QUBAHAN ACADEMIC JOURNAL
VOL. 4, NO. 4, January 2025
https://doi.org/10.48161/qaj.v4n4a1022

Development of Entrepreneurial Activity Using the Integration of Human Capital and Green Technologies to Optimize the Sustainable Development of the Territories

Alma Karshalova [1], Aidos Akpanov [2], Santay Tleubayeva [3], Anuar Belgibayev [4], Askar Makhmudov [5], Aigul Atchabarova [6], and Margarita Zholayeva [7]

[1] Business School, Kazakh-British Technical University, Almaty 050000, Kazakhstan;
[2] Department of Finance, Turan University, Almaty 050013, Kazakhstan;
[3] Institute of Education, University of Reading, Reading, Berkshire RG6 6AH, United Kingdom;
[4] Higher School of Economics and Management, Al-Farabi Kazakh National University, Almaty 050040, Kazakhstan;
[5] Department of Economics and Management, West Kazakhstan Innovation and Technological University, Uralsk 090000, Kazakhstan;
[6] School of Economics and Legal Technologies and Services, Eurasian Technological University, Almaty 050038, Kazakhstan;
[7] Department of Accounting and Analysis, L.N. Gumilyov Eurasian National University, Astana 010000, Kazakhstan.
* **Corresponding author:** margarita.zholayeva@mymail.academy.

ABSTRACT: The development of the tourism sector faces serious challenges, which are related to its environmental transformation, digitalization, and integration of new technologies, as well as competitiveness. Tourists' behavior is also changing. The future demand for tourism is likely to be driven by growing environmental awareness, increased use of digital services and new technologies, a shift towards a more personalized travel experience, and ensuring well-being and better engagement with local communities and culture. Meeting the requirements of the modern tourism industry is a problem not only for the Republic of Kazakhstan but also for other countries that strive for sustainable development of the tourism sector. The purpose of the study is to identify ways to develop entrepreneurial activity by integrating human capital and green technologies to optimize the sustainable development of the tourism sector. The paper examines the basic theoretical concepts of the essence and forms of sustainable tourism and presents the concept of the integration of human capital and green technologies to achieve the principles of sustainable development. Based on an expert survey, strengths, weaknesses, opportunities, and threats analysis, and statistical methods, the main ways of promotion and development of sustainable tourism, as well as measures to integrate human capital and green technologies into entrepreneurial activities in the tourism sector in the East Kazakhstan Region, have been identified. The authors have concluded that the introduction of green technologies and the integration of human capital with them provide new standards for the quality of tourist services while preserving the natural resources of the region.

Keywords: Business, Natural Resources, Ecology, Benefits, Real Estate, Agricultural territories

I. INTRODUCTION

The idea of sustainable tourism has developed in parallel with the sustainable development strategy. In the documents of the World Conference in Rio de Janeiro in 1992, tourism was defined as an economic sector with significant potential for implementing the principles of sustainable development. According to the United Nations World Tourism Organization (UNWTO), tourism comprises "the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes not related to the exercise of an activity remunerated from within the place visited, or a form of outdoor activity outside their place of permanent residence" [1, p. 4].

Modern tourism as a concept simultaneously describes many theoretically mutually exclusive terms. This is a global phenomenon, but it has the greatest impact on local communities [2,3]. It has both a mass nature and a niche character [2,4]. The preamble to the Charter of Sustainable Tourism [5] states: "Tourism, as a worldwide

phenomenon, touches the highest and deepest aspirations of all people and it is also an important element of socio-economic and political development in many countries".

The integration of human capital and green technologies into tourism activities through the development of green jobs and the introduction of green technologies is a global trend that can become a response to problems associated with environmental degradation, that is, a consequence of expansive human actions [6-9]. However, every global action echo field actions [10]. The intensification and coordination of initiatives with the specifics of a particular tourist market begins at this level [11]. The task is so difficult that often the characteristics of the local tourism market deviate from general assumptions.

The task is to create solutions that will not remain just a concept but will be used in practice. Moreover, one region is a set of domestic local markets, each of which has different needs and requirements and is at different stages of the development and implementation of sustainable tourism. Practice shows that local actions and initiatives determine the shape and nature of global trends.

Based on the focus of our study, we chose the East Kazakhstan Region (EKR) as a territory potentially interesting for the integration of human capital and green technologies into tourism activities. The purpose of the paper is to identify ways to develop entrepreneurial activity by integrating human capital and green technologies to optimize the sustainable development of the tourism sector.

In this paper, we tried to answer the following research questions: (1) What are the strengths and weaknesses, as well as the main ways for the promotion and development of sustainable tourism in the EKR? and (2) What are the strengths and weaknesses, as well as the main measures to integrate human capital and green technologies into business activities in tourism in the EKR?

The structure of the paper is organized as follows. The "Theoretical basis" section provides a literature review on sustainable tourism and the integration of human capital and green technologies as a method for its development. The "Methods" section outlines the research methods, including the use of a qualitative and quantitative approach based on expert survey results. The section also discusses expert survey results and uses statistical methods, such as Kendall's and "Chi-Square" concordance coefficient, to evaluate the consistency of expert opinions. In the "results and discussion section" findings highlight practical steps for developing sustainable tourism in the region. The "Conclusions" section includes the theoretical and practical conclusions, limitations of the study, and suggestions for further research.

