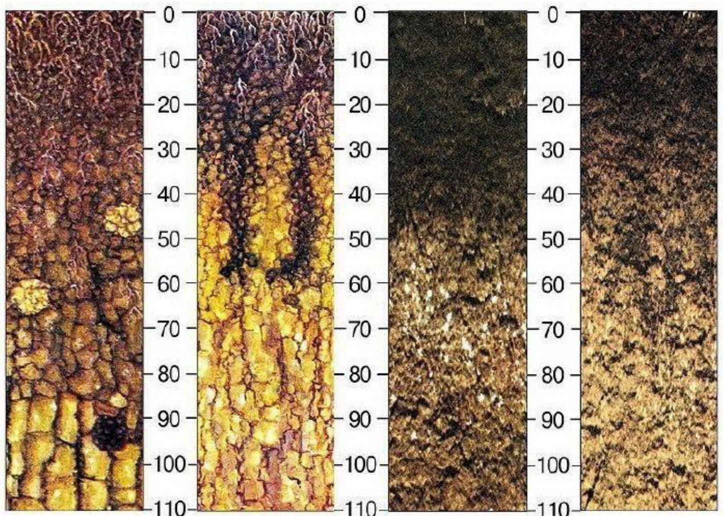
Figure 1. Chernozem soils in Zaporizhzhia region [3]

Symbols for Figure 1:

- Common low-humus deep chernozems
- Ordinary medium humus chernozems
- Ordinary low-humus chernozems
- Ordinary low-humus shallow chernozems
- Southern low-humus chernozems
- Black soil on dense clay
- Saline chernozems on dense clays
- Chernozems are predominantly gravelly on eluvium of hard non-carbonate rocks
- Carbonate chernozems on eluvium of dense carbonate rocks
- Black earth clay-sandy and sandy loam soils
- Ordinary residual-saline chernozems
- Southern residual-saline chernozems

The formation of chernozems occurred under the influence of steppe grass vegetation (sod formation) with a deep (over 5-7 m) groundwater table, under normal atmospheric moisture conditions on loess and loess-carbonate unsaline and unglaciated rocks. Soil formation was due to the accumulation of humus and mineral nutrients during the growth and death of herbaceous vegetation.

The total depth of the humus profile (H+HPk) in ordinary deep chernozems is 85-100 cm, in ordinary ordinary chernozems – 75-85 cm, in ordinary shallow chernozems – 55-60 cm; the humus (H) horizon is 40-45, 35-40, 30-35 cm, uniformly humus, dark grey, almost black when wet [2, 6] (Figure 2).



A B C D

Figure 2 – Profiles of chernozem soils in Zaporizhzhia region [4]

Symbols: A – ordinary medium-humus chernozem; B – ordinary low-humus chernozem; C – micellar carbonate chernozem; D – southern chernozem

There is no redistribution of colloids in the profile. The structure in the subsoil layer is granular, while in the topsoil it is dispersed. Carbonates are concentrated in the rock in the form of amorphous white specks, and within the transition horizon – in the form of greyish mould. The mechanical composition of the soils is mostly heavy loamy and clayey, with sandy loam, light and medium loamy soils also occurring. Water-physical properties are favourable for plants and create conditions for the active work of beneficial microorganisms, which contribute to the accumulation of mobile forms of nutrients in the soil.

Ordinary chernozems are classified as low-humus in terms of humus content. The average humus content in the topsoil is 4-5%, and its amount gradually decreases with depth. There is a proportional dependence of the amount of nitrogen on the humus content: the higher the percentage of humus, the more nitrogen. Soils are provided with easily soluble phosphorus and potassium. The amount of phosphorus in all types of soil decreases with depth, due to the formation of hardly soluble compounds with calcium and other elements. The reaction of the soil solution is close to neutral. Ordinary chernozems are characterised by high saturation with absorbed calcium, lack of redistribution of colloids along the profile, and therefore, no signs of profile differentiation into eluvium and illuvium horizons. Significant calcium saturation, high content of silt particles and a large amount of humus ensure good water-air regime. Ordinary chernozems on loess rocks are among the most fertile soils, with the exception of sandy loam chernozems, which have low humus content, insufficient saturation with absorbed bases, and a small amount of nutrients due to the predominant sand fraction [2, 6].

