УДК 33.2964
doi:10.21685/2227-8486-2022-3-3

ECONOMIC FEASIBILITY OF SUSTAINABLE INNOVATIONS

R.D. Doszhan[1], A.S. Zhuparova[2], A.K. Kozhakhmetova[3], L.N. Semerkova[4]

[1, 2, 3] Al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan
[4] Penza State University, Penza, Russia
[1] raiguldos2011@gmail.com, [2] aziza_z@mail.ru,
[3] aselekdream@gmail.com, [4] semerkova55@yandex.ru

Abstract. *Background*. The theme of sustainability is widely supported in Kazakhstan at the state level and by large national companies, however, for medium and small enterprises this area requires awareness. Companies do not always understand the value of sustainable development innovations and how they can be effectively managed. This research describes the experiences of 7 organizations and, in particular, their efforts to introduce sustainable-driven innovations in Kazakhstan. This article is aimed at a study of medium and small companies in Kazakhstan that focused on the development of sustainable development innovations and reveal the barriers to development. *Materials and methods*. The study uses a qualitative research method, which is based on collecting and analysing qualitative data from semi-structured interviews. *Results*. Research results reveal that only 18 % of those surveyed were supported financially by government assistance. In addition, 87 % of respondents were faced with market and development barriers. 2 of investigated enterprises show 1st level of maturity while 5 of them correspond to the requirements of the 2nd level. *Conclusions.* The set of recommendations based on the modified Adams et al model will contribute to the creation of a sustainable development policy for small and medium-sized enterprises.

Keywords: sustainable development, sustainable development innovations, company management, development barriers, environmental sustainability

Acknowledgments: the data for the publication were collected with the financial support of the grant project AP08053346 "Research of sustainable development innovations from the point of view of their economic feasibility and building effective enterprise management in the Republic of Kazakhstan".

For citation: Doszhan R.D., Zhuparova A.S., Kozhakhmetova A.K., Semerkova L.N. Economic feasibility of sustainable innovations. *Modeli, sistemy, seti v ekonomike, tekhnike, prirode i obshchestve = Models, systems, networks in economics, technology, nature and society*. 2022;(3):42–59. (In Russ.). doi:10.21685/2227-8486-2022-3-3

ЭКОНОМИЧЕСКАЯ ЦЕЛЕСООБРАЗНОСТЬ ИННОВАЦИЙ УСТОЙЧИВОГО РАЗВИТИЯ

Р. Д. Досжан[1], А. С. Жупарова[2], А. К. Кожахметова[3], Л. Н. Семеркова[4]

[1, 2, 3] Казахский национальный университет имени аль-Фараби, Алматы, Республика Казахстан
[4] Пензенский государственный университет, Пенза, Россия
[1] raiguldos2011@gmail.com, [2] aziza_z@mail.ru,
[3] aselekdream@gmail.com, [4] semerkova55@yandex.ru

Аннотация. *Актуальность и цели.* Тема устойчивого развития широко поддерживается в Казахстане на государственном уровне и крупными национальными компаниями, однако для средних и малых предприятий эта область требует осведомленности. Компании не всегда понимают ценность инноваций в области устойчивого развития и то, как ими можно эффективно управлять. В этом исследовании описывается опыт семи организаций и их усилия по внедрению инноваций, основанных на устойчивом развитии, в Казахстане. Проводится исследование средних и малых компаний Казахстана, которые сосредоточились на разработке инноваций в области устойчивого развития и выявили барьеры на пути развития. *Материалы и методы.* Используется метод качественного исследования, который основан на сборе и анализе качественных данных из полуструктурированных интервью. *Результаты.* Результаты исследования показывают, что только 18 % опрошенных получили финансовую поддержку от правительства. Кроме того, 87 % респондентов столкнулись с рыночными барьерами и барьерами развития. Два исследованных предприятия демонстрируют 1-й уровень зрелости, в то время как пять из них соответствуют требованиям 2-го уровня. *Выводы.* Набор рекомендаций, основанный на модифицированной модели Адамса и др., будет способствовать созданию политики устойчивого развития для малых и средних предприятий.

Ключевые слова: устойчивое развитие, инновации устойчивого развития, управление компании, барьеры развития, экологическая устойчивость

Финансирование: данные для публикации были собраны при финансовой поддержке грантового проекта AP08053346 «Исследование инноваций в области устойчивого развития с точки зрения их экономической целесообразности и построения эффективного управления предприятием в Республике Казахстан».

Для цитирования: Досжан Р. Д., Жупарова А. С., Кожахметова А. К., Семеркова Л. Н. Экономическая целесообразность инноваций устойчивого развития // Модели, системы, сети в экономике, технике, природе и обществе. 2022. № 3. С. 42–59. doi:10.21685/2227-8486-2022-3-3

Introduction

The development of more effective approaches to the use of natural resources, including energy, water, and fuel will contribute to the formation of an era of fundamentally new economic development (Porter & Kramer (2006), Prahalad (2009), Hart (1995, 2007), and Brown (2011)). The UN in its reports indicates the importance of greening the economy as the engine of the new Millennium. The World Business Council for Sustainable development's (WBCSD) program 2050 also focuses on promoting business through sustainable development innovations and a holistic transformation of the enterprise management system from raw material supply to finished products.

Thus, environmental sustainability has become a visual problem globally. According to reports of the Worldwide Fund for Nature (Tucker et al., 2010), the scale of consumption of natural resources in the world, especially in countries with developing economies, is becoming so large that to meet the needs of the population of the earth by 2050, a new planet will be needed. Governments and States around the world understand that the use of natural resources needs to change. Those companies that have responded to the call from states to implement sustainable development innovations (sustainability-led innovation) have already noted significant positive changes. Process and product innovations aimed at saving natural resources, waste processing, lean attitude to all types of costs bring significant economic benefits to the company. According to experts, the global market of

green products and services is estimated today at 3.2 billion undeveloped dollars. In other words, sustainable development innovations are not only important for the preservation of the natural balance but also useful for enterprises as new business models.