Thus, the relevance of the paper and the formulation of the problem are justified by the possibility of optimizing the sustainable development of the tourism sector of the Republic of Kazakhstan through the integration of human capital and green technologies into entrepreneurial activity.

The novelty of our work is in the description of the possibility of applying the concept of the integration of human capital and green technologies as a methodological mechanism for sustainable tourism development. By integrating human capital and green technologies, the research offers practical solutions for enhancing tourism while preserving natural resources. This approach not only improves the quality of tourism services but also promotes environmental protection, increases competitiveness, and creates new green jobs. The study provides a framework for policymakers and businesses to implement sustainable practices, addressing both local and global environmental challenges.

II. THEORETICAL BASIS

1. TOURISM CONCEPTS IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

According to researchers, sustainable development in tourism is expressed in the protection of the natural, historical, cultural, and social environment. This protection is understood as preventing and countering degradation, as well as conserving, protecting, and prioritizing quality over the number of services offered, striving to provide a sense of security for both tourists during their stay and for local communities [12-14]. Table 1 shows the different concepts of tourism in the context of sustainable development.

Table 1. Tourism in the context of the concept of sustainable development [15-17].

	Socio-cultural dimension of sustainable development
Tourism as a psychological phenomenon	- participation in tourism is a consequence of meeting the needs that affect the motives and methods of travel (the need for self-realization, development, education, belonging, withdrawal from everyday life); - achieving this goal (satisfaction of needs) is associated with value and experience;

	- the object of the analysis is the individual
Tourism as a social phenomenon	- during the journey, the individual n changes their social environment, finds themselves in new social roles, establishes new relationships; - it can be a means of checking stereotypes, but also of perpetuating them; - the individual enters into a relationship with the community of the place of residence, is influenced by it, and influences it
Tourism as a cultural phenomenon	- tourism in this approach is an element of modern life: it has moved from a luxury item (value) to a more obvious, necessary, lower level; - the level of social culture determines the purpose of trips, motivation, as well as the way of traveling and interacting with the local community; - tourism is a carrier of cultural values and behaviors; - it is both an element of culture and its bearer
	Natural dimension of sustainable development
Tourism as a spatial phenomenon	- destination territories for tourism development transform due to the emerging infrastructure (depending on the level of spatial planning, this may have a positive, neutral, or negative impact); - the tourist flow also affects the travel space of tourists; - the use of tourist space, depending on the intensity of the tourist flow and available resources, can affect the environment to varying degrees
	Economic dimension of sustainable development
Tourism as an economic phenomenon	- tourism is a branch of the economy, a sector that generates significant revenues to gross domestic product (GDP) on a global, national, and regional scale (the level depends, among other things, on the degree of development of the tourism function and the stage of development of tourism in the destination); - it contributes to the development of infrastructure, the creation of new services and products, as well as jobs

2. INTEGRATING HUMAN CAPITAL AND GREEN TECHNOLOGIES

According to the research results, integrating human capital and green technologies means integrating intellectual capital and environmental problems at the organizational level or at the individual level, which includes all types of assets that are considered intangible, such as competence, knowledge, and interaction [18-20]. It is considered as the sum of all knowledge that an organization can use in the process of environmental management to obtain competitive advantages [21-23]; as the integration of environmental sources and sources of knowledge about the environment and knowledge of the potential of companies to increase the competitive advantages of green entrepreneurs, firms, and enterprises [24,25]; as a set of knowledge, skills, capabilities, experience, attitudes, creativity, and obligations of employees regarding environmental protection or green innovations that were introduced specifically by employees of green business entities [26,27].

The integration of human capital and green technologies allows an organization to recognize its intangible assets (knowledge, skills, and capabilities) and helps to implement green strategies in a dynamic competitive environment and achieve better results and green goals [28-31].

3. PROPOSED MODEL

The positive results of the integration of human capital and green technologies are environmental protection [32,33], increased labor productivity, positive financial consequences, and the well-being and health of employees [34-36]. The integration of human capital and green technologies has significant chances to add value to the environmental development of the company and attract an important tool for motivating, inspiring, and stimulating employees to implement green practices, leading to an improvement in the sustainability indicators of the personnel management organization, and is fully consistent with environmental goals [37, 38].

The joint action for the integration of human capital and green technologies is a cohesive set of human resources that have a combined impact on the overall effectiveness of the organization by 1) selecting ideal employees who are sufficiently familiar with the aspects of green technologies, which is called the conditions of green hiring [39, 40], 2) providing environmental training for members of the organization to participate in environmental activities to increase environmental awareness, i.e., green training and participation [41], 3) offering non-monetary and monetary compensation to members of the organization based on environmental

achievements [42]. Green hiring involves the practice of attracting environmentally conscious and environmentally oriented innovations, green technologies, environmental knowledge, etc. for employees of the organization [43]. Green hiring, green training and development, and environmental compensation have a positive relationship with the environmental performance of an organization [44,45].

III. MATERIALS AND METHODS

1. RESEARCH APPROACH

The methodology of this study employs both qualitative and quantitative approaches. The qualitative component is based on an expert survey, in which professionals from the tourism industry provided insights into the integration of human capital and green technologies. This approach allowed for an in-depth understanding of the specific needs and challenges faced by the sector. The quantitative component involves ranking and weighting the strategies proposed by the experts, with the results processed using statistical methods such as Kendall's concordance coefficient. This ensures a reliable measure of consistency of expert opinions and helps to identify the most effective strategies for sustainable tourism development. By combining these methods, the study offers a comprehensive analysis that balances expert insights with empirical data to formulate actionable recommendations.

