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COMPARATIVE ANALYSIS OF TRANSLATION OF ECOLOGICAL TERMINOLOGY IN ENGLISH, KAZAKH AND RUSSIAN LANGUAGES

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Abstract. In the context of globalization and digitalization, translation is becoming an essential tool for intercultural communication and integration. This is especially common in scientific fields, such as ecology, where accurate transmission of specialized terminology is required. The purpose of this study is to identify the features and difficulties of translating environmental terms between English, Russian and Kazakh languages, as well as to analyze the influence of internationalisms and borrowings on the formation of environmental discourse.

The study is based on the theoretical approaches of such scholars as E.A.Nida, C.Nord, H.J.Vermeer, M. Baker, A. Pym. In this article we used the methods of content analysis, comparative analysis and lexical semantic study of terms. Particular attention was paid to the functional and pragmatic aspects of translation, as well as cultural adaptation.

The analysis revealed that a significant number of terms in the environmental sphere are of international origin and function as internationalisms in three studied languages (Kazakh, Russian and English). These terms often originate from Greek, Latin, French and German and retain graphic and semantic similarities. We also considered examples of calque that helps to transfer the scientific concepts. We can state that successful translation of environmental terminology requires not only linguistic accuracy, but also consideration of the cultural context, communication goals and specifics of the target audience. The theoretical significance of the study lies in understanding translation as a complex interlingual and intercultural process. The practical significance lies in using the data obtained in creating dictionaries, teaching aids and training translators, especially in the multilingual space of Kazakhstan.

Keywords: ecological terminology, translation, internationalism, translation transformations, borrowings, calque, interlinguistics, politics

Introduction

Translation in the modern world is becoming a key tool for integration, globalization and intercultural dialogue. With the development of technology, its importance will only increase, playing an important role in the formation of a connected and mutually understanding world. Translators remain important

figures in this process, despite the growing role of automation, since their knowledge and ability to understand cultural nuances cannot be completely replaced by technology. Still there are some nuances, inadequacies and problems during translation that may happen. Translation problems are a set of issues and difficulties that a translator faces when conveying the content of a text from one language to another. These difficulties are related to differences in linguistic, cultural, cognitive, communicative and technical aspects. The theoretical basis of this work: translation theory – C.Nord, E.A.Nida, H.J.Vermeer, M. Baker, A.Islam, A.A. Aldabergenova, V.V. Akulenko, I.S. Kubryakov, and V.V. Krasnykh. Practical significance - the results of the work can be used in the preparation of educational materials and dictionaries in the field of ecodiscourse. The materials can be effectively used in the disciplines of linguistics and translation, intercultural communication, cognitive linguistics and future scientific research.

According to M.I. Qani the main translation problems can be divided into the following aspects: linguistic aspects (interlingual asymmetry, polysemy and homonymy, idioms and phraseological units); cultural aspects (realia, connotations, cross-cultural adaptation), pragmatic issues (author's intention, target audience, context); cognitive issues (perception and interpretation, conveying meaning); technical aspects (machine translation, working with terminology, text formatting); ethical aspects (authorial identity, censorship and adaptation, translator's responsibility); genres and style (preservation of the author's style, translation of poetry) [1].

The problems of translation are a multifaceted area that includes both linguistic and cultural aspects, as well as cognitive, technical, and ethical issues. For a successful translation, a translator must take all these factors into account in order to ensure adequate transmission of the meaning, style, and functionality of the text in another language and culture. During the study we used such methods as content analysis, comparative analysis and linguistic analysis.

In order to make the translation successful we need to take into consideration some aspects of translation and refer to some popular founders of modern translation theory, like E.A.Nida, H.J.Vermeer, C.Nord, A. Pym, L. Venuti, M. Baker, D.D. Geert and etc.

C.Nord, a German translation scholar known for her work in the field of the functional approach to translation, focused on the pragmatic aspects of translation and the role of text in the process of intercultural communication. The main ideas related to the problems of translation according to C.Nord can be formulated as follows: Functional theory of translation, the problem of equivalence and adequacy, analysis of the source text, intercultural communication, ethical aspects of translation, the role of the translator. Translation cannot be carried out without text interpretation, which represents the fundamental procedure in any type of translation [2]. According to C.Nord the adequate translation is to find a balance between preserving the meaning, function of the text and adaptation to the target

culture. Her works have made a significant contribution to the understanding that translation is not just a linguistic process, but a complex cultural and pragmatic phenomenon that requires analysis, flexibility and responsibility [3].