Due to the relative newness of sustainable business ideas in developing countries (Cherkasova & Rasadi, 2017), there is a lack of studies about sustainable innovations of small and medium-sized companies in such countries. Despite the fact that the world at the highest level discusses the need for sustainable development – at the level of enterprises remain unsolved questions about how to transfer business management in the green sphere.

At the moment, in countries with developing economies, the theory of business process management in general and innovation management, in particular, is largely based on foreign literature and the best foreign practices of developed countries. The theory presented in foreign textbooks is based on the study of the experience of international companies such as Microsoft, Apple, Ford, Nestle, Coca-Cola, and similar. The experience of developed countries and advanced companies is certainly important for studying the basic foundations of business management. However, the promotion of national enterprises and the training of national personnel is not always possible on the basis of foreign experience, as the realities and the level of economic development of international companies do not always correspond to national opportunities. It should be noted that Kazakhstan has its own advanced innovative companies, the experience of which should be described and used in business practice. The study surveyed Kazakhstani companies that were among the first to introduce sustainable development innovations in the Republic. In addition, the activities of these enterprises meet the main directions of the Concept of Kazakhstan for the transition to a "green" economy. These companies have an experience that is important to study, analyze, summarize, and present in a theoretical model and methodological recommendations for the development of other companies in Kazakhstan.

It should also be noted that today the world is interested in innovation from emerging economies. In light of the theory of Reverse innovation (Govindarajan & Euchner, 2012), Jugaad innovation (Radjou et al., 2012), and The Lean Start-Up (Ries, 2011) – the experience of companies engaged in innovation in countries such as Kazakhstan, is particularly relevant. Foreign researchers wonder what technologies and innovative ideas are emerging in emerging economies and whether reverse technology transfer is possible. How processes are built in innovative companies of countries with developing businesses when resources are limited and you have to improvise. What can be learned from the leading enterprises of Kazakhstan, which have developed their own approaches to the management of sustainable development innovations (sustainability-led innovation).

It should be noted that for Kazakhstan it is important to study the application of innovations in the field of sustainable development at the enterprise level. In Kazakhstan, all enterprises are involved in the public sector, which makes it difficult to develop sustainable innovations as in developed countries.

Therefore, the main goal of the study is to analyze the implementation of sustainable innovations at enterprises in Kazakhstan and to reveal the barriers to the development.

More specifically, this study contributes to the literature in several ways: First, to learn about sustainable innovation development in enterprises in Kazakh-

stan. Second, to identify the barriers to the development of sustainable innovations in this country. Third, to measure the maturity level of sustainable innovations in Kazakhstani SMEs and to reveal how to improve sustainable innovation development according to a theoretical model by Adams et al. (2016).

The rest of the study is organized as follows: Section 1 introduces the relevance and goals of the study. Section 2 presents the theoretical background for the study. Section 3 explains the methodology of the research. Section 4 contains the results and discussion. The conclusion of the study summarizes the results and shows the direction for further research.

Literature review

The concept of sustainable development was introduced into business in the so-called Brundtland report, published by the United Nations (Brundtland, 1987). Sustainable development is defined in the report as "meeting current needs without compromising the needs of future generations". Currently, the topic of sustainable development innovations is discussed in foreign literature by various authors (Bradbury & Clair, 1999; Cowell et al., 1999; Freeman et al., 1973; Hart, 1995; Toscher et al., 2020).

Meadows & Randers (2012) in research "The limits to growth" argued that in many areas we had "overshot" our limits, or expanded our demands on the planet's resources and sinks beyond what could be sustained over time. The main challenge identified in Beyond the Limits was how to move the world back into the sustainable territory. Perez-Carmona (2013) noted that the common argumentative line was that technological progress and the market mechanism could prevent scarcity and pollution from constituting a substantial limitation on long-term economic growth. According to Freeman et al. (1973) annual 2 % improvement in technological progress would postpone collapsing indefinitely. To avoid these results pollution control must obviously be competitive with growth rates of pollution and consumption so that even if the rapid growth will be rapid it will be balanced (Freeman et al., 1973).

Therefore, the role of sustainable development of companies is certainly important. Earlier Hart (1995) proposed that strategy and competitive advantage in the coming years will be rooted in capabilities that facilitate environmentally sustainable economic activity–a natural-resource-based view of the firm. Furthermore, the transformation of an organization’s ability to innovate and excel was enacted in The Natural Step, where an entrepreneurial organization that has significantly advanced the movement toward environmental sustainability in Sweden (Bradbury & Clair, 1999).

There is evidence in the literature that since the early 1990s, the mining industry has shown increasing interest in social and environmental issues and it has been seeking ways to integrate the challenges of sustainability into its core business practices (Hilson & Murck, 2000). Cowell et al. (1999) noted that in recent years mining industry has attempted to address its social and environmental responsibilities. So sustainable development has been included in the agendas of the mining industry (Cowell et al., 1999), and various national and international initiatives have developed frameworks for sustainability.

The management of knowledge and technology for sustainable production has been discussed in a report for the European Commission (Jansson & Phaal, 2002; Phaal et al., 1999). This report reviews the contribution that technology and

technology management can make toward the transition to more sustainable modes of production. According to (Senge et al., 2001), true learning organizations stand out by championing business models that foster sustainable growth. There is evidence that there are signs of increasing convergence between the concepts of organizational learning and sustainability. So the only long-term and sustainable competitive advantage of a learning organization is the ability to meet the challenges of the tri-dimensional triple-bottom-line approach to sustainable development. Therefore, a comprehensive definition of enterprise sustainability implies that it is the "conceptualization, development and production of goods and services that meet the needs of the current generation but do not reduce the economic, social and environmental opportunities in the long term" (Paramanathan et al., 2004).