2. EMPERICAL CONTEXT

The EKR has a wide range of natural and recreational resources (Lake Alakol, Sibinsk Lakes, Bukhtarma coast, Katon-Karagai Nature Reserve) and is attractive to tourists from Kazakhstan, Russia, Commonwealth of Independent States (CIS) countries, and the rest of the world. The unique natural potential, well-preserved historical monuments, as well as the geographical location of the EKR determine the availability of a competitive regional tourism product, which includes such types of sustainable tourism as ecotourism, sports tourism (mountain skiing, cross-country skiing, etc.); medical and wellness tourism; cultural and educational tourism.

The EKR has significant potential for the development of sustainable tourism due to the presence of recreational tourism, represented by health resorts and sports and wellness tourism organizations [43]. Significant opportunities to increase the sustainability of recreational tourism are due to the stable demand of the EKR population, as well as the favorable geographical location of ski resorts and sports bases to attract not only Kazakh tourists but also tourists from neighboring countries. The historical, cultural, and natural potential of the EKR, combined with the growing interest in the historical heritage, traditions, and culture of Kazakhstan, contribute to the sustainable development of historical and cultural tourism [32,46].

Sports tourism has a significant potential for sustainable development (especially winter tourism), which requires special sports infrastructure (ski slopes, ice rinks, trampolines, etc.) since the natural and climatic conditions of the EKR (long and snowy winters, dry and hot summers) and landscape features contribute to the sustainable development of sports tourism in this region.

3. DATA COLLECTION

3.1 Research Papers Selection

Following the purpose of the study, we selected scientific sources using the Russian Science Citation Index (RSCI) database, as well as the international Web of Science and Scopus databases for the keywords "sustainable tourism", "human capital", "green technologies", and "green human resources" in English and Russian, with the publication date limit of 15 years.

The data was collected between October 10, 2023, and February 10, 2024, by analyzing the scientific literature on the research problem, selecting an expert pool, performing an expert survey by e-mail, and processing and analyzing the survey results. The analysis of the data obtained during the desk study was carried out using a strength, weaknesses, opportunities, and threats (SWOT) analysis of the promotion and development of sustainable tourism in the EKR.

We utilized the PRISMA algorithm (table 2) to ensure a systematic approach to the selection and inclusion of studies. This methodology helped us provide a well-founded basis for our conclusions by filtering the most relevant and high-quality sources.

Table 2. PRISMA algorithm.

Steps	Description
Selection	Studies selected after search (n=100)
1st step of approval	The annotations are checked according to relevance criteria (n=100). Left after checking (n=75)
2nd step	The full text articles checked whether they are thematically relevant (n=75). After checking left (n=55)
Results of selection	Research papers left after checking (n=55)

3.2 Experts Evaluation

The expert pool consisted of two aggregates: the first group included employees of tourism enterprises of the EKR and the second one consisted of heads of tourism enterprises (entrepreneurs). Thus, the main ways of sustainable tourism development through the integration of human capital and green technologies into entrepreneurial activity were formulated from the point of view of employees working in the tourism industry and entrepreneurs who, based on a certain market demand, will carry out this integration. Therefore, the ways of sustainable tourism development through the integration of human capital and green technologies form a logical whole and represent an algorithm of action.

Emails with an invitation to participate in the survey were sent to 63 respondents (46 employees of travel agencies and 17 entrepreneurs, heads of travel agencies) from Kazakhstan. These experts were selected based on their extensive knowledge and direct involvement in the tourism sector, particularly in areas related to sustainable tourism development and the integration of green technologies. Most of the experts had significant experience in the tourism industry, ranging from 5 to 15 years. Many of them had previously participated in similar studies or initiatives related to environmental sustainability, green practices, and business development in tourism. Finally, 55 people (40 employees of travel agencies and 15 entrepreneurs) agreed to participate in the survey, after which they were sent emails with questions that aroused our interest after completing the analysis of scientific literature. In the emails, they were asked to elaborate on the answers in a free form. All survey participants had been warned about the purpose of the survey and that the organizers of the study were planning to publish its results in a generalized form.

After receiving expert answers, a second email was sent to the respondents, where they were offered to arrange on a scale certain way of promotion and development of sustainable tourism and measures to integrate human capital and green technologies into entrepreneurial activities in tourism recorded during the study, assigning points depending on the level of their importance. After that, the rank of each of the ways and activities was determined, according to the scores given by the experts.

The final analysis of the data obtained during the expert survey was carried out using a SWOT analysis of integrating human capital and green technologies into entrepreneurial activities in the tourism sector.

4. DATA ANALYSIS

4.1 Hypothesis testing

In this study, hypothesis testing was conducted to validate the relationship between the integration of human capital and green technologies and the sustainable development of the tourism sector in the East Kazakhstan Region. The following hypotheses were formulated based on the literature review and theoretical framework:

H1: The integration of green technologies positively influences the sustainable development of the tourism sector.

H2: Human capital plays a significant role in enhancing the competitiveness and sustainability of tourism enterprises.

H3: The combined integration of human capital and green technologies leads to better environmental outcomes in the tourism industry.