Agricultural plants on ordinary chernozems significantly increase their yields from the application of organic and mineral fertilisers. The main requirement for agricultural technology is the struggle for moisture accumulation and its economical use, and timely mechanical processing is of particular importance.

Southern loess chernozems are among the most typical soils in Zaporizhzhia region. They are common on flat, poorly drained wide watersheds and their slopes. The profile resembles ordinary chernozems, but with a shorter transition to the soil-forming rock and some compaction of the transition (HP) horizon, and in the dry state – of the upper arable layer as a result of the manifestation of weak residual salinity. The total depth of the humified profile (H+HPk) is 55-60 cm, the horizon (H) is 30-35 cm deep, darkish grey, lumpy, powdery in the arable layer, and granular in the subsoil layer. Humus penetration into the soil-forming rock by tongues is observed. Carbonates are found only in the form of white powdery white mica, mostly at a depth of 80-120 cm [2].

The mechanical composition of southern chernozems is predominantly light clay, heavy loam and sometimes medium loam. There is no distribution of colloids in the profile. Silty particles (<0.001 mm) are evenly distributed across the horizons, their content gradually increasing with depth.

In terms of humus content, these soils are classified as low-humus. Light loam soils contain 1.8% of humus, medium loam soils – 3.0%, heavy loam soils – 3.6%, and light clay soils – 3.9%. The distribution of humus and nutrients gradually decreases with depth. Southern chernozems have a large absorption capacity, characterised by high saturation with calcium and magnesium and low sodium content. This causes a neutral or slightly alkaline reaction of the soil solution. In the southern chernozems, the ratio of absorbed Ca:Mg bases is reduced to 4:1 [6].

The physical properties of southern chernozems are characterised by a deterioration in the water regime, which is due to climate and physical composition: poor structure and compaction. Southern chernozems of light texture have a more favourable water regime, as they accumulate active moisture faster due to their low moisture capacity and good filtration, but heavier texture chernozems may not be provided with the necessary amount of moisture under the same weather conditions.

Southern chernozems are moderately supplied with nitrogen, phosphorus and sufficient potassium for cereals, while industrial crops require moderate doses of organic and mineral fertilisers. Southern chernozems are among the most fertile soils in the region, which can be successfully used for growing all crops and orchards, but in the system of agronomic measures, moisture accumulation and conservation should be in the first place.

Black soils on dense clays are common in small areas on the slopes of gullies, where red-brown clays are exposed. Ancient erosion eroded the thickness of Quaternary sediments here and exposed red-brown clays, which are the soil-forming rocks of these soils. Black soils on dense clays were formed under the influence of the sod process of soil formation on dense saline clays.

The soil profile of the described chernozems (H+Hp) has a considerable depth of up to 70 cm. The horizon (H) is 0-35 cm, dark grey, sometimes black, with a strong coarse-grained structure. In saline chernozems on dense clays, the profile is similar to that of non-saline chernozems: (He) 30-35 cm, dark grey, granular-fine grained or flaky, clearly lighter than the illuvial. Humus illuvial (No) horizon is noticeably compacted, nutty above, finely prismatic below, dark grey, black when wet. The red-brown clay is dense, carbonate, with abundant white-veined and gypsum streaks [2].