A Group of authors also note the importance of a sustainable environment. For example, Porter & Kramer (2006) argue that not only do people from surrounding society hold organizations accountable for their actions but so do the media, governments, and activists as well. Moreover, other authors provide numerous examples of business model innovation for sustainability (Biggs et al., 2015; Chouinard & Stanley, 2012; Esty & Winston, 2009; Manning et al., 2011; Senge et al., 2001; Tukker et al., 2010).

However, despite the fact that the number of articles seems significant, publications are examples from practice on the topic. At the same time, there is a significant deficit in terms of basic research and generalizing theoretical models. In this regard, for example, Silvestre & Ţîrcă (2019) emphasize that "it is important to identify and assess the boundaries and factors behind novel sustainability perspectives such as Sustainable Innovation 2.0 and its "double bottom line" approach in terms of refining them and testing them empirically". For further research projects on the topic, authors Yuan & Zhang (2020) propose to focus on research on "relationships between flexible environmental policies and technological innovation, technological innovation, and industrial sustainable development".

According to Global Sustainable Development Report (Messerli et al., 2019), developed countries need to change their production and consumption patterns, including limiting the use of fossil fuels and plastics, and encouraging public and private investments that align with the SDGs. But the situation for developing countries, where the main goals include stronger social protection floors is needed to ensure food security and nutrition.

For many years, Kazakhstan has been working in this direction: the year of "Environmental Protection" was declared, the Environmental code was adopted, the Council for sustainable development was established, the partnership program "Green bridge" was launched, and various government programs were adopted, etc. One of the key points can be considered the Message of the President to the people of Kazakhstan in the new Strategy "Kazakhstan-2050", where the Government was tasked with the transition from a "brown economy" ta o "green economy". A Concept for the transition to a "green" economy was developed and signed on May 30, 2013. First of all, the Concept presents a list of priorities, mainly aimed at reforming certain sectors of the economy and laying the Foundation for deep systemic changes in order to transition to a new formation of the economy while minimizing the burden on the environment and the degradation of natural resources. Despite there being made steps towards sustainable development in 2019 on the realization of the 2030 Agenda sustainable development goals ranks Kazakhstan in 77th place out of 162 countries. Most of the post-soviet countries such as Estonia (10^{th} place), Slovenia (12^{th} place), Belarus (23^{rd} place), and Latvia (24^{th} place) received better results in achieving sustainable goals.

According to estimates, by 2050, in Kazakhstan, the transformation of the "green economy" will further increase GDP by 3 %, create more than 500 thousand new jobs, create new industries and services, and provide high standards of quality of life for the population everywhere. To date, a high rate of transformation in the field of public policy has already been set. "Strategy – 2050" and other strategic policy documents set ambitious goals: the share of alternative and renewable electricity should reach 50 % by 2050, and in energy efficiency, there is a task to reduce the energy intensity of GDP by 25 % by 2020 compared to the initial level of 2008; in agriculture, the task is to raise the productivity of agricultural land by 1.5 times by 2020; reduction of the current level of carbon dioxide emissions in the electric power industry to 40 % by 2050; 100 % coverage of the population with the removal of solid waste and bringing the level of recycling to 50 % by 2050. Achieving these goals will require a significant change in the existing trajectory of development of the economy of Kazakhstan, which proves the relevance of the research topic.

Methodology

Research model

The model of C. A. Adams (2013) (Fig. 1) was used as a theoretical basis. This model builds the logic and structure of the study on the management of sustainability-led innovation of innovative companies in Kazakhstan.

Fig. 1. Sustainable innovation development conceptual model Source: developed by the authors and concept adopted from Adams et al. (2013)

Following C. A. Adams (2013), the study developed a conceptual model that describes the sustainable-innovation development process in Figure 1. The model is based on three different stages. Stage 1 explains the operational level of the company, which is characterized by incremental improvements towards sustainability, such as increasing the energy efficiency of processes or recycling products with improved resource efficiency. Most organizations that introduce innovations such as environmental efficiency can be characterized as "first-tier organizations". The second stage

of the SOI model focuses on sustainability at the organizational level, considering not only new products and services but also creating value. This can be both autonomous innovation activities at the department or divisional level, and activities at the company and stakeholder level. A typical example would be a firm's transition from a product-based business model to a service-based business model.

The third stage of SOI has the following context: the "ideal state", which probably could not exist without changes in non-organizational institutions and factors; that is, national policy, legal, macroeconomic, regulatory, etc. The third level of SOI goes beyond creating new products and services, focusing on system-wide innovation that affects the company, its suppliers, the market, and other institutions.

Data collection and research sample

In order to explore the development of sustainable innovations, this study uses a qualitative research method, which is based on collecting and analyzing qualitative data from semi-structured interviews (Gill et al., 2008; Gioia et al., 2013; Silverman, 2005; Smith et al., 1994). Specifically, were conducted an interview survey from seven enterprises located in three regions of Kazakhstan: Almaty, Atyrau, and Shymkent. The choice of enterprises is based on their innovative activities in the field of sustainable innovation development and the development of a green economy.

In order to collect the primary data from surveys and interviews, the study develops questionnaires that are based on previous research. The developed questionnaire and the interview conducted meet all ethical standards.[1] In the first round, questionnaires were sent to 152 enterprises, and 32 out of 152 responded to the questionnaire. The last question of the survey was "would *you like to participate in the interview*" and 8 enterprises out of 32 responded positively. Finally, the study got one respondent (interviewee) from each except 2 from 2 enterprises. Table 1 provides details about each enterprise and its profile.