4.2 Justification of the expert's selection

To determine the minimum sample size for an a priori ranking of 8 priority directions with the participation of at least 55 experts, we need to calculate if this number of experts is sufficient to confirm the non-randomness of the expert agreement with the Pearson Chi-Square test. The calculated Chi-Square value for 55 experts with

W=0.73 is approximately 8030. This high Chi-Square value suggests that the level of agreement among the experts is statistically significant, indicating that the number of experts (55) is sufficient. The result supports the idea that the consensus is reliable and that the group of experts is large enough to draw conclusions from the data.

For a more objective analysis of the data obtained during the expert survey, the degree of consistency of expert opinions with mathematical processing of the results was measured using the Kendall concordance coefficient, using the formula:

$$W = 12S/n^2(m^3 - m) \qquad (1)$$

where S is the sum of the squares of the deviations of all estimates of the ranks of each of the items from the average value; n is the number of experts; m is the number of evaluated items.

4.3 Data processing

Further, the information obtained during the expert survey was processed to determine the weights of the obtained parameters with the construction of a rank transformation matrix and subsequent calculation of the arithmetic mean of the individual weights for each of the parameters. The final values of the weights determine the significance of a particular parameter from the experts' point of view.

In the process of data analysis, the triangulation method was used for the validity and reliability of the results of the empirical study. The triangulation was performed through the triangulation of researchers when several researchers participated in the project, each of whom participated in the processing of information. After that, a discussion was held on each topic, and information that had been run by all participants of the study was entered into the report. The triangulation process made it possible to increase the reliability of the expert survey data and improve the quality of the information received. All results obtained from the study were recorded in the study report.

IV. CONCLUSION

Based on the results of the desk study using SWOT analysis, we performed an analysis of the strengths and weaknesses of the promotion and development of sustainable tourism in the EKR (Table 3).

Table 3. SWOT analysis of the promotion and development of sustainable tourism in the EKR.

Strengths	Weaknesses
- attractive natural conditions and landscape, - a rich and strong tradition of individual farms, - the tradition of national (nomadic) cuisine, - the tradition of producing canned food based on unique local products (regional products such as honey, qurut, cold cuts of maral deer and roe deer meat, etc.), - the growing interest of tourists in recreation in the region (not only in summer but also in winter, for example, in the Altai Alps, when ski lifts and cross-country ski trails are open), - dynamically growing interest and fashion for a healthy lifestyle, for example, organic products, and wellness procedures	- lack of cooperation between organic producers, - lack of a brand for local products, - lack of demand for regional products, - lack of promotion of regional products and sales and distribution networks, - lack of small local associations

When we started work on the main ways for the development of sustainable tourism and the integration of human capital and green technologies into entrepreneurial activities in tourism in the EKR, we assumed that the survey participants would develop separate proposals for solutions. In the course of the work, the developed proposals on the ways of development and integration were adapted to the specific needs of each of the districts, considering the characteristics of the entire EKR. The experts showed great awareness of the needs in their areas and indicated specific ways for the promotion and development of sustainable tourism where human capital and green technologies should be integrated into business activities in the tourism sector.

The main ways of promotion and development of sustainable tourism in the EKR are presented in Table 4.

Table 4. The main ways of promotion and development of sustainable tourism in the EKR

Main ways of promotion and development of sustainable tourism	Rank	Weight
Creating a tourist brand in the region and supporting existing regional brands, for example, Altai Alps, Lake Zaisan, Lake Alakol, Rakhmanov Springs, Katon-Karagai (National Park), Berel Mounds, etc.	1	0.24
Development of tourist activity centers based on landscape qualities (for example, a winter sports center with ski lifts, cross-country ski trails in the Altai Alps, and wellness procedures in Rakhmanov Springs)	2	0.20
Popularization of the unique natural and cultural conditions of the region	3	0.16
Promotion of culinary routes based on local culture and cuisine	4	0.12
Production, distribution, and promotion of regional products with the creation of a network of points of sale and catering, including those outside the region	5	0.09
Creation, promotion, and support of regional product brands	6	0.07
Promotion of family and weekend tourism among the residents of the region	7	0.05
Agreement on joint promotion of tourism products and services with the creation of tourism clusters as entities uniting homeowners and travel agencies	8	0.04
Support for participation in exhibitions and other national and international events	9	0.03

Note: compiled based on the expert survey; the value of the concordance coefficient W = 0.71 ($p < 0.01$), which indicates a strong consistency of expert opinions

Further, based on the results of the expert survey, we identified the main ways of integrating human capital and green technologies into entrepreneurial activities in tourism in the EKR (Table 4).

Table 4. The main steps for the integration of human capital and green technologies into entrepreneurial activities in tourism in the EKR

Main ways of human capital and green technology integration	Rank	Weight
Financial support (financial instruments, grants) for investments in support of the integration of human capital and green technologies into tourism activities (creation of green jobs)	1	0.25
A quick way to register for green travel companies, tax benefits from the state budget	2	0.20
Preferential treatment of tourism companies integrating green technologies by municipalities	3	0.16
Creation of new professions, for example, eco-cooks (for people engaged in catering in campsites, campsite canteens, hotels)	4	0.13
Specialized training in tourism services: organizer/guide of thematic excursions related to the geological history of the region; presenter, trainer, and organizer of courses on traditional crafts; organizer of environmental tours or events; green animator for thematic events and situational games (for example, archery tournaments)	5	0.10
Spread of knowledge on green technologies, green jobs, and environmental activities among entrepreneurs and travel companies that create such jobs	6	0.08
Training of local producers, for example, on old recipes, product registration rules, and regulatory and sanitary requirements that allow them to sell in retail chains and outside the region	7	0.05
Ecological breeding and cultivation of vegetables, fruits, and grains, ecological breeding of poultry and cattle (for the supply of tourist enterprises)	8	0.03

Note: compiled based on the expert survey; the value of the concordance coefficient W = 0.73 ($p < 0.01$), which indicates a strong consistency of expert opinions

Based on the results of an expert survey (Tables 3 and 4), using SWOT analysis, we evaluated the strengths and weaknesses of integrating human capital and green technologies into entrepreneurial activities in the tourism sector in the EKR (Table 6).