The mechanical composition of the soil is predominantly clay. The humus content in the upper horizons is 3.5-4.5%, gradually decreasing along the profile, with phosphorus of 9.1 mg and potassium of 9.7 mg per 100 g of soil. The mineral complex of these soils is saturated with calcium and magnesium, with a small amount of absorbed sodium in non-saline soils. In saline chernozems, the amount of absorbed sodium increases in the illuvial horizon. The ratio between calcium and magnesium is 6-7:1. The salinity of the soil profile with easily soluble salts is low. The soil-forming rock is dense saline clay, which has its own influence on the formation and properties of this soil: increased density, very low water permeability, low salinity [6].

Black soils on dense clay float easily after rain, are viscous when wet and break up into prismatic cohesive particles; when dry, they are dense and cracked. They offer great resistance to processing, have reduced aeration and water permeability. Due to their unsatisfactory water-physical properties, they are unsuitable for orchards and of little use for vineyards. Therefore, measures to improve fertility are based on the application of organic and mineral fertilisers and gypsumisation.

The predominantly gravelly chernozems on the eluvium of hard non-carbonate rocks occupy small areas on eroded slopes in places close to the granite surface. They have a shortened profile, 40-50 cm deep, and are poorly differentiated into humus and transitional horizons. Humus content is 3-3.5-4%. These soils are poorly supplied with nitrogen, phosphorus and moderately with potassium [2, 6].

The soil-forming rock is continuous crushed stone, gradually turning into granite or multi-grained sand with an admixture of crushed stone, weathered sandstone. The gravelly nature of the soil makes it difficult to cultivate. Low-washed soils can be used for field, grain and fodder grass crops. They are unsuitable for gardens due to the shallow occurrence of hard rocks.

Black soils are predominantly gravelly on the eluvium of dense carbonate rocks and are common on the slopes of gullies and river banks, where dense limestone is exposed due to the washout of forests. These soils are drier than loess due to the fractured nature of the limestone rocks. They are characterised by low mobility of plant nutrients, especially phosphates, due to the high carbonation of the soil-forming rocks.

Crushed stone chernozems on the eluvium of dense carbonate rocks are characterised by very low moisture availability due to the conditions of their occurrence, as well as by a reduced water-resistant capacity. They are poorly supplied with nitrogen, phosphorus and moderately with potassium.

The humus horizon (H) is 30-35 cm deep, grey, granular-powdery, dusty-light loamy with an admixture of crushed stone. The depth of the humus profile is shallow, so it is necessary to apply organic fertilisers and deep ploughing without turning the layer to prevent low-productive horizons from coming to the surface. These soils can be used for field, grain and fodder grass crops, and are also suitable for vineyards [2].

Black earth clay-sandy and sandy loam soils are common on sandy terraces and on sandy uplands of river floodplains. The soil-forming rock is clayey alluvial sands. Due to their looseness and high water permeability, they are deeply humified and leached of soluble salts and lime. Having a low amount of strongly bound water, these soils are quite productive and are effectively used in agriculture for sowing vegetable, melons and grain crops, as well as for orchards and vineyards.

The humus horizon (H) is grey with a depth of 30-35 cm, clay-sandy or sandy loam (H+HP) – up to 70-75 cm. The humus content in these soils is low - 0.62-1.82%. The availability of nitrogen, phosphorus and potassium is very low, so organic and mineral fertilisers are highly effective here. The compacted sandy loam layers play a positive role in improving the moisture content of the upper horizons. The low humus content, insufficient saturation with bases (on average, in the 0-20 cm horizon, calcium is 6.6 mg-eq per 100 g of soil and magnesium is 2.4 mg-eq), and a small amount of nutrients are due to the predominant fraction of coarse and fine sand [6].

The application of organic fertilisers is important not only as a source of plant nutrition, but also as one of the main ways to improve the physical and physicochemical properties of the soil. An example of the correct and efficient use of these soils can be found in the Melitopol district, where valuable fruit crops and vineyards are grown on chernozem sandy loam and clay-sandy soils. Orchards on these soils bring large annual profits to the farms.