The main purpose of the survey was the following:

1) assess the development of sustainable principles and their impact on the development of Kazakhstani enterprises;

2) select enterprises that apply sustainable development innovations for further in-depth research.

The survey was organized on the Google Docs platform, from 09/12/2020 to 09/28/2020. As a result, responses were received from 31 respondents. Descriptive analysis, regression analysis and Pearson's Chi-square were used as the method of processing the questionnaire.

Methods of expert assessments were conducted through interviews based on protocols developed separately for senior, middle and lower management. Depending on the size of the company, it is expected to collect from ten to fifteen interviews lasting from 1 to 2 hours each.

Finally, 7 companies were chosen for case study analysis. Each case (object of research) is based on interviews with senior, middle, and lower management of

[1] All participants were informed in advance that the research is purely voluntary. The collection of personal data was carried out in accordance with the legislation of the Republic of Kazakhstan in force in this area. Approval was received for conducting a qualitative and quantitative study from the Ethics Committee of Al-Farabi KazNU No. 2513 dated 13.08.2020.

the company. Interviews were recorded on tape, with the consent of the interviewees. All interviews were transcribed and translated into English. The main results of the primary data collection were translated into English and analyzed using Nvivo10 software.

Table 1

Research Sample Details (enterprises profile)

Name of company	Size (SML?)	Interviewee profile (age range, position etc)	Number of respondents
NGO "Origins of Good"	Medium	Director	1
LLP "Magnum Cash & Carry"	Large	CFO	1
AIFC	Large	Chief Manager	1
Kuntech LLP	Small	Director	1
Uly Dala LLP	Small	Director, Project Manager	2
Kazakh National University named after al-Farabi	Large	Vice-rector	1
Center for Green Technologies "Arnasay"	Small (15 employers)	Director	1

Thus, it is planned to conduct a fundamental study of these seven well-known Kazakhstani enterprises that are actively implementing sustainable development innovations, based on the model of Adams et al. (2013, Fig. 1) in accordance with the Concept of the transition of the Republic of Kazakhstan to a "green economy". Based on the results of data collection, it was planned to describe the processes of sustainable development innovation management (sustainability-led innovations) in the companies selected for research using case study methods (Eisenhardt et al., 2016; Yin, 2003) and other qualitative approaches (Silverman, 2005; Smith et al., 1994).

Results and discussion

Analysis of Kazakhstani practice of sustainable innovation management

The gradation by the number of employees showed that the majority of the respondents who took part in the survey turned out to be small organizations with up to 100 people, but there were also large organizations with a small share of participation, which had 1000 or more employees. This fact shows that small and medium-sized enterprises are more flexible than large companies in adopting sustainable principles. During the survey, representatives of small organizations were open and showed interest in participating at all stages of the project, which facilitated the process of organizing the survey. The participation of the state among the respondents was about 10 %, and the share of private capital exceeded eight times. The answers to the questions "is the company creating a sustainable environment" and "is their sustainable development moving" answered approximately the same, thus about 90 percent of the respondents understand and accept the problems and principles of sustainability in their activities. The same segment of enterprises assessed the impact of the transition to sustainable development positively. For the

rest about 10 percent, sustainability is not the main driving force. If we consider the survey participants by industry, more than half of the respondents belong to the service sector. Producers took one third, the rest came from trade, NGOs took a small share.

Most of the respondents belong to private organizations of small or medium-sized businesses. If half received support from external funds, the rest is supported by its own funds. Organizations that received government support noted the special role of funding research projects, State programs "Rukhani Zhangyru", "Kazakhstan 2030"; Concept for the transition to "green" technologies, the Initiative of the First President of the Republic of Kazakhstan N. Nazarbayev "Green Economy"; projects "Green bridge through generations", "10 theses on new paradigms to ensure sustainable development and human security" President of the Republic of Kazakhstan K.K. Tokayeva, "Sanaly urpak-zharkyn bolashak", the introduction in some regions of the practice of waste distribution and the culture of environmental preservation, the development of a new environmental code. The influence of government initiative can be considered as one of the factors contributing to the development of an innovative sustainable company. This statement was confirmed in the question of the factors that influenced the development of sustainable innovation. The factors were grouped according to the nature of the responses.

The current trend (including one's own desire to care for the environment) on sustainability was reflected in the decision of 52 % of the respondents. 18 % of those surveyed decided to establish a sustainability model with government assistance. While resource conservation led to the sustainability of 4 % of companies, the laws of competition dictated 18 % of respondents to conduct business with sustainability in mind.

Along with an optimistic view of government initiatives in support of sustainability, there are respondents who point to factors that hinder the development of sustainability such as bureaucracy, lack of awareness, and lack of information. This is 37 % of respondents who believe that the state does not support or insufficiently supports the sustainability of companies.

As the analysis shows, in general, the respondents give a positive assessment of their practice of transition to sustainable development. However, there are several companies that are neutral. The development of innovative products and technologies was reflected in the answers of half of the respondents, the rest acquire the current model and adapt it to their practice. Among them were companies that are both developing and adopting sustainability practices. About 10 % of respondents are not involved in development and acquisition, as this is due to a lack of funds for such work. Sustainable development companies indicated (75 % of respondents) that they reward their suppliers for being green and caring for the environment. This initiative is reflected in the requirements for packaging that minimize risks to the environment, in the requirements for the quality of goods, and in the disposal of substandard or expired products in accordance with the sanitary norms and rules that are laid down in contracts.

