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## **ENVIRONMENTAL MANAGEMENT OF QUALITY: THE MODERN VISION OF SUSTAINABLE BUSINESS**

**Abstract:** *The paper studies the concept of environmental management of quality as the basis for the sustainable development of business in modern conditions. The importance of integration and agreement of principles of quality management with the key approaches of sustainable development, such as corporate social responsibility (CSR), green supply chains management (GSCM), ESG management, and the circular economy (CE), is emphasized. Large attention is paid to the issues of agreement of quality management systems and standards of environmental stability to achieve synergy in the ecological, social, and economic dimensions.*

*This research is based on the multidisciplinary methodological approach, which combines the concepts of management, ecology, and sustainable development to develop an integrated environmental management model of quality. We emphasize the necessity to implement sustainable practices into the activities of business through compliance with the standards of the group ISO 14001, ISO 9001, ISO 26000, and others, which are given as the key tools of raising product quality, with simultaneous resolution of environmental and social challenges.*

*Results obtained demonstrate that the proposed integration not only ensures high quality of products but also coordinates business processes with global goals of sustainable development. Using innovative tools and approaches, including digitalization, eco-design, etc., companies can raise the effectiveness of using resources, reduce the pressure on ecology, and improve the economic results of activities and competitive positions.*

**Keywords:** *environmental management, quality management, sustainable development, CSR, GSCM, ESG, Circular economy, ISO standards.*

## **1. Introduction**

The development of business is one of the most dynamic and flexible processes. It requires constant attention to challenges and threats and demands the search for new opportunities and their realisation, so it

depends a lot on external conditions and the environment of existence. Forces that influence business include consumer interests of buyers, competitive dynamics, state and institutional environment, natural resources, and resource support. Given the main goal of business – receiving profit –

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correct reaction to the above factors determines the success, effectiveness, and competitiveness of entrepreneurial structures.

For a long time, the criterion of maximisation of profit did not have any alternatives. The ability to receive profit due to entrepreneurial activities was a factor of motivation and an element of the economic mechanism of redistribution of resources and the basis of the entrepreneurial cycle. At present, the system of criteria for the success of business is more diverse, which is connected with a change in the paradigm of public development. According to the modern ideas of success and progress, the main goal of business is sustainable functioning in the long term. This approach combines economic, social, and environmental components. Modern business is often oriented toward not only financial results but also responsibility before society and nature.

In the context of quality management, the notion of sustainable development acquires a new value. It goes beyond the traditional treatment of quality as the correspondence of products and services to consumer demands and covers a wider range of processes, including public and global values. Due to this, the notion of quality is integrated into the global processes of green transition and social justice, which is manifested through the implementation of the elements of environmental management in business with emphasis on the fight against climate change, preservation of biodiversity and non-renewable resources, reduction of environmental pollution, and ensuring social justice.

Thus, environmental management of quality stimulates the transition to business models which minimise the negative influence on the environment, optimise the use of resources, and contribute to sustainable consumption. Within these activities, comprehensive managerial activities are ensured – aimed at building long-term

partnership relations with stakeholders, ensuring the development and implementation of innovative technologies for energy and resource saving, and active communication with consumers to promote the Sustainable Development Goals. As a result, environmental management of quality, from the position of sustainable development, covers all economic processes of the company and allows ensuring the high quality of products at all stages of the life cycle, including design, production, turnover, and disposal.

## **2. Methodological basis of the research**

The problems studied in this paper are complex. The considered processes belong to different scientific and public spheres of activities. Thus, the methodology of this paper is implemented through a comprehensive multidisciplinary approach, which includes tools and methods of management, economics, ecology, quality management, and the concept of sustainable development in its most current manifestations. The combination of conceptual provisions of the above spheres is based on the UN Sustainable Development Goals and offers a list of concepts, theories, and views that provide effective tools to solve social and environmental problems of humanity through the transformation of business models within ESG management, social responsibility, circular economy, supply chains management, innovations in quality management and design, interrelations with stakeholders, digitalisation of quality management systems, institutionalisation of the global standards of quality management, etc. This approach conforms to the complexity of the studied processes and forms the basis for systemic analysis and development of recommendations to integrate environmental practices into business activities.

Integration of the environmental vision with the systems of quality management is one of the most relevant directions of studying environmental management of quality. This approach takes into account the historical development of the concepts of quality management and their evolution from technical inspection and control to systemic quality management and interaction with external factors (Hamid et al., 2019), including reaction to the challenges of sustainable development (Sousa & Voss, 2002). Modern studies dwell on the combination of quality management systems with approaches and concepts of sustainable development and environmental management, including supply chain management (Jum'a et al., 2024; Akhmatova et al., 2022). At the same time, they elaborate on the institutionalisation of environmental management through implementation of standards aimed at sustainable development, environmental sustainability, innovations management (Finkbeiner, 2014; Badhan, 2020), development of social responsibility and ethics in business (McAdam & Leonard, 2003; Nunes, 2017), combined with the systems of quality management, principles of the circular economy, and sustainable development (Nowicki et al., 2020; Siva et al., 2016). Comprehensive studies of the integration processes of environmental management and quality systems are set onto regional, industry, and global specifics and challenges (Abaidullayeva et al., 2023; Kazambayeva et al., 2023), as well as current innovative processes, including digitalisation (Aichouni et al., 2024; Matias-Correia et al., 2024).

