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ВЕСТНИК

РОО «НАЦИОНАЛЬНОЙ
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В 2016 году для развития и улучшения качества жизни казахстанцев был создан частный Благотворительный фонд «Халык». За годы своей деятельности на реализацию благотворительных проектов в областях образования и науки, социальной защиты, культуры, здравоохранения и спорта, Фонд выделил более 45 миллиардов тенге.

Особое внимание Благотворительный фонд «Халык» уделяет образовательным программам, считая это направление одним из ключевых в своей деятельности. Оказывая поддержку отечественному образованию, Фонд вносит свой посильный вклад в развитие качественного образования в Казахстане. Тем самым способствуя росту числа людей, способных менять жизнь в стране к лучшему – профессионалов в различных сферах, потенциальных лидеров и «великих умов». Одной из значимых инициатив фонда «Халык» в образовательной сфере стал проект *Ozgeris powered by Halyk Fund* – первый в стране бизнес-инкубатор для учащихся 9-11 классов, который помогает развивать необходимые в современном мире предпринимательские навыки. Так, на содействие малому бизнесу школьников было выделено более 200 грантов. Для поддержки талантливых и мотивированных детей Фонд неоднократно выделял гранты на обучение в Международной школе «Мирас» и в *Astana IT University*, а также помог казахстанским школьникам принять участие в престижном конкурсе «*USTEM Robotics*» в США. Авторские работы в рамках проекта «Тәлімгер», которому Фонд оказал поддержку, легли в основу учебной программы, учебников и учебно-методических книг по предмету «Основы предпринимательства и бизнеса», преподаваемого в 10-11 классах казахстанских школ и колледжей.

Помимо помощи школьникам, учащимся колледжей и студентам Фонд считает важным внести свой вклад в повышение квалификации педагогов, совершенствование их знаний и навыков, поскольку именно они являются проводниками знаний будущих поколений казахстанцев. При поддержке Фонда «Халык» в южной столице был организован ежегодный городской конкурс педагогов «*Almaty Digital Ustaz*».

Важной инициативой стал реализуемый проект по обучению основам финансовой грамотности преподавателей из восьми областей Казахстана, что должно оказать существенное влияние на воспитание финансовой

грамотности и предпринимательского мышления у нового поколения граждан страны.

Необходимую помощь Фонд «Халык» оказывает и тем, кто особенно остро в ней нуждается. В рамках социальной защиты населения активно проводится работа по поддержке детей, оставшихся без родителей, детей и взрослых из социально уязвимых слоев населения, людей с ограниченными возможностями, а также обеспечению нуждающихся социальным жильем, строительству социально важных объектов, таких как детские сады, детские площадки и физкультурно-оздоровительные комплексы.

В копилку добрых дел Фонда «Халык» можно добавить оказание помощи детскому спорту, куда относится поддержка в развитии детского футбола и карате в нашей стране. Жизненно важную помощь Благотворительный фонд «Халык» оказал нашим соотечественникам во время недавней пандемии COVID-19. Тогда, в разгар тяжелой борьбы с коронавирусной инфекцией Фонд выделил свыше 11 миллиардов тенге на приобретение необходимого медицинского оборудования и дорогостоящих медицинских препаратов, автомобилей скорой медицинской помощи и средств защиты, адресную материальную помощь социально уязвимым слоям населения и денежные выплаты медицинским работникам.

В 2023 году наряду с другими проектами, нацеленными на повышение благосостояния казахстанских граждан Фонд решил уделить особое внимание науке, поскольку она является частью общественной культуры, а уровень ее развития определяет уровень развития государства.

Поддержка Фондом выпуска журналов Национальной Академии наук Республики Казахстан, которые входят в международные фонды Scopus и WoS и в которых публикуются статьи отечественных ученых, докторантов и магистрантов, а также научных сотрудников высших учебных заведений и научно-исследовательских институтов нашей страны является не менее значимым вкладом Фонда в развитие казахстанского общества.

С уважением, Благотворительный Фонд «Халык»!

БАС РЕДАКТОР:

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РЕДАКЦИЯ АЛҚАСЫ:

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© **B.S. Korabayev**^{1*}, **George Abuselidze**², **B. Kadyrov**³, **B. Yespenbetova**⁴, 2023

¹L.N. Gumilyov Eurasian National University. Astana, Kazakhstan;

² Batumi Shota Rustaveli State University. Batumi, Georgia;

³Alikhan Bokeihan University.

E-mail: bei2010@mail.ru

PROBLEMS OF ACCOUNTING AND ANALYSIS MODELS OF THE EFFECTIVENESS OF ENVIRONMENTAL AND ECOLOGICAL COST SYSTEMS

Korabayev Beibit — PhD student of the specialty «Accounting and audit», L.N. Gumilyov Eurasian National University, K. Satpaev St., 2A, Astana city, Kazakhstan

E-mail: bei2010@mail.ru. ORCID: 0000-0003-0420-9517;

Abuselidze George — Head of the Department of Finance, Banking and Insurance -PhD, Batumi Shota Rustaveli State University, 32/35 Rustaveli/Ninoshvili st. Batumi, 6010, Georgia

E-mail: george.abuselidze@bsu.edu.ge. ORCID: 0000-0002-5834-1233;

Kadyrov B. — PhD, Senior lecturer of the Department of Business and Management, scholarship program "Bolashak", Alikhan Bokeikhan University

E-mail: bekadoc@mail.ru, bekakadyr_phd@mail.ru. <https://orcid.org/0000-0001-6629-8581>;

Yespenbetova Bayan Arapovna — Associate Professor of the Department "Economics and Finance" NJSC "Shakarim University of Semey", Glinki 20a, Semey city, Abai region, Republic of Kazakhstan, 071400

E-mail: baespenbetova@mail.ru. <https://orcid.org/0000-0002-3291-1568>.