In the 21st question of the questionnaire, respondents shared a number of alternative ways of doing business. According to the respondents, the working models are the introduction of "green" technologies, renewable energy sources and solar dryers, drip irrigation, spiritual practices, remote operation, the introduction of separate waste collection and delivery to collection points, automated business processes based on the principle of self-management, e-commerce, online ordering of goods and delivery, sales by phone or through your own website, market place-

ments, use of the experience of industry leaders, b2c, customization, affiliate programs, and remote work during quarantine.

In general, companies are satisfied with their activities since the introduction of sustainable development innovations, but only 9 % (2 respondents) were dissatisfied. However, according to the survey, one of them received a good financial result and indicates an increase in the company's performance. Negative answers from the second respondent regarding financial results and development, in general, may be related to the organizational form of his activities, not related to financial transactions.

It is noteworthy that not a single respondent assessed negatively the dynamics of changes in activity over the past 3 years, on the contrary, the answers were positive. The responses of the surveyed organizations were in the following key: the level of sales and assortment increased, the quality of products improved, the geography expanded, the number of tree planting and promotion of the product, as well as the image, increased, employees became more literate in the field of tourism and environmental initiatives, communication with partners has become stronger, new proposals have appeared, new awards have been received, large socially significant projects have been implemented, some companies declared themselves to be organizers of significant sessions at major venues like AEF-2018, 2019, as well as a number of international events at EXPO -2017 and others.

As a result, the data obtained from the interviews will be processed and the results of the descriptive analysis will be applied in the development of a model of innovation for sustainable development at Kazakhstani enterprises. In addition, a causal logistic regression model was built, which shows which of the questionnaire questions affect the key research question that determines the intention of companies to engage in the sustainable development of their activities.

Table 2

Sustainable innovation practice

Question	Answer	
Attributes of sustainable innovation	Yes	No
Economical to practice Sustainable innovation (%)	30 %	70 %
Is the practice of sustainable development driving the development of your company?	90 %	10 %
Can you tell us how the changes in business and the transition to sustainable development affected positively the development of your company?	76 %	23 %
Does your company develop innovative green technologies and processes by itself?	90 %	10 %
Do you encourage your suppliers to be environmentally friendly by offering them incentives (for example, investing in technology development to develop sustainable practices)?	71 %	29 %
Are you using alternative working conditions for your employees, such as telecommuting, for travel time, travel costs, and energy consumption?"	78 %	22 %
Your company's performance has changed for the better since the introduction of sustainable innovation practices [successful development of radically new or significantly improved products or services]	90 %	10 %

Based on the interview with these companies, were found the following results:

– developing new green products or services, or improving existing ones and encouraging suppliers to take care of the environment have a positive effect on working towards a sustainable society, environment, and business;

– the practice of sustainable development is the driving force behind the development of such.

Factors affecting the development of an innovatively sustainable environment and the model of sustainable development innovations at Kazakhstani enterprises.

The analysis of the results of the survey of 31 respondents and the analysis of the cases of the selected 8 sustainable companies made it possible to identify the factors that hinder the development of sustainable innovations. When structuring the factors, the main areas of barriers are clarified and attention should be paid to them when initiating regulatory acts and stimulating a business environment focused on sustainable development innovations. These factors are indicated in Table 3. Along with these factors, the results of the analysis of expert data made it possible to identify positive factors contributing to the development of innovation sustainability among enterprises. There are few such factors, but they are solid, and they tirelessly stimulate companies to create a business environment, forming rational and effective cases for the good of society and the achievement of personal goals. Private investment and government support under various programs and projects can be identified as the main drivers of sustainability. The global trend (including one's own desire to care for the environment) significantly affects the implementation of innovative sustainable business projects.

Table 3

Identified barriers to the development of sustainable innovation

Systemic factors	Barriers to sustainable innovation
1. State-regulated factors	No penalties for instability
	Insufficient incentives from the state
	Bureaucracy and indifference to the problems of sustainability of local administrative structures
	Weak legal framework regulating sustainable development
	Lack of financing instruments for sustainable development
2. Factors dictated the market	Import and smuggling of harmful products and technologies into the country
	Market competition
	Macroeconomic instability of the economy
	Weak demand for sustainable goods
3. Development factors	Underdeveloped infrastructure for sustainable projects
	Lack of radical innovation in product and process development
	Low return on sustainable products and processes
	Lack of competent specialists in this area
	Various risks manifested in the course of work
4. Communication factors	Low public awareness
	Lack of promotion of sustainable development and necessary information

A theoretical review of the relevant literature, the study of foreign experience, the designation of the research concept, then the systematization and generalization of the results of the analysis, the description of cases, the analysis of factors, i.e., the combination of these actions creates an understanding around the current model of sustainable development of domestic enterprises based on an innovative component. Kazakhstan's practice of sustainability still has to struggle with the modern challenges and realities of the country's economic development. In order for the global agenda to be reflected in solving local problems, the global trend toward sustainability and rational consumption of resources has become a common practice in domestic enterprises. Successful innovation-driven sustainability models should be adapted.

As mentioned in the theoretical part of the study, while developing a model of innovation for sustainable development, the study relied on the research of Adams (2013), who studied more than 20 models of sustainable development focused on innovation (Fig. 1). The study consisted of a comprehensive and detailed analysis of sources that allowed us to determine what kind of innovative activities enterprises are implementing in order to become sustainable. According to the model developed by the research, companies can group their innovations according to three dimensions. These are parameters such as the focus of innovation on technology or the needs of society, the company's assessment of its relation to society, and the degree of innovation diffusion within the company.