Residual-saline chernozems on loess rocks are common on low-drainage and drainless plateaus. They differ from non-saline chernozems by a greater dispersion of the upper humus horizon and a clearly visible compaction of the transition horizon, which is a consequence of the manifestation of weak residual salinity. Their agrochemical and physicochemical characteristics are similar to those of non-saline soils. Residual salinity somewhat worsens the water-air regime of these soils. The ability of soils to flood after rain and to compact in the dry state increases. The heavy mechanical composition causes high hygroscopicity and moisture capacity. However, a significant amount of moisture (up to 15%) is in a state of reserve, which is not used by plants [2].

In terms of humus content (3.7-4.5%), these soils are classified as low-humus. They are characterised by a significant saturation with calcium and magnesium, and a low sodium content. Residual-saline chernozems are sufficiently supplied with nitrogen and potassium, and moderately with phosphorus. They are characterised by a neutral or slightly alkaline soil solution reaction. Easily soluble salts are leached out of the profile. Despite the good supply of mobile forms of nutrients, the effect of organic and mineral fertilisers (phosphorus and nitrogen) is significant here [6].

Residual-saline chernozems on loess rocks are among the fertile soils of the region, which can be successfully used for sowing all agricultural crops and gardens with the application of both organic and mineral fertilisers.

Saline chernozems are predominantly on loess rocks and are common in depressions on the plateau. The profile structure of slightly saline chernozems is similar to that of non-saline chernozems, but their upper Ne horizon (0-40 cm) is more dispersed, even in the subsoil, with a noticeable SiO_2 dusting at the bottom. The HPi horizon (40 to 65-70 cm) is compacted, dark grey, fine-grained above and nutty below. Ordinary medium-saline chernozems are observed in combination with slightly saline chernozems, but the signs of salinity are more pronounced. The humus eluvial horizon (He) is 25-35 cm, slightly grained, darkish grey; the humus illuvial horizon (Hi) is darker coloured, rather compacted, nutty above, nutty-small prismatic below [2].

The humus content in the 0-20 cm horizon is 4.3-4.6%, phosphorus per 100 g of soil is 9.9 mg, potassium 5.5 mg, calcium 34.8 mg-eq, magnesium 7.2, sodium 6.3; in the 20-40 cm horizon, calcium 36.3 mg-eq, magnesium 11.1. Saline chernozems are characterised by a significant amount of absorbed sodium, especially in the illuvial horizon. A smaller amount of absorbed sodium is found in slightly saline soils [6].

Saline chernozems are characterised by unfavourable water-physical properties for plants (low filtration capacity, compaction of the transition horizon, poor structure and a tendency to form clods in the arable layer), but can be used for all field, garden and fodder crops zoned for the steppe zone. They are not recommended for orchards and vineyards. The main place in the system of fertility improvement measures should be given to agricultural technology, especially deep ploughing, gypsumisation and organic fertilisation. Saline chernozems are suitable for irrigation, provided that secondary salinisation is controlled: construction of non-filtration channels and a regulated irrigation regime that prevents irrigation water from mixing with groundwater. Under irrigation conditions, small doses of gypsum are effective.

Meadow chernozem soils on loess rocks are common in shallow but wide depressions on plateaus, on the bottoms of beams, and river terraces, where groundwater is 3-4 m from the surface. The humus horizon (H) is 35-40 cm deep; it is dark grey in colour and has a granular structure. The humus profile (H+HP) is up to 100-120 cm deep and more. The meadow chernozem leached soil is distinguished by the boiling of HCl deeper than the transition (PH) horizon (Figure 3). Often, a slight compaction and glazing is observed in the transition horizon [2, 6].

Depending on the depth of the most saline (peptidized) horizon, meadow chernozem soils are divided into deeply saline and superficially saline soils. Deeply saline soils differ from surface saline soils in that the maximum saline horizon is located at depth. Its formation is associated with the accumulation of intensely peptidised colloids washed in from above from a higher horizon. The profile of meadow chernozem deeply saline soils is clearly differentiated into horizons of colloidal eluvium and illuvium. The extent of these horizons depends on the salinity.