Table 6. SWOT analysis of the integration of human capital and green technologies into entrepreneurial activities in tourism

Strengths	Weaknesses
stable employment: employees using green technologies are valuable human capital, a wide range of training on the market, improving the competitiveness of travel companies through the use of green technologies and an appropriate image, increasing the ability to scale up activities by expanding the tourist offer, high growth rates of demand for a tourist product, awareness of a significant number of tour operators about the need to introduce green technologies	a small proportion of employees using green technologies in the structure of a travel company, a small proportion of employees using green technologies and having higher education, low awareness of the need for integration of human capital and green technologies, low ability to increase the scale of activities due to the expansion of the tourist offer, low level of implementation of green technologies, lack of prospects for the introduction of green technologies

As the results of the study showed, the possibility of increasing the integration of human capital and green technologies in the tourism sector is considered in the development of sustainable tourism.

The main proposals of experts on the promotion and development of entrepreneurship in tourism in the EKR through the integration of human capital and green technologies concerned the following:

1. further work to expand the offer for tourists, especially in the case of family, weekend, and medical rehabilitation tourism;
2. the need to develop the tourist sector and its infrastructure, while the key measures should be to work on the brand of the region and support existing and existing brands from the EKR;
3. the development of organic agriculture and animal husbandry related to the tourism sector, and, consequently, the production, promotion, and distribution of local products on regional and national markets.
4. increasing environmental awareness of consumers of tourism services.

The experts noted that some organizations and small and medium-sized enterprises in the EKR were looking for methods of subsidizing their activities in the introduction of environmental solutions, for example, in the form of cheaper investment loans or government subsidies [47].

This is not a distinctive feature for business development, especially in the tourism sector [48]. The need to make new decisions on the integration of human capital and green technologies into entrepreneurial activity is also imposed by the changing legislation of Kazakhstan in environmental protection [49]. All this is a sufficient reason for travel companies to implement these solutions. However, based on the results of the study, we cannot answer the question of whether businesses are striving to develop this approach or waiting for further assistance from the state, without taking active initiative. We believe that to change the situation, state and municipal policy in this area should be more focused on offering solutions such as tax incentives for real estate, which will be able to create new jobs and objects for the tourism industry.

The change in the real estate situation, as confirmed by experts, will help to change the current trend (which is typical for both the EKR and Kazakhstan) represented by excessive concentration of tourist flow and tourist accommodation facilities. Besides, the lack of tourist culture and education in this area leads to the degradation of the natural environment, which is also noted in the study [50,51].

Other negative consequences, as noted, for example, by an expert (head of company, Altai district), include the following: "The problems of our district are the seizure of land and water, as well as the presence of industrial infrastructure that uses large tracts of land. Therefore, we increasingly have to deal with the impoverishment of the landscape and cluttering" [52, p. 1209]. This is confirmed by the results of the data and the results of other researchers [26,37,38,53]. Water pollution and wastewater generation by tourism organizers (hotels, restaurants) are consistent with the data in [44,46]. It is also noted in [53] that tourists engaged in skiing and hiking in the EKR make a negative contribution to the environment due to soil degradation [38] or subsidence of slopes and destruction of vegetation or fragmentation caused by skiing. To solve these problems,

it is necessary to actively promote integrating human capital and green technologies to achieve the principles of sustainable development [46, 54]. This promotion should start from the lowest level, using public events, conferences, seminars, and examples of best practices. Such events may be organized by tourism enterprises supported by local authorities which will begin to implement best practices in the districts of the EKR.

The analysis of the integration of human capital and green technologies into sustainable tourism development in the East Kazakhstan Region has provided clear insights into the relationship between these two components and the overall sustainability of the tourism sector. The findings confirm the validity of the research hypotheses.

H1 is supported by the expert survey and SWOT analysis, which highlight those green technologies, such as eco-friendly infrastructures and sustainable waste management practices, have a direct and positive impact on reducing the environmental footprint of tourism activities.

The results underscore the importance of human capital in promoting sustainable tourism confirming **H2**. Experts emphasized the value of eco-conscious training programs and the creation of new green jobs, which contribute to developing a skilled workforce equipped to manage environmentally friendly operations.

To confirm **H3**, authors conclude that the combined approach of integrating both human capital and green technologies yields the best outcomes for environmental sustainability. Tourism enterprises that employ skilled workers with knowledge of green practices and implement sustainable technologies see improved environmental performance, reduced resource consumption, and enhanced service quality.

In conclusion, the results validate the research hypotheses and demonstrate that the integration of green technologies and human capital is key to optimizing the sustainable development of the tourism sector in the East Kazakhstan Region.

V. CONCLUSION

This paper answers the following research questions: (1) What are the strengths and weaknesses, as well as the main ways for the promotion and development of sustainable tourism in the EKR? and (2) What are the strengths and weaknesses, as well as the main measures to integrate human capital and green technologies into business activities in tourism in the EKR?