Enterprises can use this model to assess innovative products and technologies, as well as ongoing activities, taking into account individual developments or the organization as a whole. The sustainable development model consists of three stages. In the first stage, the company makes small adjustments to its business model with a focus on social and environmental issues, thereby reducing the harmful effects on the environment as a result of its activities. The second stage involves the development of new products and technologies for the needs of society or for the benefit of the environment, which fits the description of the "good deeds" model. The third stage of sustainable enterprise, being part of the ecosystem, solves systemic issues, thereby bringing benefits and changing society for the better.

If the study ranks the companies under study according to this model, the result will show different levels of innovation activity, from insignificant to radical forms, showing the degree of maturity of innovation initiatives depicted in Table 4.

Table 4

Maturity model for innovation based on sustainable development

Level Maturity	Name	Characteristics of innovation	Practice examples
1	2	3	4
0	Passive / Lack of innovative activity	No activity or ‘cosmetic’ statements of intent based on public relations	–
1	Improving innovation	Concept-based innovation, waste disposal, reduced footprint of existing processes, increased efficiency	Compliance with regulations, adherence to regulations such as FSC Greening, green processes

End of the Table 4

2	Opportunity Driven Innovation / New Products / Processes	Development of new products, processes, and services that open up an innovation space	New technologies, solar
3	System-level innovation	Creation of new models at the system level that contributes to other fields.	Flora re-proclaims itself as an integrated 'green' company

Further, the data of the surveyed companies were inserted on the map as shown in Table 5 The results of the analysis showed that no organization corresponds to the zero level of innovative activity, i.e. the lack of innovative activity was not revealed in any of them, which proves the correctness of our choice. Three projects of Kuntech LLP and Magnum Cash & Carry LLP meet the first maturity level, improving their innovations on the way to sustainable development.

Table 5

Map of the maturity degree and SDG compliance of innovative projects

Maturity level	Company	Description of necessary activities
0	–	–
1	Kuntech LLP Magnum Cash & Carry LLP	Radical changes, including the redefinition of core business policy focused on causing less harm to the environment, and green strategy development
2	Center for Green Technologies "Arnasay", NGO "Origins of Good", AIFC, Uly Dala LLP, Al-Farabi KazNU	Development of new supportive directions and opportunities for the creation of green products, processes, and services that open up an innovation space. Strengthening sustainable values of stakeholders

Thus, for Kuntech LLP and Magnum Cash & Carry LLP business model changes are a more important element for the transition from the first to the second level of maturity.

From a policy perspective, for the Center for Green Technologies "Arnasay", NGO "Origins of Good", AIFC, Uly Dala LLP, and Al-Farabi KazNU it is important to focus on an organizational transformation strategy that involves collaborating with immediate stakeholders in vertical integration along the value chain to mutually create value through new products, services, or business models. These activities may help to listed above companies to increase their maturity level from 3 to 4 and manage sustainable innovations in a proper manner.

Conclusion

Based on the results of the study of all seven research objects, the maturity level of sustainable innovations was measured. 2 of these companies show the 2nd

level of maturity, and 5 companies show the 3rd level of maturity. The highest level of maturity wasn't achieved by any company. Therefore, the study states that the development of sustainable innovations in small and medium-sized businesses in Kazakhstan is under development. As derived from the study the reason is a big group of barriers like state-regulated, market, development, and information forces. The revealed barriers list will help policymakers to prepare a plan for future development during their decision-making process.

Research findings inform companies about the way how they could further develop sustainable innovation management systems within their regions of operations.

Generalizing conclusions will be made to the questions of what model of sustainable development allows:

– develop the company through sustainability-led innovation;

– make changes at the system level in the management of the company;

– open up new prospects for economic growth.

The derived model will be the key result of the study and can be used:

– for further policy development in the field of sustainable economic development;

– other enterprises in the methodological recommendations;

– universities for training and retraining.

Research limitations are a narrow focus on one country during data collection and a small sample size. Therefore, further research may be concentrated on many countries' sustainable development activities and cover other aspects of this research topic.

References

1. Adams C.A. Sustainability reporting and performance management in universities: Challenges and benefits. *Sustainability Accounting, Management and Policy Journal.* 2013.
2. Adams R., Jeanrenaud S., Bessant J. et al. Sustainability oriented innovation: A systematic review. *International Journal of Management Reviews*. 2016;18:180–205.
3. Biggs E.M., Bruce E., Boruff B. et al. Sustainable development and the water–energy–food nexus: A perspective on livelihoods. *Environmental Science & Policy*. 2015;54:389–397.
4. Bradbury H., Clair J.A. Promoting sustainable organizations with Sweden's natural step. *Academy of Management Perspectives*. 1999;13:63–74.
5. Brundtland G.H. Our common future – Call for action. *Environmental Conservation*. 1987;14:291–294.
6. Cherkasova V., Rasadi D. Earnings quality and investment efficiency: evidence from Eastern Europe. *Review of Economic Perspectives*. 2017;17:441.
7. Chouinard Y., Stanley V. *The responsible company*. Patagonia books, 2012:158.
8. Cowell S.J., Wehrmeyer W., Argust P.W., Robertson J.G.S. Sustainability and the primary extraction industries: theories and practice. *Resources Policy*. 1999;25:277–286.
9. Eisenhardt K., Graebner M., Sonenshein S. From the Editors Grand Challenges And Inductive Methods: Rigor Without Rigor Mortis. *Academy of Management Journal*. 2016;59:1113–1123.
10. Esty D.C., Winston A. *Green to gold: How smart companies use environmental strategy to innovate, create value, and build competitive advantage*. John Wiley & Sons, 2009.