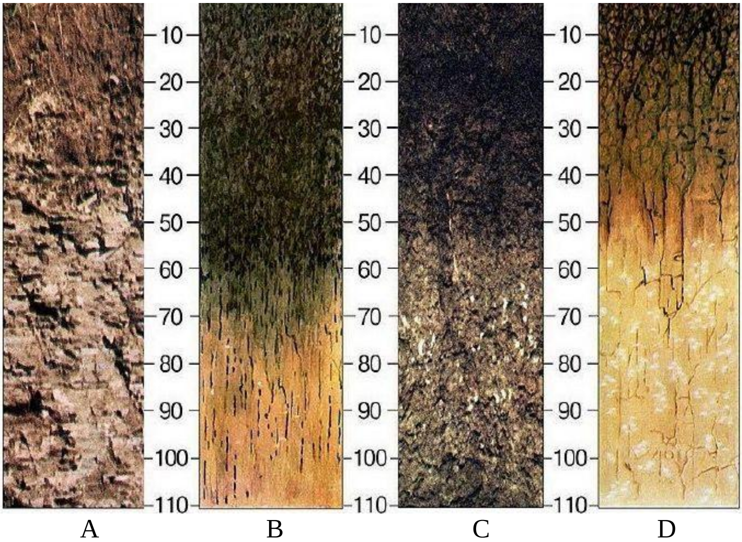


Figure 3. Profiles of chernozem and chestnut soils in Zaporizhzhya region[4]

Symbols: A – short profile chernozem on eluvium; B – meadow chernozem soil; C – dark chestnut soil; D – chestnut soil

Meadow chernozem soils are characterised by a high humus content: light loamy 2.4-2.7%, medium loamy 2.9-3.2%, heavy loamy and clayey 4.4-4.6%. They contain a large amount of nutrients: medium loamy soils contain 10.2-16 mg of phosphorus and 13-20 mg of potassium per 100 g of soil; heavy loamy soils contain 13.7-16.3 and 13.8-16.3, respectively; light clayey soils contain 12-17 and 13.7-15.5. The soils are characterised by a high saturation of the colloidal complex: absorbed calcium is 28-30 mg-eq per 100 g of soil, and magnesium is 5-10 mg-eq per 100 g of soil [2,6].

Meadow black chernozem saline soils have morphological signs of salinity, although there is little absorbed sodium in the illuvial horizon, and are characterised by the distribution of colloids along the profile. They are characterised by a neutral, slightly alkaline and alkaline reaction. Meadow chernozem non-saline soils have high potential fertility. Salinity causes a number of negative physical properties: easy flooding, increased crusting, high cohesion, density, and fissuring in the dry state, and viscosity, adhesion, and plasticity in the wet state. These soils offer increased resistance to tillage, have low air and water permeability, and short maturity. This is the main reason for the reduced productivity of saline soils.

Soils of this group are sufficiently supplied with nitrogen, moderately with phosphorus, and well with potassium. They can be used for almost all grain, vegetable, fodder and industrial crops, but they are not suitable for planting fruit trees. To increase the fertility of meadow chernozem soils, it is necessary to: radically improve agrophysical properties through gypsumisation, proper tillage, and control of crusting; apply organic, mineral, nitrogen, and phosphorus fertilisers; and use perennial grasses, especially in combination with gypsumisation and proper tillage [6].

The main factor behind the imbalance of soil conditions is anthropogenic. The development of human economic activity results in soil erosion, deflation, waterlogging, salinisation and pollution. Humans cause changes in soil composition and even its destruction [7, 8].