E.A.Nida, one of the founders of modern translation theory, made a significant contribution to the study of translation. He focused on such key aspects like equivalence, intercultural differences, and how the translator preserves the original sense of the content. According to E.A.Nida, the inadequacy of translation is associated with the need to take into account many factors: equivalence, cultural and semantic differences, background, and the translator's responsibility for communication process. His ideas laid the foundations for the functional and intercultural approaches to translation, which remain relevant today [4].

H.J.Vermeer believed that the main problem of translation is the necessity to take into account the purpose (skopos) of the text, cultural differences and the expectations of the target audience. His functional approach implies flexibility and adaptation, which makes translation complex but more result-oriented. H.J.Vermeer's theory remains one of the most influential in modern translation practice [5].

A.Pym emphasizes that the adequate translation goes beyond purely linguistic issues. They include ethical, cultural, technological and professional aspects. His work is relevant for understanding how translation functions in today's globalized world, where not only accuracy and equivalence are important, but also adaptability, creativity and cultural awareness [6].

Nowadays, the movement toward language unification is advancing at a tremendous pace. Internationalisms fulfill the primary role of communication in the present-day Russian language. They engage in syntagmatic and paradigmatic connections, by contributing to word formation, and as a result, expand the lexicons of Russian and Kazakh languages [7]. International vocabulary is a set of internationalisms used in various related and unrelated languages within a given cultural and linguistic area [8].

In connection with the significant successes of England and the USA in science and technology, since the 19th century many English terms have been borrowed into many languages worldwide, and this process continues to this day. Although many English words are themselves ultimately derived from Latin, there is a growing tendency when borrowing to retain English pronunciation rather than reconstructing traditional Latin (for example, combine).

It is important to take into account different linguistic and contextual aspects during translation. Linguistic factors incorporate not only subtle linguistic features but also stylistic devices, various cultural allusions, and historical background. Contextual factors require an understanding of the political, social, and cultural environment in which the speech is delivered [9].

Based on the abovementioned information we can state that translation is a very complex process and requires a thorough approach and also translation in the modern world is a multifaceted activity related to interlingual and intercultural

communication, which plays a key role in a globalized society. It goes beyond the simple transfer of information between languages and covers cultural, economic, technological and social aspects.

Materials and methods

The study is based on a comparative linguistic and translation analysis of environmental (ecological) terminology in English, Russian, and Kazakh languages. The main objective was to identify the similarities and differences in the structure, origin, and semantic characteristics of ecological terms across these languages, as well as to explore translation problems and strategies for adequate rendering of such terms.

The research material included authentic texts and terminological sources in the field of ecology and environmental protection in English, Russian, and Kazakh languages by R.Nurdillayeva [10]. Scientific and academic works on translation theory and terminology by both foreign and Kazakhstani scholars (e.g., C.Nord, E.A.Nida, H.J.Vermeer, M. Baker, A.Islam, A.A. Aldabergenova, S.S. Kunanbayeva, A.K.Zhumabekova) have been analyzed. Lexical data from specialized ecological dictionaries, glossaries, and linguistic corpora were used in this study.

Several research methods were applied in the study: content analysis – to select and classify ecological terms and translation examples from linguistic sources; comparative analysis – to identify similarities and differences between English, Russian, and Kazakh equivalents, as well as to examine the structure and semantics of internationalisms and borrowings; linguistic analysis – to study morphological, syntactic, and semantic features of ecological terminology and its translation equivalents; etymological analysis – to trace the origin and historical development of ecological terms from Greek and Latin roots;

The research process involved several stages: collecting and organizing terminological data from multilingual sources; analyzing translation correspondences and adaptation patterns; summarizing the results to determine the main tendencies in the formation and translation of ecological terminology across the three languages.

Results and discussion

Nowadays, actual directions of linguistics are actively developing terminology. D.S. Lotte, T.L. Kandelaki, I.S. Kvito, A.A. Reformatskiy worked on terminology. Y. Averbukh, L.M. Alekseeva, M.N. Volodina, E.I. Golovanova, B.N. Golovin, S.V. Grinev-Grinevich, V.P. Danilenko are working on terminological system of languages. Interlinguistic interaction in different spheres of activity is actual in our times. Consequently, comparative linguistic research, including comparative terminology becomes very important. Ecology and environmental protection are very relevant worldwide and terminology in this sphere is in need of study.