11. Freeman C.H., Jahoda M., Pavitt K.L.R. *Thinking About the Future: A Critique of the Limits to Growth*. Chatto & Windus, 1973.
12. Gill P., Stewart K., Treasure E., Chadwick B. Methods of data collection in qualitative research: interviews and focus groups. *British Dental Journal*. 2008;204:291–295.
13. Gioia D.A., Corley K.G., Hamilton A.L. Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods*. 2013;16:15–31.
14. Govindarajan V., Euchner J. Reverse innovation. *Research-Technology Management*. 2012;55:13–17.
15. Hart O. Corporate governance: some theory and implications. *The Economic Journal*. 1995;105:678–689.
16. Hilson G., Murck B. Sustainable development in the mining industry: clarifying the corporate perspective. *Resources Policy*. 2000;26:227–238.
17. Jansson P.M., Phaal R.J. Progress towards sustainable production: industrial and academic perspectives. *Proceedings 10th Int. Conf. of the Greening of Industry Network*. 2002.
18. Manning R., Valliere W., Anderson L. et al. Defining, measuring, monitoring, and managing the sustainability of parks for outdoor recreation. *Journal of Park and Recreation Administration*. 2011;29.
19. Meadows D., Randers J. *The limits to growth: the 30-year update*. Abingdon: Routledge, 2012.
20. Messerli P., Murniningtyas E., Eloundou-Enyegue P. et al. *Global sustainable development report 2019: the future is now–science for achieving sustainable development*. 2019.
21. Paramanathan S., Farrukh C., Phaal R., Probert D. Implementing industrial sustainability: the research issues in technology management. *R&D Management*. 2004;34:527–537.
22. Perez-Carmona A. Growth: a discussion of the margins of economic and ecological thought. *Transgovernance*. 2013;83–161.
23. Phaal R., Jansson P.M., McNamee L.T. et al. *Management of Knowledge and Technology for Sustainable Production. Final Report for DG XII, European Commission, by Cambridge University*. Cambridge, 1999.
24. Porter M.E., Kramer M.R. The link between competitive advantage and corporate social responsibility. *Harvard Business Review*. 2006;84:78–92.
25. Radjou N., Prabhu J., Ahuja S. *Jugaad innovation: Think frugal, be flexible, generate breakthrough growth*. John Wiley & Sons, 2012.
26. Ries E. *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. New York: Crown Publishing Group, 2011.
27. Senge P.M., Carstedt G., Porter P.L. Next industrial revolution. *MIT Sloan Management Review*. 2001;42:24–38.
28. Silverman D. Instances or sequences? Improving the state of the art of qualitative research. *The State of the Art of Qualitative Research in Europe*. 2005;6.
29. Silvestre B.S., Ţîrcă D.M. Innovations for sustainable development: Moving toward a sustainable future. *Journal of Cleaner Production*. 2019;208:325–332.
30. Smith L.M., Denzin N., Lincoln Y. Biographical method. *The SAGE*. 1994.
31. Toscher B., Dahle Y., Steinert M. Get Give Make Live: An empirical comparative study of motivations for technology, youth and arts entrepreneurship. *Social Enterprise Journal*. 2020;16:179–202. doi:10.1108/SEJ-03-2019-0016
32. Tucker G., Kettunen M., McConville A. et al. *Valuing and conserving ecosystem services: a scoping case study in the Danube Basin*. London; Brussels, 2010.
33. Tukker A., Cohen M.J., Hubacek K., Mont O. Sustainable consumption and production. *Journal of Industrial Ecology*. 2010;14(1):1–3.
34. Yin R.K. Design and methods. *Case Study Research*. 2003;(3).

35. Yuan B., Zhang Y. Flexible environmental policy, technological innovation and sustainable development of China's industry: The moderating effect of environment regulatory enforcement. *Journal of Cleaner Production*. 2020;243.

Список литературы

1. Adams C. A. Sustainability reporting and performance management in universities: Challenges and benefits // Sustainability Accounting, Management and Policy Journal. 2013.
2. Adams R., Jeanrenaud S., Bessant J. [et al.]. Sustainability oriented innovation: A systematic review // International Journal of Management Reviews. 2016. Vol. 18. P. 180–205.
3. Biggs E. M., Bruce E., Boruff B. [et al.]. Sustainable development and the water–energy–food nexus: A perspective on livelihoods // Environmental Science & Policy. 2015. Vol. 54. P. 389–397.
4. Bradbury H., Clair J. A. Promoting sustainable organizations with Sweden's natural step // Academy of Management Perspectives. 1999. Vol. 13. P. 63–74.
5. Brundtland G. H. Our common future – Call for action // Environmental Conservation. 1987. Vol. 14. P. 291–294.
6. Cherkasova V., Rasadi D. Earnings quality and investment efficiency: evidence from Eastern Europe // Review of Economic Perspectives. 2017. Vol. 17. P. 441.
7. Chouinard Y., Stanley V. The responsible company. Patagonia books, 2012. 158 p.
8. Cowell S. J., Wehrmeyer W., Argust P. W., Robertson J. G. S. Sustainability and the primary extraction industries: theories and practice // Resources Policy. 1999. Vol. 25. P. 277–286.
9. Eisenhardt K., Graebner M., Sonenshein S. From the Editors Grand Challenges And Inductive Methods: Rigor Without Rigor Mortis // Academy of Management Journal. 2016. Vol. 59. P. 1113–1123.
10. Esty D. C., Winston A. Green to gold: How smart companies use environmental strategy to innovate, create value, and build competitive advantage. John Wiley & Sons, 2009.
11. Freeman C. H., Jahoda M., Pavitt K. L. R. Thinking About the Future: A Critique of the Limits to Growth. Chatto & Windus, 1973.
12. Gill P., Stewart K., Treasure E., Chadwick B. Methods of data collection in qualitative research: interviews and focus groups // British Dental Journal. 2008. Vol. 204. P. 291–295.
13. Gioia D. A., Corley K. G., Hamilton A. L. Seeking qualitative rigor in inductive research: Notes on the Gioia methodology // Organizational Research Methods. 2013. Vol. 16. P. 15–31.
14. Govindarajan V., Euchner J. Reverse innovation // Research-Technology Management. 2012. Vol. 55. P. 13–17.
15. Hart O. Corporate governance: some theory and implications // The Economic Journal. 1995. Vol. 105. P. 678–689.
16. Hilson G., Murck B. Sustainable development in the mining industry: clarifying the corporate perspective // Resources Policy. 2000. Vol. 26. P. 227–238.
17. Jansson P. M., Phaal R. J. Progress towards sustainable production: industrial and academic perspectives // Proceedings 10th Int. Conf. of the Greening of Industry Network. 2002.
18. Manning R., Valliere W., Anderson L. [et al.]. Defining, measuring, monitoring, and managing the sustainability of parks for outdoor recreation // Journal of Park and Recreation Administration. 2011. Vol. 29.
19. Meadows D., Randers J. The limits to growth: the 30-year update. Abingdon : Routledge, 2012.