The introduction of green technologies in the concept of the integration of human capital with them provides new standards for the quality of tourist services while preserving the natural resources of the region. This implies the creation of a comprehensive strategy for sustainable tourism development in integrating human capital and green technologies with systemic state and regional approaches.

Despite the theoretical and practical contributions, this study is partially limited by the size of the expert pool and therefore does not allow generalizations though Pearson Chi-Square and W formulas allow to rely on gained results.

While this study provides valuable insights into the integration of human capital and green technologies in the tourism sector, it is limited by its focus on the East Kazakhstan Region (EKR). As a result, the findings may not be directly applicable or generalizable to other regions, especially those with different economic, cultural, and environmental contexts. The general results of several studies distributed throughout Kazakhstan will allow to create a more generalized picture of optimizing the sustainable development of the tourism sector in Kazakhstan through the integration of human capital and green technologies into entrepreneurial activity.

Nevertheless, the findings demonstrate that integrating green technologies with human capital has the potential to improve the quality of tourism services while simultaneously preserving natural resources. The implications of this study are significant for both academic and practical applications.

Firstly, the study contributes to the body of knowledge on sustainable tourism by providing a framework for integrating green technologies and human capital. This model can be adapted and applied in other regions seeking to optimize their tourism industries for sustainable development.

Secondly, for practical use, the results highlight actionable strategies to promote sustainable tourism. This includes offering financial incentives for the adoption of green technologies, fostering local training programs to build eco-conscious human capital, and developing new professional roles within the tourism industry.

Funding statement

This research received no external funding. All work was conducted independently without financial support from any funding agency, commercial entity, or non-profit organization.

Data availability statement

The data and code can be provided upon request.

Author contribution

All authors made an equal contribution to the development and planning of the study.

Conflict of Interest

The authors declare no conflicts of interest.

Acknowledgments

The authors extend their sincere appreciation to the publisher for their invaluable support throughout the review and publication process of this article.

REFERENCES

1. De Esteban, J., Cetin, G., & Antonovica, A. (**2015**). Theory of knowledge of tourism: A sociological and epistemological reflection. *Journal of Tourismology*, 1(1), 2–15.
2. Stepanova, D., Nurgaliyeva, A., Bessonova, T., Chernova, O., Litvinov, A., & Aru, Y. (**2023**). The influence of active types of tourism on the development of territories and the achievement of ESG principles. *Journal of Law and Sustainable Development*, 11(2), e318–e318.
3. Mohanty, R., & Samal, A. (**2023**). An empirical study on developing the tourism potentials of fairs and festivals in Odisha in India. *Theoretical and Practical Research in Economic Fields*, 14(2), 335–344.
4. Islam, N. U., & Chaudhary, M. (**2020**). Index of destination attractiveness: A quantitative approach for measuring tourism attractiveness. *Turizam*, 25(1).
5. Shames, M., & Ghadban, S. (**2016**, April). Tourisme durable au Liban: Une approche innovante dans la gestion des paysages culturels. In *7èmes Journées Scientifiques du Tourisme Durable: Commercialisation des Destinations Touristiques–Hôtellerie, Loisirs et Territoires*.
6. Guo, M., Wang, H., & Kuai, Y. (**2023**). Environmental regulation and green innovation: Evidence from heavily polluting firms in China. *Finance Research Letters*, 53, 103624.
7. Mishra, P. K., Rout, H. B., Sahoo, D., Kumar, P., & Chaini, S. R. (**2023**). International tourism, financial deepening and economic growth: Insights from Southern African countries. *Theoretical and Practical Research in Economic Fields*, 14(1), 74–84.
8. Zhyrgalova, A., Yelemessov, S., Ablaikhan, B., Aitkhozhayeva, G., & Zhildikbayeva, A. (**2024**). Assessment of potential ecological risk of heavy metal contamination of agricultural soils in Kazakhstan. *Brazilian Journal of Biology*, 84, e280583.
9. Auganbai, A., Kalymbek, B., Shulanbekova, G. K., Urisbaeva, A. A., & Yerezhepkyzy, R. (**2020**). Protection of objects of historical and cultural heritage: Legal problems and the application of information technologies. *Environmental Policy and Law*, 49(6), 379–388.
10. Mazina, A., Syzdykova, D., Myrzhykbayeva, A., Raikhanova, G., & Nurgaliyeva, A. M. (**2022**). Impact of green fiscal policy on investment efficiency of renewable energy enterprises in Kazakhstan. *International Journal of Energy Economics and Policy*, 12(5), 491–497.
11. Kulbaeva, A., Nakhipbekova, S., Mergenbayeva, A., Akhmetova, K., & Kulbaeva, M. (**2023**). Improvement of the efficiency of urban management within the concepts of smart city and sustainable development (as exemplified by cities in Kazakhstan). *WSEAS Transactions on Business and Economics*, 20, 2692–2699.
12. Antimova, R., Nawijn, J., & Peeters, P. (**2012**). The awareness/attitude-gap in sustainable tourism: A theoretical perspective. *Tourism Review*, 67(3), 7–16.
13. Kuznetsova, I., Okagbue, H., Plisova, A., Noeva, E., Mikhailova, M., & Meshkova, G. (**2020**). The latest transition of manufacturing agricultural production as a result of a unique generation of human capital in new economic conditions. *Entrepreneurship and Sustainability Issues*, 8(1), 929–944.
14. Akhmetshin, E., Nemtsev, A., Shichiyakh, R., Shakhov, D., & Dedkova, I. (**2024**). Evolutionary algorithm with deep learning based fall detection on Internet of Things environment. *Fusion: Practice and Applications*, 14(2), 132–145.
15. Bowman, K. S. (**2011**). Sustainable tourism certification and state capacity: Keep it local, simple, and fuzzy. *International Journal of Culture, Tourism and Hospitality Research*, 5(3), 269–281.
16. Zolfani, S. H., Sedaghat, M., Maknoon, R., & Zavadskas, E. K. (**2015**). Sustainable tourism: A comprehensive literature review on frameworks and applications. *Economic Research-Ekonomska Istraživanja*, 28(1), 1–30.
17. Kaján, E., & Saarinen, J. (**2013**). Tourism, climate change and adaptation: A review. *Current Issues in Tourism*, 16(2), 167–195.
18. Bokayev, Z., Kaishatayeva, A., Dzhulamanov, T., Aisin, M., & Maukenova, A. (**2023**). Development of marketing tools to raise funds for green projects: Experience of the Republic of Kazakhstan. *Journal of Environmental Management & Tourism*, 14(3), 689–697.
19. Yong, J. Y., Yusliza, M. Y., Ramayah, T., & Fawehinmi, O. (**2019**). Nexus between green intellectual capital and green human resource management. *Journal of Cleaner Production*, 215, 364–374.
20. Abdullaev, I., Prodanova, N., Bhaskar, K. A., Lydia, E. L., Kadry, S., & Kim, J. (**2023**). Task offloading and resource allocation in IoT-based mobile edge computing using deep learning. *Computers, Materials & Continua*, 76(2), 1463–1477.
21. Bombiak, E. (**2019**). Green human resource management–the latest trend or strategic necessity? *Entrepreneurship and Sustainability Issues, 6*(4), 1647.
22. Kashina, E., Yanovskaya, G., Fedotkina, E., Tesalovsky, A., Vetrova, E., Shaimerdenova, A., & Aitkazina, M. (**2022**). Impact of digital farming on sustainable development and planning in agriculture and increasing the competitiveness of the agricultural business. *International Journal of Sustainable Development & Planning, 17*(8).