Abstract. Currently, features of ecological and economic systems models for accounting and analysis in industry are being deeply studied. In this regard, results of a study of industrial enterprise's environmental and economic efficiency are presented in the given research. Industry has been found to have a significant environmental impact on the environment. Analysis of scientific publications devoted to assessment of environmental and economic efficiency of enterprise; despite the importance of need to improve assessment, it was found that generally accepted and universally recognized indicators were not presented; many developments are difficult for economic practice and can only be used in scientific research. Environmental and economic efficiency indicator is based on the so-called balanced approach, in the context of study - an adequate, objective assessment of economic efficiency, taking

into account the environmental factor. The main goal of the article is to create ecological and economic means of allocating production resources in research and production to improve the state of the natural environment and the quality of life of society while ensuring the growth of the national economy, and analyzing the actual indicators of environmental costs. At the same time, the effectiveness of environmental and economic indicators in industrial enterprises is considered, the damage caused is assessed, the modern problems of accounting are determined, and the ways to solve them are proposed. Currently, new models have been proposed in the industry for environmental reporting - accounting for environmental costs and capital investments.

Keywords: industrial enterprises, environmental and economic indicators, environmental costs, accounting for environmental costs and resources, ecological and economic model, environmental and economic efficiency, damage, pollution fee, environmental tax, environmental accounting

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Б.А. Еспенбетова⁴, 2023

¹ Л.Н. Гумилев атындағы Евразия ұлттық университеті. Астана, Қазақстан;

² Шота Руставели атындағы Батуми мемлекеттік университеті. Батуми, Грузия;

³ Alikhan Vokeihan University;

⁴ Семей қаласының Шәкәрім атындағы университеті.

E-mail: bei2012@mail.ru

ТАБИҒАТТЫ ҚОРҒАУ ЖӘНЕ ЭКОЛОГИЯЛЫҚ ШЫҒЫНДАР ЖҮЙЕЛЕРІНІҢ ЕСЕБІ МЕН ТИІМДІЛІГІН ТАЛДАУ МОДЕЛДЕРІНІҢ МӘСЕЛЕЛЕРІ

Корабаев Бейбит Сыбанбаевич — «Есеп және аудит» мамандығының PhD докторанты, Л.Н. Гумилев атындағы Евразия ұлттық университеті, Қ.Сатпаев көшесі. 2А, Астана қ., Қазақстан
E-mail: bei2010@mail.ru ORCID: 0000-0003-0420-9517;

Абуселидзе Гиорги — «Қаржы, банк ісі және сақтандыру» кафедрасының меңгерушісі – PhD, Шота Руставели атындағы Батуми мемлекеттік университеті, Руставели/Ниношвили көш. 32/35. Батуми, 6010, Грузия

E-mail: george.abuselidze@bsu.edu.ge ORCID: 0000-0002-5834-1233;

Кадыров Берик Кайыпканович — PhD, «Бизнес және басқару» кафедрасының аға оқытушысы, «Болашақ» бағдарламасы стипендияты, Alikhan Vokeihan University

E-mail: bekadoc@mail.ru, bekakadyr_phd@mail.ru, <https://orcid.org/0000-0001-6629-8581>;

Еспенбетова Баян Арапқызы — «Семей қаласының Шәкәрім атындағы университеті» КЕАҚ «Экономика және қаржы» кафедрасының қауымдастырылған профессоры. Мекенжайы: 071400, Қазақстан Республикасы, Абай облысы, Семей қаласы, Глинки 20а

E-mail: baespenbetova@mail.ru, <https://orcid.org/0000-0002-3291-1568>.

Аннотация. Қазіргі уақытта өнеркәсіптегі есеп пен талдаудың экологиялық-экономикалық жүйелерінің үлгілерінің ерекшеліктері терең зерттелуде. Осыған байланысты берілген зерттеуде өнеркәсіптік кәсіпорынның экологиялық және экономикалық тиімділігін зерттеу нәтижелері берілген. Өнеркәсіптің қоршаған

ортаға айтарлықтай экологиялық әсері бар екені анықталды. Кәсіпорынның экологиялық және экономикалық тиімділігін бағалауға арналған ғылыми жарияланымдарды талдау; бағалауды жетілдіру қажеттілігінің маңыздылығына қарамастан, жалпы қабылданған және жалпыға бірдей танылған көрсеткіштер ұсынылмағаны анықталды; көптеген әзірлемелер экономикалық тәжірибе үшін қиын және тек ғылыми зерттеулерде қолданылуы мүмкін. Экологиялық және экономикалық тиімділік көрсеткіші теңгерімді тәсіл деп аталатынға негізделеді, зерттеу контекстінде – экологиялық факторды ескере отырып, экономикалық тиімділікті барабар, объективті бағалау. Мақаланың негізгі мақсаты – ұлттық экономиканың өсуін қамтамасыз ете отырып, табиғи ортаның жай-күйі мен қоғамның өмір сүру сапасын жақсарту үшін ғылыми-зерттеу және өндірісте өндірістік ресурстарды бөлудің экологиялық-экономикалық құралдарын құру және нақты көрсеткіштерді талдау. Экологиялық шығындар. Бұл ретте өнеркәсіп кәсіпорындарындағы экологиялық-экономикалық көрсеткіштердің тиімділігі қарастырылып, келтірілген залалға баға беріліп, бухгалтерлік есептің заманауи мәселелері айқындалып, оларды шешу жолдары ұсынылды. Экологиялық шығындар мен күрделі салымдарды есепке алу – қазіргі уақытта өнеркәсіптік салада экологиялық есеп берудің жаңа үлгілері ұсынылды.