Among Kazakhstani authors who have worked on translation theory and practice we can mention S.S. Kunanbayeva, A.K. Zhumabekova, A.S. Ermagambetova, R.Z. Zagidullin, A.Islam, A.A. Aldabergenova, A.Aldasheva and others.

Doctor of Philology and Professor A.Islam emphasizes the importance of achieving semantic equivalence in translating texts. She notes that official statements contain specific vocabulary and cliched phrases that require special attention during translation to maintain accuracy and adequacy of meaning. A.Islam's research focuses on translation strategies aimed at achieving semantic equivalence in official statements, which is a key aspect in intercultural communication and diplomacy [11].

According to A.A. Aldabergenova and A.K. Zhumabekova technological progress and globalization have increased the demand for translation in the wake of the need for rapid and effective dissemination of information. The work is aimed at an in-depth study of the complexities of translation with an emphasis on intercultural interaction, which contributes to the development of translation theory in Kazakhstan [12].

It is obvious that we need high-quality and precise translation, since in the era of globalization, accuracy in conveying the meaning of every term and concept is essential for effective comprehension and communication. This is especially true for environmental discourse, where even a slight inaccuracy in translating an ecological term may distort the meaning of a scientific concept.

One of the main ways to enrich any language, including the ecological lexicon, is borrowing: the process of transferring lexical units from one language into another. Many environmental terms are internationalisms that share common roots in Latin and Greek, such as ecology, biosphere, ecosystem, evolution, and anthropogenic. Because of their shared origin, these terms resemble each other both phonetically and graphically, which makes them widely recognizable across languages and facilitates international scientific communication. For instance, the English term *sustainable development* is translated into Kazakh as *тұрақты даму*, and into Russian as *устойчивое развитие*. Although the lexical forms differ, the underlying ecological concept remains the same, demonstrating functional equivalence across languages.

In the development of ecological terminology, interlinguistic interaction plays a significant role. Researchers such as L.V. Shcherba, E. Haugen, and W. Weinreich have emphasized that borrowing and bilingualism are natural mechanisms of lexical growth [13]. In the modern context, the interaction between English, Russian, and Kazakh languages in the ecological domain leads to the formation of a shared international ecological lexicon. This lexicon includes both classical borrowings from ancient languages (*biology, hydrocarbon, photosynthesis*) and modern terms originating from English (*greenhouse effect, climate change, carbon footprint*).

Ecological terminology in the three languages can be classified into several groups according to their origin and structure:

International terms of Greek and Latin origin (*biosphere, ecosystem, evolution, atmosphere*).

Loan translations (calques): terms translated structurally (*greenhouse effect* – парниковый эффект – парниктік әсер).

Culturally adapted terms, where local linguistic features influence the ecological meaning (*steppe ecosystem* – степная экосистема – дала экожүйесі).

Internationalisms emerge as a result of global communication, scientific collaboration, and technological progress. These words maintain stable meanings across languages and fields such as science, technology, and environmental studies [14]. Thus, international ecological vocabulary functions as a bridge between languages and cultures, reflecting both universal scientific concepts and local linguistic adaptation.

In recent years, environmental issues have become a key focus of scientific, political, and social discussions, which has led to the rapid development of ecological terminology. The analysis of English, Russian, and Kazakh ecological terms shows that this field reflects not only scientific and linguistic evolution but also cultural and cognitive aspects of each language.

The linguistic analysis demonstrated that ecological terminology is characterized by morphological transparency and semantic precision. Most terms consist of two components: a scientific prefix of Greek or Latin origin (*bio-, eco-, hydro-, geo-*) and a native lexical base that specifies the phenomenon (*system, zone, balance, resource*). Such structures make ecological terms easily translatable across languages, while maintaining scientific accuracy.

In the process of translation, several difficulties arise:

Polysemy and contextual variation (*e.g., pollution may refer to air, water, or soil contamination, depending on context*);

Differences in word-formation models between English, Russian, and Kazakh (*biodiversity* – биоразнообразие – биоалуантүрлілік);

Semantic shifts when translating culture-specific or newly coined ecological terms;

Terminological inconsistency in Kazakh ecological discourse due to ongoing standardization processes.