20. Messerli P., Murniningtyas E., Eloundou-Enyegue P. [et al.]. Global sustainable development report 2019: the future is now–science for achieving sustainable development. 2019.
21. Paramanathan S., Farrukh C., Phaal R., Probert D. Implementing industrial sustainability: the research issues in technology management // R&D Management. 2004. Vol. 34. P. 527–537.
22. Perez-Carmona A. Growth: a discussion of the margins of economic and ecological thought // Transgovernance. 2013. P. 83–161.
23. Phaal R., Jansson P. M., McNamee L. T. [et al.]. Management of Knowledge and Technology for Sustainable Production. Final Report for DG XII, European Commission, by Cambridge University. Cambridge, 1999.
24. Porter M. E., Kramer M. R. The link between competitive advantage and corporate social responsibility // Harvard Business Review. 2006. Vol. 84. P. 78–92.
25. Radjou N., Prabhu J., Ahuja S. Jugaad innovation: Think frugal, be flexible, generate breakthrough growth. John Wiley & Sons, 2012.
26. Ries E. The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. New York : Crown Publishing Group, 2011.
27. Senge P. M., Carstedt G., Porter P. L. Next industrial revolution // MIT Sloan Management Review. 2001. Vol. 42. P. 24–38.
28. Silverman D. Instances or sequences? Improving the state of the art of qualitative research // The State of the Art of Qualitative Research in Europe. 2005. Vol. 6.
29. Silvestre B. S., Ţîrcă D. M. Innovations for sustainable development: Moving toward a sustainable future // Journal of Cleaner Production. 2019. Vol. 208. P. 325–332.
30. Smith L. M., Denzin N., Lincoln Y. Biographical method // The SAGE. 1994.
31. Toscher B., Dahle Y., Steinert M. Get Give Make Live: An empirical comparative study of motivations for technology, youth and arts entrepreneurship // Social Enterprise Journal. 2020. Vol. 16. P. 179–202. doi:10.1108/SEJ-03-2019-0016
32. Tucker G., Kettunen M., McConville A. [et al.]. Valuing and conserving ecosystem services: a scoping case study in the Danube Basin. London ; Brussels, 2010.
33. Tukker A., Cohen M. J., Hubacek K., Mont O. Sustainable consumption and production // Journal of Industrial Ecology. 2010. Vol. 14, iss. 1. P. 1–3.
34. Yin R. K. Design and methods // Case Study Research. 2003. № 3 (9.2).
35. Yuan B., Zhang Y. Flexible environmental policy, technological innovation and sustainable development of China's industry: The moderating effect of environment regulatory enforcement // Journal of Cleaner Production. 2020. Vol. 243.

Информация об авторах / Information about the authors

Райгул Дукенбайкызы Досжан
PhD, ассоциированный профессор,
Казахский национальный университет имени аль-Фараби
(Республика Казахстан, г. Алматы, проспект аль-Фараби, 71)
E-mail: raiguldos2011@gmail.com

Rajgul D. Doszhan
PhD, associate professor,
Al-Farabi Kazakh National University
(71 al-Farabi avenue, Almaty, Republic of Kazakhstan)

Азиза Сериковна Жупарова
PhD, ассоциированный профессор,
Казахский национальный университет имени аль-Фараби
(Республика Казахстан, г. Алматы, проспект аль-Фараби, 71)
E-mail: aziza_z@mail.ru

Aziza S. Zhuparova
PhD, associate professor,
Al-Farabi Kazakh National University
(71 al-Farabi avenue, Almaty, Republic of Kazakhstan)

Асель Кошербаевна Кожахметова
PhD, старший преподаватель
кафедры бизнес-технологий,
Казахский национальный университет
имени аль-Фараби
(Республика Казахстан, г. Алматы,
проспект аль-Фараби, 71)
E-mail: aselekdream@gmail.com

Asel K. Kozhahmetova
PhD, senior teacher of the sub-department
of business technologies,
Al-Farabi Kazakh National University
(71 al-Farabi avenue, Almaty,
Republic of Kazakhstan)

Любовь Николаевна Семеркова
доктор экономических наук, профессор,
профессор кафедры маркетинга,
коммерции и сферы обслуживания,
Пензенский государственный университет
(Россия, г. Пенза, ул. Красная, 40)
E-mail: semerkova55@yandex.ru

Lyubov N. Semerkova
Doctor of economical sciences, professor,
professor of the sub-department
of marketing, commerce and service,
Penza State University
(40 Krasnaya street, Penza, Russia)

Авторы заявляют об отсутствии конфликта интересов /
The authors declare no conflicts of interests.

Поступила в редакцию/Received 21.09.2022
Поступила после рецензирования/Revised 17.10.2022
Принята к публикации/Accepted 19.10.2022