Түйін сөздер: өнеркәсіптік кәсіпорындар, экологиялық-экономикалық көрсеткіштер, табиғатты қорғау шығындары, экологиялық шығындар мен ресурстарды есепке алу, экологиялық-экономикалық үлгі, экологиялық және экономикалық тиімділік, зиян, ластау үшін төлем, экологиялық салық, экологиялық есеп

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Б.А. Еспенбетова⁴, 2023

¹ Евразийский национальный университет им. Л.Н.Гумилева,
Астана, Казахстан;

² Батумский Государственный университет имени Шота Руставели,
Батуми, Грузия;

³ Alikhan Vokeihan University, Семей, Казахстан;

⁴ Университет имени Шакарима города Семей, Семей, Казахстан.
E-mail: *bei2012@mail.ru*

ПРОБЛЕМЫ МОДЕЛЕЙ УЧЕТА И АНАЛИЗА ЭФФЕКТИВНОСТИ СИСТЕМ ПРИРОДООХРАННЫХ И ЭКОЛОГИЧЕСКИХ ЗАТРАТ

Корабаев Бейбит Сыбанбаевич — доктрант специальности «Учет и аудит», Евразийский национальный университет им. Л.Н. Гумилева, ул. К. Сатпаева, 2А, Астана, Казахстан
E-mail: *bei2010@mail.ru*. ORCID: 0000-0003-0420-9517;

Абуселидзе Гиорги — PhD, зав. кафедрой «Финансы, банковское дело и страхования», Батумский Государственный университет имени Шота Руставели, ул. Руставели/Ниношвили, 32/35. Батуми, 6010, Грузия

E-mail: *george.abuselidze@bsu.edu.ge* ORCID: 0000-0002-5834-1233;

Кадыров Берик Кайыпканович — PhD, старший преподаватель кафедры «Бизнес и управление», Alikhan Bokeihan University, Семей, Казахстан

E-mail: bekadoc@mail.ru, bekakadyr_phd@mail.ru, <https://orcid.org/0000-0001-6629-8581>;

Еспенбетова Баян Араповна — к.э.н, ассоциированный профессор кафедры «Экономика и финансы» НАО «Университет имени Шакарима города Семей». 071400, ул. Глинки 20а Семей, Казахстан

E-mail: baespenbetova@mail.ru, <https://orcid.org/0000-0002-3291-1568>.

Аннотация. В настоящее время глубоко изучаются особенности моделей эколого-экономических систем для учета и анализа в промышленности. В связи с этим в данной статье представлены результаты исследования эколого-экономической эффективности промышленного предприятия. Было установлено, что промышленность оказывает значительное воздействие на окружающую среду. Анализ научных публикаций, посвященных оценке эколого-экономической эффективности предприятия, показал, что несмотря на важность необходимости улучшения оценки, общепринятые и общепризнанные показатели не представлены; многие разработки сложны для хозяйственной практики и могут быть использованы только в научных исследованиях. Показатель эколого-экономической эффективности основан на так называемом сбалансированном подходе, в контексте исследования - адекватной, объективной оценке экономической эффективности с учетом экологического фактора. Основная цель статьи - создание эколого-экономических средств размещения производственных ресурсов в научных исследованиях и производстве для улучшения состояния природной среды и качества жизни общества при обеспечении роста национальной экономики, а также анализ фактических показателей и экологических затрат. Так же авторами рассмотрена эффективность эколого-экономических показателей на промышленных предприятиях, оценен причиненный ущерб, определены современные проблемы бухгалтерского учета и предложены пути их решения. В настоящее время в отрасли предложены новые модели экологической отчетности – учет экологических затрат и капитальных вложений.

Keywords: промышленные предприятия, эколого-экономические показатели, природно-охранные затраты, учет экологических затрат и ресурсов, эколого-экономическая модель, эколого-экономическая эффективность, ущерб, плата за загрязнение, экологический налог, экологический учет

Introduction

In the study of economic systems, relation between social and economic aspects was first studied within the framework of classical political economy of Quesnay-Smith-Ricardo. However, at the end of the 19th century, principle of green economy was put forward as a science after the Walras revolution and emergence of neoclassical political economy. Main attention was paid to issues of the market, price evolution, capital flow, etc. Until now, main efforts of researchers were concentrated around these issues, which served as the basis for creation of mathematical models. New

mathematical methods, diverse and effective toolkit that allows to solve many important problems have been developed as well.

On this basis, mathematical models are reviewed in various ways, calculating the environmental and economic efficiency indicator in the balance sheet, and measures are applied to assess economic efficiency in determining the environmental factor. The reviewed indicators were calculated and determined problems of use at industrial enterprises, namely: difficulties in assessing damage caused by pollution during production and paying fees to the state budget; amount of difficulties in accounting for full data on environmental costs; difficulties in drawing up environmental management reports in special accounting and reporting. In view of these features, there is a need to form prerequisites for maintaining a target model of environmental and economic indicators of industrial production.

Materials and methods

Formation of scientific and practical research of modern domestic and foreign practitioners on the issues of introducing methods, technologies and means of ensuring environmental and economic activities of enterprises, assessment of production aspects of industrial enterprise's economic relations, including those proposed for discussion at All-Kazakhstan and international conferences. Methodological basis is represented by a set of methodological approaches of general scientific content, and an extensive list of general and individual scientific methods and techniques for a comprehensive study of practical developments was applied, including: method of systematic and retrospective approaches, modeling, complexity, performance generalization, comparison of indicators, etc. In addition to the above, the study used special methods of quantitative and qualitative nature in relation to managerial analysis: coefficient, factor analysis method, comparison of absolute and relative values, etc.

Main provisions

Possible problems with the use of proposed indicator were identified: fairness and validity of assessment of the damage caused by pollution and its payment; difficulties in accounting for environmental resources and costs; difficulties in drawing up special environmental reports. The need to form a special model of environmental and economic indicators of an industrial enterprise is substantiated.

Literature review

Scientific and practical approaches to accounting, analysis and classification of the system of economic and environmental costs were developed by foreign scientists: V.I. Vernadsky, A. Bell, B. Martin, V.K. Gupta, K.S. Sayenko, Z.S. Tuyakova, A.A. Chertkova, O.V. Kovalenko, A.D. Dumnova, among the Kazakhstan authors: K.T. Taygashinova, G.Zh. Zhumabekova, A.U. Abdrakhmanova, F.K. Yerdavletova are studying the given subject.

Content issues, analysis of sectoral aspect of the environmental and economic system are reflected in works of the following foreign scientists: J.Forrester, D. Meadows, N.N. Moiseyev, D. Poff, A. Michalos, J. Sachs, G. Lafortune, G. Schmidt-Traub, C. Kroll, G. Fuller, F. Woelm, L.G. Elkinoy, I.S. Belik, among the Kazakhstan scientists: A.A. Nurgaliyeva, Z.O. Imanbayeva, N.S. Nurkasheva.