To achieve adequate translation of ecological terms, translators must consider both the scientific precision of the source term and the cultural and linguistic norms of the target language. Functional equivalence, as emphasized by C.Nord and E.A.Nida, is achieved when the translated ecological term fulfills the same communicative purpose within the target linguistic community [15].

Thus, the analysis proves that ecological terminology in English, Russian, and Kazakh languages is largely international in nature, but each language

demonstrates a specific pattern of adaptation and integration. The translation of ecological terms requires balancing linguistic equivalence with contextual and cultural adequacy, which ensures accurate cross-linguistic communication in the field of ecology.

Borrowings can be classified into two categories:

Lexical borrowings. Elements transferred from one language system into another language system (borrowed words, lexicon); (foreign language, language aggregates, transliterated borrowings). Ecological words are borrowed in Kazakh, Russian and English from Greek, Latin, German, French and other languages.

Биосфера – biosphere – [biosphere] немецкий

Аббисаль – zone of great sea and ocean depth – [oceanic depth] французский

Баланс – balance – [equilibrium] французский

Эволюция – evolution – [evolutio] латинский

Semantic borrowings (calque/ copy). Semantic borrowings are borrowed translations – exact translation. Calque – is one of the ways to borrow new ecological terms. There is a difference between lexical calque and semantic calque. Lexical (structural) calques can be word formative or syntactical. Lexical calques can be complete or incomplete. Complete means calque, incomplete means half calque. Semantic borrowings are borrowed translations.

Internationalism is very important part of international terminology. Internationalisms are lexemes and they are very similar in the meaning and external form.

For example,

Table 1. International terms

Kazakh, Russian	English	Origin
<i>Экология</i>	<i>Ecology</i>	<i>O'bgie – German Ecologie – French</i>
<i>Экосистема</i>	<i>Ecosystem</i>	<i>Ocosystem – German</i>
<i>Гидрометеорология</i>	<i>Hydrometeorology</i>	<i>Hydrometeorologie – German</i>

Many international terms are artificially created and material for creation of such terms is taken from Latin and Greek morphemes:

Table 2. International terms from Greek origin

Kazakh, Russian	English	Origin
<i>Антропоэкология</i>	<i>Antropoecology</i>	<i>Greek</i>
<i>Антициклон</i>	<i>Anticyclone</i>	<i>Greek</i>

There are also lexical calques, which may be partly borrowed and partly translated, for example.

Table 3. Terms with syntactic total calque

English	Russian	Kazakh
<i>Agricultural</i>	<i>Сельскохозяйственный</i>	<i>Ауыл шаруашылық</i>
<i>Microwave</i>	<i>Микроволновый</i>	<i>Микротолқынды</i>
<i>Internal consumption</i>	<i>Внутреннее потребление</i>	<i>Ішкі тұтынушылық</i>

Table 4. Terms with syntactic half calque

English	Russian	Kazakh
<i>Soil bacteria</i>	<i>Почвенные бактерии</i>	<i>Топырақ бактериясы</i>
<i>Greenhouse gas</i>	<i>Парниковый газ</i>	<i>Парникті газ</i>
<i>Global warming</i>	<i>Глобальное потепление</i>	<i>Жаһандық жылыну</i>
<i>Sea-water culture</i>	<i>Морская культура</i>	<i>Теңіз мәдениеті</i>

A Multilingual Glossary by R.Nurdillayeva revealed a number of linguistic, structural, and conceptual challenges that arise when translating ecological terms between English, Russian, and Kazakh. The results demonstrate that the three languages differ considerably in their morphological typology, term-formation mechanisms, and strategies for representing scientific concepts, which directly influences the accuracy, clarity, and consistency of ecological terminology.

First, the study shows that English ecological terms are predominantly analytic, compact, and often formed through multi-component nominal structures such as *groundwater recharge*, *climate-resilient water infrastructure*, or *integrated water cycle management*. These structures pose difficulties for both Russian and Kazakh, where equivalents require syntactic expansion and reorganization. Russian tends to render such terms through adjective–noun combinations (*интегрированное управление водным циклом*), while Kazakh frequently relies on multiword descriptive constructions (*су айналымын интеграцияланған басқару*), which may increase length and reduce terminological density.