Sources

1. Гришко С. В., Зав'ялова Т. В., Прохорова Л. В. Основні риси ґрунтового покриву Запорізької області. *Актуальные научные исследования в современном мире* // Журнал. Переяслав, 2021. Вып. 5(73). Ч. 3 С. 100-106.
2. Гришко С. В., Непша О. В. Фізико-хімічні властивості ґрунтів Запорізької області. *Розвиток сучасної освіти і науки: результати, проблеми, перспективи. Том 6: Проєктування суспільних та гуманітарних досліджень: колективна монографія* / Наукова редакція: Я. Ґжесяк, І. Зимомря, В. Ільницький. Конін – Ужгород – Перемишль – Херсон: Посвіт, 2021. С. 241-255.
3. Карта ґрунтів Запорізької області. URL: https://geomap.land.kiev.ua/obl-7.html (дата звернення: 26.07.2023).
4. Петроченко В. І. Природа Запорізького краю: Довідник. Запоріжжя: «Тандем Арт Студія», 2009. 200 с.
5. Прохорова Л. А., Завялова Т. В. Проблеми осолонцювання ґрунтів Запорізької області.*Соціальніта екологічні технології: актуальні проблеми теорії і практики: матеріали XV інтернет-конференції (Київ, 24-26 січня 2023 року)* / за заг. ред. В. І. Лисенка, Н. М. Сурядної. Одеса : Олді+, 2023. С. 118-119.
6. Фізична географія Запорізької області: Хрестоматія / Л.М. Даценко, В.В. Молодиченко, В.П. Воровка та ін. Відп. ред. Л.М. Даценко. Мелітополь: Вид-во МДПУ ім. Б. Хмельницького, 2014. 200 с.
7. Hryshko Svitlana V., Zavyalova Tetyana V., Nepsha Oleksandr V. Geoecological condition and problems of using the soil cover of Zaporizhzhia region.*Modern scientific challenges and trends: a collection scientific works of the International scientific conference (20-21 January, 2023).* Warsaw: Sp. z o. o. «iScience», 2023. pp. 24-28.
8. Hryshko Svitlana V., Prokhorova Larysa A. The main factors of anthropogenic impact on land resources and soils of the Zaporizhzhia region and their protection. *Modern scientific challenges and trends: a collection scientific works of the International scientific conference (27-28 February, 2023).* Warsaw: Sp. z o. o. «iScience», 2023. pp. 17-20.

Наукове видання

Altai Abdullaiev, Hryshko Svitlana, Kotova Olena Volodymyrivna,
Kyriienko Oleksandr Levada Olga, Mohelnytska Ludmyla,
Nepsha Oleksandr Viktorovych, Prokhorova Larysa,
Protsenko Andrii Anatoliiovych, Rebar Inessa, Shadura Valentyna,
Sopotnytska Olena, Sukhanova Hanna Petrivna, Tsybulska Viktoriia Viktorivna,
Zavialova Tetiana, Александренко Олена Віталіївна,
Безсмертна Оксана Владиславівна, Винничук Роксолана Олександрівна,
Гнилянська Ольга Василівна, Завгородня Олена Василівна,
Карпінська Олена Борисівна, Карпінський Борис Андрійович,
Космін Леонід Георгійович, Курчатова Анжеліка Віталіївна,
Овсієнко Станіслав Леонідович, Овсяннікова Наталія Юріївна,
Прокопченко Сергій Вікторович, Хоменко Павло Петрович,
Шапочка Катерина Анатоліївна, Шевченко Олена Леонідівна,
Шершова Тетяна Вікторівна.

Нові реалії сучасної України та світу

Колективна монографія

Видання українською та англійською мовами

Видавець СГ НТМ «Новий курс»
Вул. Манізера, 3, м. Харків, 61002, Україна
Тел.: 097-044-03-09, e-mail: nr1989@ukr.net

Свідоцтво про внесення суб'єкта видавничої справи до Державного реєстру видавців, виготовлювачів і розповсюджувачів видавничої продукції: серія ДК № 6392 від 07.09.2018.

Свідоцтво про державну реєстрацію інформаційного агентства як суб'єкта інформаційної діяльності КВ №894-716Р від 16.08.2022.