However, it has been revealed that practical solution of optimization problems, which are effective in a short period of time on a microeconomic scale, leads to significant losses from a macroeconomic point of view due to intensification of man-made impacts on the environment. From the middle of the 20th century, scale of this impact began to approach the planetary one.

In the seventies of the twentieth century, it became clear that such approaches could not provide a quantitative analysis of prospects for economic development and assessment of alternative options for targeted international actions, as well as solution to complex problems of interaction between humanity and the environment. J. Forrester set the foundation for new approaches; in his fundamental work, *World Dynamics*, processes of economic development, demography and environmental pollution were linked to a single mathematical model for the first time in order to describe the global environmental process. A new aspect was developed in works of D. Meadows, N.N. Moiseyev and other researchers. Important result of this activity was an understanding of existence of global problems with a crisis nature, in which the economy is inseparable from the environment. In the context of the world economy's globalization, ensuring vital activity of the world community on a planetary scale becomes the main task of a global nature. It is this circumstance that determines a new conceptual approach - transition from the economic system concept to concept of an ecological and economic system. Certainly, new specific tasks and patterns arise against the background of such approach.

In the centuries-old process of human evolution, load on the biosphere has increased steadily as a result of its production activities. Even with the advent of civilization, increase in scale of human activity led to irreversible changes in the environment. For example, in China, vast areas of rice fields have completely changed natural landscapes, displaced the previously existing fauna and flora, and led to new climatic conditions in large areas. In the early 30s, the famous Russian scientist academician V.I. Vernadsky introduced a special term, *noosphere*, denoting the habitat of a human community, modified to meet the needs of the 20th century and significantly different from natural conditions. In fact, all large-scale changes in the natural environment associated with industrial activity of mankind can be attributed to *noosphere*: megacities, agriculture, extraction of natural resources, man-made effects on the biosphere during development of new territories.

Resource ecosystem supports functioning of the biosphere and civilization on our planet. All its resources can be divided conditionally into renewable and non-renewable ones. Difference between them is in the duration of their recovery periods; if a recovery period for the first group of resources is relatively small (decades), then it is more than 1000 years for the second group of resources.

Scale of human activity has already acquired a planetary nature, which requires a creation of new class of development models to make recommendations for coordinating economic activities of states in order to preserve the living conditions on our planet, and successful development of the world economy, accordingly. It is necessary to review main aspects of the problem here.

Energy aspect. Together with the growth of labor productivity, improvement of technologies and advanced training, technological regime of previous years was characterized by an ever-increasing energy intensity of production. This was proved

in past centuries due to transition from a low-performance system of production to a high-performance one. Main contribution to increasing labor productivity was made by energy sector, which developed at the same pace. This is particularly evident in development of agriculture; In the middle of the twentieth century, the average grain yield in developed countries has tripled as a result of almost double increase in energy costs for production of a ton of grain. However, new types of services and technologies have appeared recently that require much less energy: microelectronics, biotechnology, robotics. First of all, there is an improvement of modern technologies in reducing energy costs. This trend is manifested primarily in transition of energy-intensive industries from economically developed countries to developing ones, in other words, in transformation of energy intensity into one of the most important characteristics of production. In addition, labor is much cheaper, almost everything is cheaper in developing countries: rent, land, electricity. Therefore, production will be moved there in order not to waste energy resources as well.

1. Problem of closed technologies. Production activity of people can be considered as a global technological process of providing civilization with everything necessary. In recent centuries, this technology has been fundamentally open: it cannot exist without the use of non-renewable reserves of the earth. There is not only a depletion of fossil natural resources, but also a shortage of renewable resources, such as fresh water. Therefore, significant efforts are being made in all developed economies to create and use closed technologies that use renewable resources, including energy.

2. Pollution aspect. Not only energy-intensive technologies but also industries with high levels of pollution to the biosphere are being displaced from developed economies to developing countries. These include, for example, extraction of non-renewable natural resources, ferrous metallurgy, some types of chemical production. This is the reason for the huge growth in exports of raw materials and metals from developing countries. In addition, there is a tendency to displace and waste the high-tech industries of developed countries into developing countries - for example, export of radioactive waste. However, this process seems dangerous primarily because it widens the gap between developed countries and developing countries not only in terms of technology, but also in terms of living standard of the population and due to increasing global threat of biosphere destruction.

3. Organizational aspect. Development of technologies and scientific and technological progress require continuous improvement of organizational structures of production activities, including at the international level. These problems affect interaction of people and biosphere at the global level. Social and environmental factors and long-term consequences of decisions have to be taken into account. Models that allow to describe these processes have not been developed in practice yet.

Nature capacity

Important efficiency indicator of functioning of a natural product system is the capacity of nature. It characterizes the type and level of environmental and economic development. At the macro level, indicator of nature capacity is defined as the cost of natural resources (P) spent per unit of GDP:

$$E_N = P / \text{GDP} \quad (1)$$

The second type of the nature capacity indicators is determined by cost of a natural resource R_N per unit of final product in volume V produced on the basis of this resource (at the product or industry level):

$$e = R_N/V. \quad (2)$$

Energy intensity (energy costs per unit of final product) can serve as such indicator. There is an important macroeconomic indicator of energy intensity - number of petajoules spent on the products manufacture per 1 billion dollars of GDP (1 petajoule - 1015 joules). According to this indicator, Kazakhstan has a technological gap currently: Brazil, South Korea, England, Germany, the United States and Japan are ahead by 3.2, 4.1, 6, 6.8, 4 and 11 times, respectively.

In statistics, inverse of the nature capacity rate – indicator of the return of natural resource is widely used.

$$\sigma = V/R_N. \quad (3)$$

Extensive type of economic development is characterized by high environmental intensity (low return of natural resources). If technological level is kept for a long time, this leads to a gradual depletion of resources, which further aggravates the economic situation. Intensive type of economic development is characterized by a decrease in return of natural resources (increase in productivity of natural resources). In the context of reforming structural and investment policy, the most important task of the state is to minimize nature capacity or increase the return of natural resources:

$$e \rightarrow \min \text{ or } \sigma \rightarrow \max. \quad (4)$$

Extensive type of economic development is one of the main factors of civilization evolution, sustainable economic development in the environment. Issue of sustainable development was first raised at the international level in 1987 in a report by the UN World Commission on Environment and Development. «Sustainable development» term refers to the following patterns of civilization evolution: threatening the ability to meet the needs of future generations without meeting the needs of present ones; taking into account social and environmental factors; taking into account the long-term consequences of decisions.