Second, a significant number of English ecological concepts have no direct equivalents in Russian or Kazakh, creating terminological lacunae. This is especially noticeable in Kazakh, where ecological terminology has been actively developing only in recent decades. Terms such as *water footprint*, *ecosystem services*, or *sustainable drainage system* require either structural calques, functional analogues, or descriptive translations. As a result, even authoritative sources contain variations, making standardization difficult.

Third, the analysis revealed important differences in the adaptation of international morphemes. Russian easily incorporates Greek and Latin components (*био-, гидро-, эко-*), whereas Kazakh translations may involve either direct borrowing (*гидрогеология*), hybrid forms (*экожүйе*), or fully descriptive equivalents (*биоалуантүрлік*). This leads to competition between borrowed and indigenous forms, affecting terminological consistency.

Fourth, polysemy and context-dependent meanings create additional translation challenges. Terms such as *runoff*, *discharge*, *mitigation*, or *resilience*

exhibit semantic variation across environmental science, engineering, and climate policy, requiring careful contextual interpretation. The glossary helped identify several cases where one English term corresponds to two or more distinct equivalents in Russian and Kazakh, highlighting the need for precise differentiation in translation.

Finally, the comparison of three languages demonstrated differences in the degree of terminological standardization. English terminology benefits from well-established norms developed by international institutions (UNEP, IPCC, EU Water Framework Directive), whereas Russian allows a greater degree of variation, and Kazakh terminology is still in the process of consolidation. Because of this, translators frequently rely on descriptive methods, leading to longer and more complex term constructions in Kazakh compared to English and Russian.

Overall, the results indicate that translating ecological terminology requires not only linguistic equivalence but also conceptual alignment. The multilingual glossary proved to be an essential reference, enabling terminological comparison and helping identify gaps, inconsistencies, and patterns in translation practices.

Conclusion

The study examined the peculiarities of ecological terminology and its translation in English, Russian, and Kazakh within the framework of modern translation theory. The study achieved several important results related to identifying and analyzing the specific challenges of translating ecological terminology among English, Russian, and Kazakh languages. Based on the multilingual ecological glossary, the research demonstrates that:

1. The main structural and semantic features of ecological terms were identified. It was found that ecological terminology is characterized by a high degree of internationalization, scientific precision, and the dominance of terms derived from Latin and Greek roots (*biosphere, ecosystem, evolution, pollution*).

2. The main translation difficulties were identified as the absence of one-to-one equivalents, the need to maintain terminological consistency, and the challenge of conveying culturally specific ecological concepts in Kazakh.

3. Key structural differences between the three languages significantly influence term formation and translation strategies.

4. Terminological lacunae were identified in both Russian and Kazakh, with the highest number appearing in Kazakh due to the relatively recent formation of ecological terminology.

5. Variation in the adaptation of international morphemes leads to competing forms and complicates terminological standardization.

6. Polysemous ecological terms often require contextual clarification to avoid misinterpretation in translation.

7. English shows a higher degree of standardization, while Russian and especially Kazakh display multiple competing equivalents for newly emerging ecological concepts.

8. The multilingual glossary proved effective for cross-linguistic comparison and served as a reliable reference for establishing consistent terminology.

Overall, the research contributes to a clearer understanding of the linguistic and conceptual difficulties inherent in translating ecological terminology in a trilingual context. The findings may serve as a basis for improving translation practices, developing standardized ecological terminology in Kazakh, and enhancing the quality of multilingual environmental communication.

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АҒЫЛШЫН, ҚАЗАҚ ЖӘНЕ ОРЫС ТІЛДЕРІНДЕГІ ЭКОЛОГИЯ ТЕРМИНОЛОГИЯСЫН АУДАРУДЫҢ САЛЫСТЫРМАЛЫ ТАЛДАУЫ

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Аңдатпа. Жаһандану және жаңа технология заманында аударма түрлі елдердің арасындағы байланыс пен өзара ықпалдастықтың ең маңызды құралдарының біріне айналды. Бұл әсіресе экология сияқты ғылыми салаларда өзекті, себебі мұнда арнайы терминологияны дәл әрі нақты жеткізу өте маңызды. Зерттеудің мақсаты – экологиялық терминологияны аудару кезінде лексикалық, стильдік және концептуалды аспектілерді ескере отырып, аударма кезіндегі қиыншылықтарды анықтау. Сондай-ақ, экологиялық терминологияның ғылыми-ақпараттық жанрларда экологиялық терминологияның қалыптасуына әсер ететін экстралингвистикалық факторларды анықтауда, құрылымдық семантикалық талдау мен пәнаралық байланыстарды анықтауда тіл білімінің дамуына үлес қосатыны дәлелденді.