23. Abdullaev, I., Prodanova, N., Ahmed, M. A., Lydia, E. L., Shrestha, B., Joshi, G. P., & Cho, W. (**2023**). Leveraging metaheuristics with artificial intelligence for customer churn prediction in telecom industries. *Electronic Research Archive, 31*(8), 4443–4458.
24. Guerci, M., Montanari, F., Scapolan, A., & Epifanio, A. (**2016**). Green and nongreen recruitment practices for attracting job applicants: Exploring independent and interactive effects. *The International Journal of Human Resource Management, 27*(2), 129–150.
25. Abdullayev, I., Osadchy, E., Shcherbakova, N., & Kosorukova, I. (**2025**). An innovative approach to financial distress prediction using relative weighted neutrosophic valued distances. *International Journal of Neutrosophic Science,* 1, 370–370.
26. Tang, G., Chen, Y., Jiang, Y., Paillé, P., & Jia, J. (**2018**). Green human resource management practices: Scale development and validity. *Asia Pacific Journal of Human Resources, 56*(1), 31–55.
27. Morozova, T., Akhmadeev, R., Lehoux, L., Yumashev, A. V., Meshkova, G. V., & Lukiyanova, M. (**2020**). Crypto asset assessment models in financial reporting content typologies. *Entrepreneurship and Sustainability Issues, 7*(3), 2196.
28. Chreif, M., & Farmanesh, P. (**2022**). Applying green human resource practices toward sustainable workplace: A moderated mediation analysis. *Sustainability, 14*(15), 9250.
29. Pavlenko, O., Irtyshcheva, I., Kramarenko, I., Stehnei, M., Boiko, Y., Nadtochiy, I., ... & Uliana, R. (**2023**). Design management of an innovative model of sustainable development and regional features in conditions of global turbulence.
30. Lambekova, A., Nurgalieva, A., Syzdykova, E., Zhanibekova, G., & Aff, J. (**2017**). Development of internal audit. *Journal of Advanced Research in Law and Economics, 8*(8), 2483–2489.
31. Seriyev, B. A., Beisov, E. Z., Kopbassarova, G. K., & Nurmaganbet, E. T. (**2013**). Current problems of state regulation of leasing relations. *Life Science Journal, 10*(12).
32. Ospangaliyev, A., Sarsekova, D., Mazarzhanova, K., Dosmanbetov, D., Kopabayeva, A., Obezinskaya, E., ... & Mukanov, B. (**2023**). Assessment of the degree of landscaping in Astana, Kazakhstan, and recommendations for its development. *Caspian Journal of Environmental Sciences, 21*(3), 585–594.
33. Nasiyev, B. (**2016**). The study of the processes, degradation factors and the selection of crops for the restoration of bioresources capacity of the grassland of semi-desert zones. *Research Journal of Pharmaceutical, Biological and Chemical Sciences, 7*(3), 2637–2646.
34. Yusliza, M. Y., Norazmi, N. A., Jabbour, C. J. C., Fernando, Y., Fawehinmi, O., & Seles, B. M. R. P. (**2019**). Top management commitment, corporate social responsibility, and green human resource management: A Malaysian study. *Benchmarking: An International Journal, 26*(6), 2051–2078.
35. Abdullayev, I., Akhmetshin, E., Kosorukova, I., Klochko, E., Cho, W., & Joshi, G. P. (**2024**). Modeling of extended osprey optimization algorithm with Bayesian neural network: An application on Fintech to predict financial crisis. *AIMS Mathematics, 9*(7), 17555–17577.
36. Osadchy, E., Abdullayev, I., Bakhvalov, S., Klochko, E., & Tagibova, A. (**2024**). Jellyfish search algorithm-based feature selection with optimal deep learning for predicting financial crises in the economy and society. *Fusion: Practice & Applications, 14*(2).
37. Popov, V., Serekpaev, N., Zharlygasov, Z., Stybaev, G., & Ansabaeva, A. (**2017**). Adaptive technology of environmentally-friendly production of legumes in the dry steppe zones. *Journal of Central European Agriculture.*
38. Shah, M. (**2019**). Green human resource management: Development of a valid measurement scale. *Business Strategy and the Environment, 28*(5), 771–785.
39. Dumont, J., Shen, J., & Deng, X. (**2017**). Effects of green HRM practices on employee workplace green behavior: The role of psychological green climate and employee green values. *Human Resource Management, 56*(4), 613–627.
40. Ansabayeva, A., & Akhmetbekova, A. (**2024**). Biological products sway the yield and quality traits of chickpea (*Cicer arietinum L.*) in a continental climate. *SABRAO Journal of Breeding & Genetics, 56*(1).
41. Rayner, J., & Morgan, D. (**2018**). An empirical study of 'green' workplace behaviors: Ability, motivation, and opportunity. *Asia Pacific Journal of Human Resources, 56*(1), 56–78.
42. Jabbour, C. J. C., & de Sousa Jabbour, A. B. L. (**2016**). Green human resource management and green supply chain management: Linking two emerging agendas. *Journal of Cleaner Production, 112,* 1824–1833.
43. Hooi, L. W., Liu, M. S., & Lin, J. J. (**2022**). Green human resource management and green organizational citizenship behavior: Do green culture and green values matter? *International Journal of Manpower, 43*(3), 763–785.
44. Umrani, W. A., Channa, N. A., Yousaf, A., Ahmed, U., Pahi, M. H., & Ramayah, T. (**2020**). Greening the workforce to achieve environmental performance in the hotel industry: A serial mediation model. *Journal of Hospitality and Tourism Management, 44,* 50–60.
45. Utelbayev, Y. A., Abysheva, G. T., Bazarbayev, B. B., Mussynov, K. M., & Tahsin, N. T. (**2021**). Development and spread of diseases in spring camelina (*Camelina sativa* (L.) Grantz) when using various treatments. *OnLine Journal of Biological Sciences, 21*(4), 288–298.
46. Вечкинзова, Е. А., & Дарибекова, А. С. (**2021**). Проблемы и перспективы развития туристической отрасли Казахстана. *Креативная экономика, 15*(8), 3403–3420.
47. Borodina, M., Idrisov, H., Kapustina, D., Zhildikbayeva, A., Fedorov, A., Denisova, D., ... & Solovyanenko, N. (**2023**). State regulation of digital technologies for sustainable development and territorial planning. *International Journal of Sustainable Development & Planning, 18*(5).
48. Bagratuni, K., Kashina, E., Kletskova, E., Kapustina, D., Ivashkin, M., Sinyukov, V., ... & Hajiyev, E. (**2023**). Impact of socially responsible business behavior on implementing the principles of sustainable development (Experience of large business). *International Journal of Sustainable Development & Planning, 18*(8).
49. Rakhimzhanova, G., Maidyrova, A., & Kocherbaeva, A. (**2023**). Human capital management based on the principles of green economy and the creation of green jobs for sustainable territorial development. *Journal of Environmental Management and Tourism, 14*(5), 2319–2327.
50. Bekezhanov, D., Kopbassarova, G., Zhunispayeva, A., Urazymbetov, T., & Seilkassymova, R. (**2021**). Environmental problems of international legal regulation of transboundary pollution. *Journal of Environmental Management and Tourism, 12*(2), 392–405.