«Sustainable development» concept occurred in the middle of the twentieth century, which defines development that meets the needs of the present, but does not threaten development and satisfaction of the future needs. Sustainable development, first of all, means that the human economic activity should not violate natural basis of his/her existence. Models and principles of «sustainable development» set the foundation for the so-called green economy (environmental-saving technologies, waste-free production, reduction and elimination of emissions into the environment, compensation for existing pollution), which is based on achieving and maintaining a balance between the economic activity and its efficiency (profitability, economic

growth). It is very difficult to achieve necessary balance, since any measures to protect the environment include costs (current and capital, insurance) and always «compete» with any indicators of economic results, often this «argument» does not end in favor of environmentally balanced and economically justified decisions.

Therefore, implementation of any economic activity in modern conditions, unfortunately, has a negative impact on the environment. Industrial waste and emissions are necessary no matter how developed the production technology is (it is necessary to keep in mind both current activities and possible emergencies). Of the sectors of national economy, industrial enterprises, especially enterprises of metallurgical, petrochemical, mechanical engineering, chemical industry, cause the most damage to nature.

Investments in environmentally friendly technologies (cleantech) are welcome in the world practice, particularly if they are aimed at alternative energy and energy efficiency. Their value is growing every year, but investments are expanding to new positions in relation to the green business. An industrial enterprise that intends to enter the foreign market has a chance to engage in environmental management, take into account environmental risks and balance them in the course of its work (Nurgaliyeva, 2021).

Environmentally oriented business is considered as a type of sustainable business development, which has its own specifics. Main feature of an environmentally oriented business is a transition from negative consumer value (consumer depreciation) to consumer value (cost of consumption). Ecopreneur (environmental entrepreneur) creates a high consumer value for environmentally interested consumers (for example: minus pesticides, plus naturalness) (Journal of Internet Banking and Commerce, 2016).

To objectively assess the level and dynamics of environmental regulation, it is important to determine criteria and tools for its assessment. Simply measuring damage to the environment with the hope that it will be reduced on its own – a road to nowhere; in modern conditions, it is impossible to force enterprises to invest in environmental protection measures that harm economic efficiency indicators, any «punitive measures» called «negative motivation» traditionally give very weak results (Akimova, 2023).

Taking into account the environmental factor, it is important to develop such indicator of the industrial enterprise performance that allows an objective assessment of real economic efficiency and encourages industrial enterprises to use clean technologies.

From an economic point of view, this means that conditions for a civilized relations between the present and the future are observed in sustainable development:

- no additional costs are incurred for subsequent generations;
- negative external impacts between generations are minimized;
- if simple and/or extended reproduction of production potential is provided in the future;
- life of the human being is provided by a percentage of natural capital.

It is worth to note that reducing the nature intensity is a necessary condition for

transition to sustainable development for individual countries and the world economy as a whole. Moving along the trajectory of sustainable development means, first of all, reducing consumption of natural resources through the use of new industries and improving existing production technologies (Sadvakasova, 2022).

Goals of sustainable development are the quality of life, level of economic development, and environmental sustainability.

Of course, questions on measures to ensure sustainable development arise here as well. Concept of critical natural capital occurred as natural goods necessary for life, which cannot be replaced artificially. These include: landscapes, rare species of flora and fauna, ozone layer in the upper part of the earth's atmosphere, global climate, etc. This important natural capital must be preserved in any economic development scenario. The rest of natural capital can be replaced artificially - first of all, we mean renewable and some non-renewable natural resources (for example, natural energy resources can be replaced with solar energy, one percent of which would be enough to satisfy the current humanity needs) (Krass, 2010).

Taking into account the natural capital N^* , sustainable development can be supplemented by limiting depletion of this value over time. For a non-decreasing production function, arguments for which labor L , capital K and natural resource N are aggregate variables

$$F_t(K, L, N) \leq F_{t+1}(K, L, N) \quad (5)$$

It is necessary to observe condition that the value N^* does not decrease over time.

Also, the condition of partial replacement of natural capital N with artificial N_s (with renewable resource or non-renewable resource)

$$N = N^* + N^s \quad (7)$$

Study of main pollution types creates a need.

We can say that production waste is environmental pollution with an open production cycle. The 20th century was also characterized by nuclear waste with a long life cycle. Components alien to the nature, anthropogen products are actively included in natural cycle, which leads to significant, sometimes irreversible changes in the biosphere. Number of such pollution types is very large, the main ones are noted below (Lyapina, 1997).

First of all, it is air pollution. These include chlorofluorocarbons, carbon dioxide emissions, sulfur and nitrate compounds. Rising to upper layers of the earth's atmosphere, they cause processes that affect natural circulation of the biosphere negatively. The most dangerous should be recognized as a destruction of ozone layer in the stratosphere, which is a natural shield against the destructive strong solar radiation in R-spectrum.

Secondly, development and use of natural resources turns consumed resources into spent (depleted) ones, which are the production waste as well. The largest mass of

them is waste from ferrous and non-ferrous metallurgy and ash from thermal power plants (35.6 and 27.8% of total waste in Kazakhstan, respectively). A large amount of pollution occur during development and use of hydrocarbons.

Agricultural waste is mainly biological pollution and pollution from the use of chemicals.

The third is relatively small in volume, but especially dangerous in terms of impact on the environment, waste associated with the use of chemical technologies: emissions of heavy metals, impurities, solutions, radiation.

The pollution mentioned in the second and third paragraphs affects the soil layer and water sources (including ground water), causing a large amount of harmful effects on the environment (Larionov, 2018.).