Бұл жұмыста лингвистикалық, мәдени және прагматикалық факторлардың аударма үдерісіне әсері Э. Найда, К. Норд, Х. Вермеер сынды ғалымдардың теорияларына сүйене отырып, көрсетілген. Зерттеуде контент-талдау, салыстырмалы талдау, лингвистикалық талдау сияқты әдістемелік тәсілдер қолданылды. Бұл жұмыста аударманың функционалдық және прагматикалық аспектілері, сондай-ақ мәдени бейімделу ерекше атап өтілді.

Талдау барысында экология саласындағы көптеген терминдердің интернационализм қатарына кіретінін ашып көрсетіп, қазақ, орыс және ағылшын тілдерінде бірдей қолданылатыны анықталды. Бұл терминдер көбінесе грек, латын, француз және неміс тілдерінен енген және графика әрі мағыналары жағынан бір-біріне ұқсас деп атап өтілген. Сонымен қатар,

ғылыми ұғымдарды жеткізуде толық және жартылай калькалау мысалдары қарастырылды. Экологиялық терминологияны дұрыс аудару тек тілдік дәлдікті ғана емес, сонымен қатар мәдени контексті, коммуникация мақсатын және мақсатты аудиторияның ерекшеліктерін ескеруді талап ететіні анықталды. Аталмыш жұмыстың теориялық маңыздылығы аударма үдерісінің тіларалық әрі мәдениетаралық күрделілігін терең түсінумен айқындалады. Практикалық маңыздылығы – алынған мәліметтерді сөздіктер мен оқу құралдарын дайындауда, сондай-ақ Қазақстандағы көптілді кеңістікте аудармашыларды дайындауда оқу-әдістемелік құрал қолдануға болады.

Тірек сөздер: экологиялық термин, аударма, интернационализм, калька, аударма трансформациялары, кірме сөздер, тіларалық, саясат

СРАВНИТЕЛЬНЫЙ АНАЛИЗ ПЕРЕВОДА ЭКОЛОГИЧЕСКОЙ ТЕРМИНОЛОГИИ В АНГЛИЙСКОМ, КАЗАХСКОМ И РУССКОМ ЯЗЫКАХ

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Аннотация. В условиях глобализации и цифровизации перевод становится важнейшим инструментом межкультурной коммуникации и интеграции. Особенно это актуально в научных сферах, таких как экология, где требуется точная передача специализированной терминологии. Цель настоящего исследования — выявить особенности и трудности перевода экологических терминов между английским, русским и казахским языками, а также проанализировать влияние интернационализмов и заимствований на формирование экологического дискурса.

Исследование опирается на теоретические подходы таких учёных, как Ю. Найда, К. Норд, Х. Вермер, М. Бейкер, А. Пим. Применялись методы контент-анализа, сравнительно-сопоставительного анализа и лексико-семантического изучения терминов. Особое внимание уделялось функциональному и прагматическому аспектам перевода, а также культурной адаптации.

В ходе анализа было выявлено, что значительное число терминов в экологической сфере имеют международное происхождение и функционируют как интернационализмы в трёх исследуемых языках. Эти термины часто происходят из греческого, латинского, французского и немецкого языков и сохраняют графическое и семантическое сходство. Также рассмотрены примеры калькирования — как полного, так и частичного — при передаче научных понятий. Успешный перевод экологической терминологии требует не только языковой точности, но и учёта культурного контекста, целей коммуникации и специфики целевой аудитории. Теоретическая значимость исследования заключается в понимании перевода

как сложного межъязыкового и межкультурного процесса. Практическая значимость заключается в использовании полученных данных при создании словарей, учебных пособий и обучении переводчиков, особенно в условиях многоязычного пространства Казахстана.

Ключевые слова: экологический термин, перевод, интернационализм, калька, переводческие трансформации, заимствования, интерлингвистика, политика

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