51. Bugubaeva, A., Chashkov, V., Mamikhin, S., Kuprijanov, A., Kuanyshbaev, S., Nugmanov, A., ... & Joldassov, A. (**2023**). Assessment of the state of vegetation cover of recultivated dumps of uranium deposits in Northern Kazakhstan. *Brazilian Journal of Biology, 83*, e279616.
52. Nasiyev, B., Nurgaziev, R., Irmulatov, B., Shegenov, S., Sattybaeva, Z., Syzdykova, G., ... & Alenov, Z. (**2023**). Improving degraded pastures in Northern Kazakhstan through moldboard plowing and grass seed mixtures. *International Journal of Design & Nature and Ecodynamics, 18*(5), 1207–1213.
53. Kairova, S. G., Esimova, D. D., & Malikova, F. M. (**2018**). Sustainable eco-tourism in Kazakhstan. *Nauka i turizm: Strategii vzaimodeistviya, 8*, 22–28.
54. Yernazarova, G. I., Ramazanova, A. A., Turasheva, S. K., Almalki, F. A., Hadda, T. B., Orazova, S. B., ... & Amangeldinova, M. E. (**2023**). Extraction, purification and characterisation of four new alkaloids from the water plant *Pistia stratiotes*: POM analyses and identification of potential pharmacophore sites. *Research Journal of Pharmacy and Technology, 16*(7), 3410–3416.