Taking into account the sustainable development, goal of an enterprise management is to increase efficiency of activities, results-to-costs (resources) ratio. Currently, efficiency criteria are often used not only to increase efficiency and profitability, but also to achieve the set goals. Any enterprise pursues economic, social, technical, environmental and even political goals. Therefore, to assess effectiveness, it is necessary to determine the criteria of economic, social, technical and environmental indicators. Optimal managerial decision presupposes the choice of main one from all goals since the rest fall under the restrictions. In Germany and other countries of the European Union, environmental criteria often take precedence over economic criteria in recent years. The 1998 situation was cited as the best case when issue of producing unleaded gasoline arose. Its production led to an increase in the cost of fuel and lubricants and cars. However, additional cleaning costs and environmental requirements have won, and only lead-free gasoline is used in Germany nowadays (Ryumina, 1980.).

For our country, assessment and management of environmental and economic efficiency of industrial enterprises is of great importance. For example, emissions from industrial enterprises are the main source of air pollution. According to the state report on environment, they account for 46% of all pollution, or 1123.9 thousand tons of harmful emissions. Main source of air pollution in Kazakhstan (which is 46% of all types of pollution) is not vehicles, as in many countries, but industrial enterprises, as indicated in the report of the Ministry of Natural Resources. The most atmosphere polluting sectors are oil production, coal and other energy carriers (a quarter of total emissions), metallurgy (23 %).

We analyzed statistical data on environmental protection, the brief conclusions of which (information on dynamics of waste formation, use and placement in 2017-2022) are provided in diagrams 1 and 2.

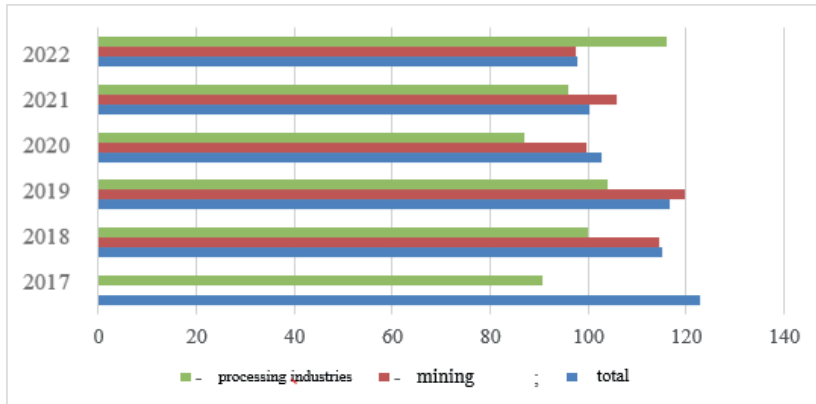


Diagram 1 - Formation of production and consumption waste for some types of economic activity, in % for the previous year

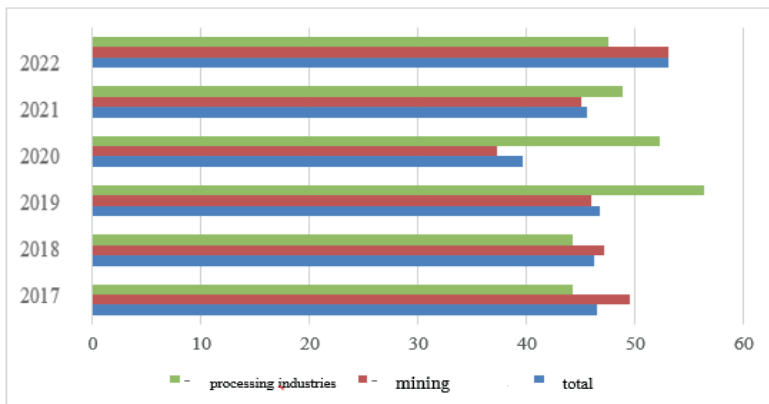


Diagram 2 - Use and decontamination of production and consumption waste for certain types of economic activity, in % for the previous year

That statistical information is presented in the report as a value at current prices, that is, incomparable value, therefore, we «turned» the statistical material into «comparison with the previous year» indicator which is formed only for certain types of economic activity.

Let's review the information provided in diagrams 1 and 2. Compared to the last year, formation and consumption of production and consumption waste decreased only in 2022, waste in the remaining periods increased regardless of the number of industrial enterprises actively operating during this period. Use and decontamination of waste changes during the entire period of proposed control, that is, half of the production and consumption waste is not used and decontaminated, but pollutes the environment.

Leakage of contaminated wastewater during the analyzed period remains actually unchanged (Diagram 3).

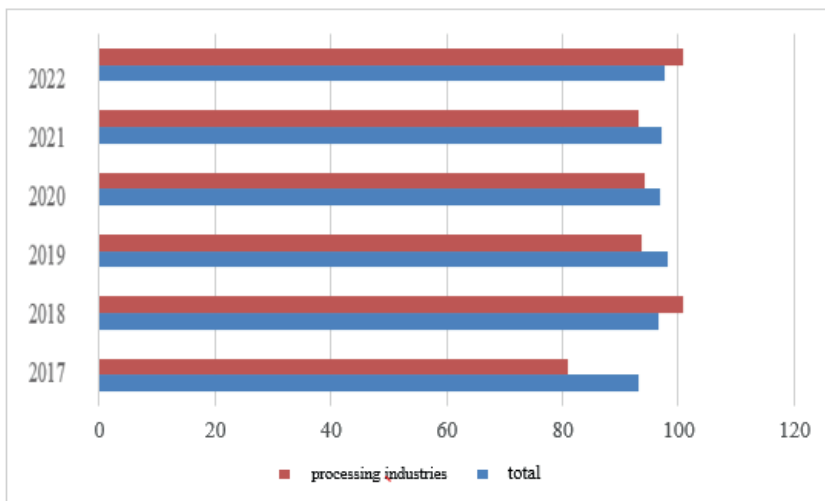


Diagram 3 - Discharge of polluted wastewater into surface water bodies for certain types of economic activities, for the last year %

In 2022, the greatest load on surface water bodies accounts for the manufacturing industry (17.6% of the cost of all wastewater), production and distribution of electricity, gas and water (55% of all wastewater), other municipal social and household support and private services (11.9%).

Dynamics of the wastewater discharge indicator is in a trend of 100%, but steadily decreases slightly due to changes in production volumes or lag of the production capacity of treatment facilities behind the main production capacity.

Basic indicators, characterizing substances and investments in main capital for the next few years are included in Diagram 4.

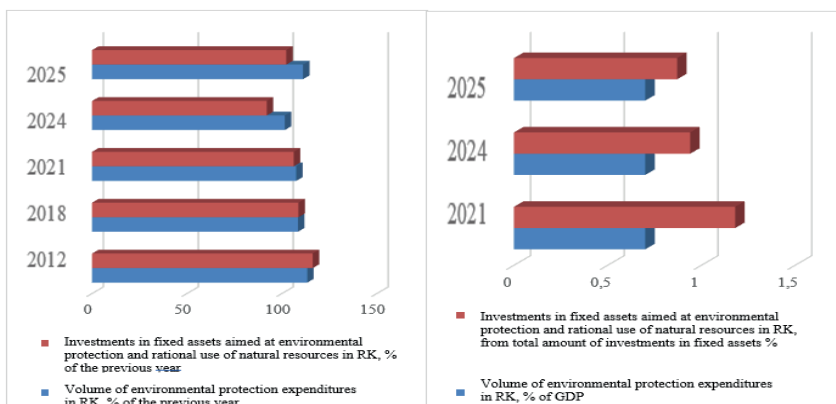


Diagram 4 - Certain indicators that describe the costs and investments in fixed assets for environmental protection

At the same time, information is presented in a targeted manner by individual years for the period from 2012 to 2025. Volume of spending on environmental protection will not decrease, but will grow (at current prices), as GDP percentage (a comparable and important indicator for international comparison), it has remained at the level of 0.7% since 2015, which is 3 times lower than in 2-developed countries.

The situation is better for individual industrial enterprises. In 2024, RAEX rating agency published the rating «Leaders of Kazakhstan's business in terms of environmental protection costs». On average, top 20 participants spend about 1.9% of their annual income on environmental protection. This is twice the average rating (1.9%) and almost three times more than in the European Union, where companies allocate about 1.5% to the environment. However, the information provided does not cover all industrial enterprises. According to researchers from the Center for Environmental Industrial Policy, today environmental legislation is structured in such way that it is more profitable for enterprises to pay for excess emissions than to introduce new environmentally friendly technologies.

The above data on level of pollution, recycling and utilization of waste, on the efforts (costs and capital investments) spent on environmental protection confirm that work on environmental regulation of economic activity is only at the beginning of the way. In the context of need to comply with principles and parameters of sustainable development, it is necessary to correctly and objectively assess the contribution of each industrial enterprise to environmental protection; level of effectiveness of its activities should be assessed only taking into account the environmental factor (contribution to environmental protection or compensation for damage caused), such indicator should be measurable and controlled statistically (formation of special reports). Taking into account the environmental factor (called as efficiency indicator), performance indicator of an industrial enterprise should be integral and make it possible to clearly distinguish, observe and manage the economic and environmental activities of enterprise through decomposition.

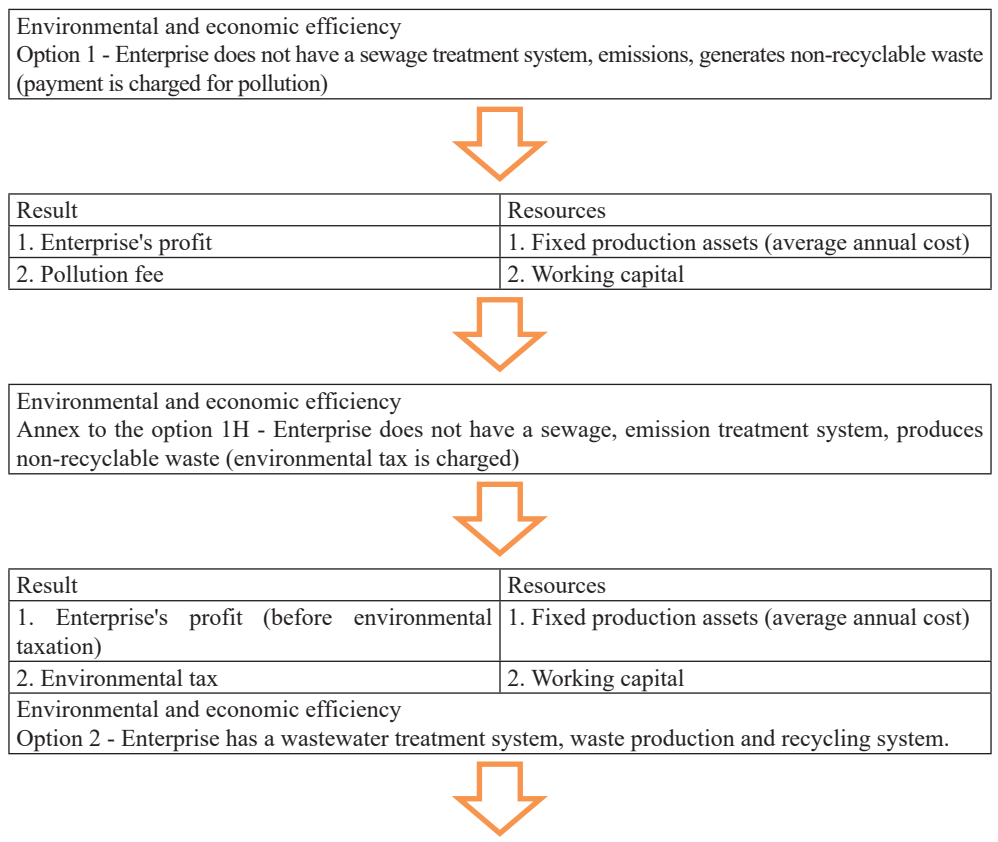
When assessing production potential of an industrial enterprise, it is recommended to use the market value indicator of enterprise, considering the environmental factor, which takes into account the industry average rate of damage caused by economic pollution. Basic production and environmental costs necessary to bring harmful emissions to the standard level are compensated through payment system and the book value.

When calculating competitiveness indicator, an integrated indicator is proposed based on three components (competitiveness index by product weight - diversification of products and production, index of enterprise's relative efficiency and index of relative risk); it is proposed to include environmental risk in the risk index (excluding natural, man-made, economic and other risks).

Results and discussion

We have developed and put into operation an indicator of environmental and economic efficiency of an industrial enterprise - efficiency. Formation of the indicator is based on a balanced approach to enterprise's activities – to achieve a balance between

the results of economic and environmental activities. All indicators of environmental and economic efficiency of activities are divided into current and project, continuous (performance indicators of current activities) and discrete (performance indicators of the project) indicators. Fundamental difference between current and project indicators is the time horizon for monitoring and evaluation; current - today and now (one - time) assessment, and project-assessment of the prospects for activities (a kind of folded indicator for a certain period of time, remember NPV). The presented indicator of environmental and economic efficiency can be used in assessing all types of environmental and economic efficiency. Initial designation when forming an indicator of environmental and economic efficiency: environmental and economic efficiency - ratio of the result to costs or resources (with formation of cost and resource indicators of environmental and economic efficiency). Typical cost indicator of economic efficiency can be, for example, profitability of products (result – profit, cost of production – cost of all types of resources: fixed and circulating assets, labor). Typical resource indicator of economic efficiency is a profitability of production (result – profit, resources fixed and working capital, efficiency, both cost and resource indicators of economic efficiency can be used, but, in our opinion, it is more convenient to use the resource. Scheme and structure of the indicator formation are given in Figure 1.



Result	Resources
1. Enterprise's profit	1. Fixed production assets (average annual cost)
2. Possible benefit from the cleaning system service	2. Working capital
–	3. Fixed production assets of cleaning system (average annual cost).
–	4. Working capital (for cleaning system operation)

Figure 1 - Formation of environmental and economic efficiency indicator

Note: Picture drawn by authors.

Figure 5 presents three options, or two if to be precise, of environmental and economic efficiency indicator of an industrial enterprise. Option 1 assumes that there is a pollution fee (until the end of 2021); option 1H involves the collection of environmental tax (from 01.01.2022). In both indicators (options 1 and 1H), productivity of an enterprise that does not have a cleaning system should decrease by the amount of damage (either calculated as a pollution fee or environmental tax). Option 2 of environmental and economic efficiency indicator assumes the possibility of additional accounting of profits from cleaning system (for example, biotechnological processes can be applied in cleaning system with biomass production, which can be used as a feed additive); and, accordingly, it is necessary to take into account all the involved resources of enterprise (including cleaning systems).

Balanced approach underlying the proposed indicator is that the assessment of economic efficiency is conducted fairly: enterprises that pollute the environment (should) receive (clean) less profit at their disposal; enterprises that do not pollute the environment and invest in treatment systems (environmental protection) should receive additional results (profit is not lost).

Currently, usual, traditionally used indicators of economic analysis do not allow assessing the effectiveness of ongoing environmental activities and formulating an environmental strategy as a new economic policy. Economic efficiency indicators of an industrial enterprise should be understandable, proven, filled with economic essence, transparent, statistically measurable and controlled. Traditionally, profitability indicators are defined as performance indicators, but only by type of economic activity. For enterprises, this information can be found in the case of its publication by enterprise (as a rule, in accordance with the requirement of publicity) or evaluated based on the results of operational economic activity (enterprise's consent as a result of independent scientific research).

Problem of difficult accounting for environmental costs and resources. Environmental protection measures at the enterprise require capital costs (structures designed to protect atmospheric air from pollution; wastewater discharge and treatment plants; equipment for neutralization and processing of production and consumption waste, etc.). Environmental measures at the enterprise require current costs associated with environmental activities, including raw materials, materials, fuel, electricity, etc. To determine the environmental component, it is necessary to allocate environmental

costs, dividing these costs into various products in complex industries (and these are industrial enterprises). Currently, environmental costs are allocated along with the costs that they are hidden. A significant part of environmental costs is contained in general production and general business costs and is not proportional to the costs of environmental protection measures, respectively, distributed by individual types of products. Consequences of such incorrect, wrong distribution of costs lead to distortion of production costs, unjustified cost and product prices. Statistical reporting form No. 4-NK «Information on current environmental protection costs and environmental protection fees» must indicate the costs for maintenance and operation of treatment facilities, environmental protection (separately for water, air, land, etc.), and the earth surface that is subject to pollution by waste. According to the plan and in practice, they are not filled in at the enterprise, since the bulk of current environmental costs are not allocated to separate items of accounting and reporting.

The problem lies in difficulty of assessing working capital (volume of working capital is not assessed by all enterprises), difficulty of measuring and controlling environmental and economic benefits. Many enterprises do not independently keep records, do not plan, do not evaluate and, as a rule, poorly manage working capital. Working Capital section gives the impression that it is necessary only when studying theoretical foundations of working capital formation, and in fact, unprofessional assessment and management of workforce is at the root of many problems of low-profitability and already unprofitable enterprises.

Conclusion

All of the above problems affect possibility and prospects of using the environmental and economic efficiency indicator, as well as any other economic indicator that takes into account the environmental factor; all problems are systematic. Formation and maintenance of a special platform for environmental and economic efficiency indicators, well-defined algorithm for their calculation and assessment, allows to control the economic efficiency of activities of industrial enterprise, manage and form environmental and economic efficiency, taking into account the environmental factor, stimulate mechanism of healthy environmental and economic behavior of enterprise.

The following conclusions were made based on the study: modern problems of assessing and managing the industrial enterprise performance, taking into account the environmental factor, have been determined; an environmental and economic efficiency indicator of industrial enterprise has been developed - environmental and economic efficiency; modern problems of assessing damage caused by industrial enterprise and its corresponding accounting have been identified, solutions have been proposed; modern problems of environmental reporting, accounting for environmental costs and capital investments have been determined, solutions have been proposed; prospects for creating a platform for environmental and economic efficiency indicators have been identified.

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