Based on this, the research methodology is based on analytical and synthetic tools connected with the detection of factors that influence the development of environmental management of quality in modern conditions and their coordination in the context of studying the factors of product quality support with observance of the sustainable development principles. Thus, the scientific

basis of the research is determined by the three main aspects: sustainable development as a system of values and priorities of mankind's development, quality management as a factor of competitiveness due to constant improvement of production processes based on consideration of the interests of consumers and market, and environmental management as a tool of resolving environmental problems or mitigating them due to reformatting of the mechanisms of corporate management. These aspects are flexible and are realised through formed concepts and approaches, including the circular economy, ESG management, corporate responsibility of business, supply chain management, etc. They are based on a system of management standards, which determine the priorities, goals, and tools of each approach.

Disclosure of the essence of the above aspects requires the use of a range of approaches of scientific cognition, including systemic, integration, process, and innovative approaches, as well as application of the universal methodological tools, including the methods of analysis, synthesis, comparative analysis, and modelling, as well as empirical methods and means of generalisation and comparison. Due to the use of these tools, there emerges the possibility to assess the role of environmental management in quality management and achievement of the Sustainable Development Goals. The results obtained enable us to critically assess the effectiveness of environmental management and offer directions for its improvement based on its interaction with other tools and approaches that conform to values and principles of environmental management and are its components, or, vice versa, include its elements in their structure.

### **3. Experimental setting and methods**

The concept of sustainable development is acquiring the status of the dominating

system of values and principles, which define the conditions of the functioning of business and society in the conditions of limited resources and space and formation of the threats to climate and demographic, security, and energy situations. In these conditions, an important factor of development is responsibility, which is manifested in the attitude towards business and products, nature and society. This responsibility has a multi-level character and is formed at the level of personality (personal responsibility), social group (morality), and state (legal responsibility). Hence, responsibility includes voluntary actions (objective behaviour), aimed at sustainable development, which are determined by personal beliefs or conform to moral norms, and forced actions (subjective behaviour), which are performed given the availability of moral or legal norms and the presence of the system of control and punishment or judgement (Krivokapić & Stefanović, 2020).

Tools of environmental management of quality allow combining responsibility of all levels due to the use of factors of institutional behaviour in the form of a set of standards and forming an entire complex of approaches and concepts, which ensure execution of a certain part of tasks with sustainable development and ensuring product quality when doing business. The study of the problems of coordinating quality management in business with sustainable development and environmental responsibility is characterised by significant reservations. They rarely cover more than two or three concepts and approaches, focusing the most on the combination of the principles of total quality management (TQM) and one of such approaches as supply chain management, ESG management, corporate social responsibility, etc. in this context, integration capabilities of environmental management and quality management, combined with approaches to sustainable development, are rarely viewed within one methodological framework.

However, different concepts and approaches to sustainable development have similar features and values, which allows unifying them within one system of views.

Integration of conceptual provisions of quality management systems, environmental management, and concepts and approaches of sustainable development based on joint values and goals allows for the transformation of the paradigm of management at which environmental responsibility acquires the top-priority status and requires the correction of the connected processes through the wide use of the corresponding regulatory and administrative levers, standards, and decisions. Using this approach allows companies to achieve double goals in the form of a reduction of negative environmental consequences of their activities and an increase in competitiveness. Reaching such results due to the reduction of the volume of waste, transition to alternative sources of energy, reduction of the use of natural resources, etc., companies conduct activities that conform to the UN Sustainable Development Goals. This allows improving their image receiving access to additional sources of financing, developing their innovative potential, and forming organisational culture based on ethical principles and sustainable values.

The theoretical and information basis of the research is formed by normative and legal documents, non-financial corporate reporting, and standards of the sphere of environmental management, sustainable development, quality management, and related processes. Information sources are viewed from the position of their integration into one model of environmental management of quality. This approach allows studying the processes of quality management, resolution of environmental problems, and ensuring sustainable development of business in their interconnection, mutually strengthening their positive influence and neutralizing the restraining processes.

The objective of this paper is to generalise the systems of views, approaches, concepts, and theories of product quality management from the position of environmental management and the Sustainable Development Goals. The main focus of the research lies in the integration of the above provisions to search for factors and levers of mutual strengthening of environmental, qualitative, and sustainable processes in business due to a rational combination of regulatory provisions, managerial tools, and institutional support.

The main assumption of this research is that supplementing the system of environmental management with the tools of quality management, combined with the use of wide approaches to sustainable development, has a larger potential for qualitative transformations.

#### **4. Results**

The notion of quality has a deep philosophical meaning. It has a positive connotation, which allows using it to characterise the desired state of anything, or as a measure expressing the level of correspondence to this state. From the position of philosophical treatment, quality management consists of a set of principles that are mutually strengthened and have internal support of the system directly or through sets of tools, practices, and techniques, which contribute to long-term effectiveness and productiveness of activities (Sousa & Voss, 2002).

Very often, quality is associated with perfection. Understanding of quality in business has a comprehensive character, which formed as a result of the long evolutionary process. According to this, the initial understanding of quality concerned only product and focused on inspection and control, which was realised within the Quality Control (QC) concept. This treatment of quality was popular in the first half of the 20th century. The important

aspects of management at this stage were the striving towards a decrease in the number of defects and share of products with defects. The measurement of quality in these conditions was standards, which determined the normative parameters of the products.

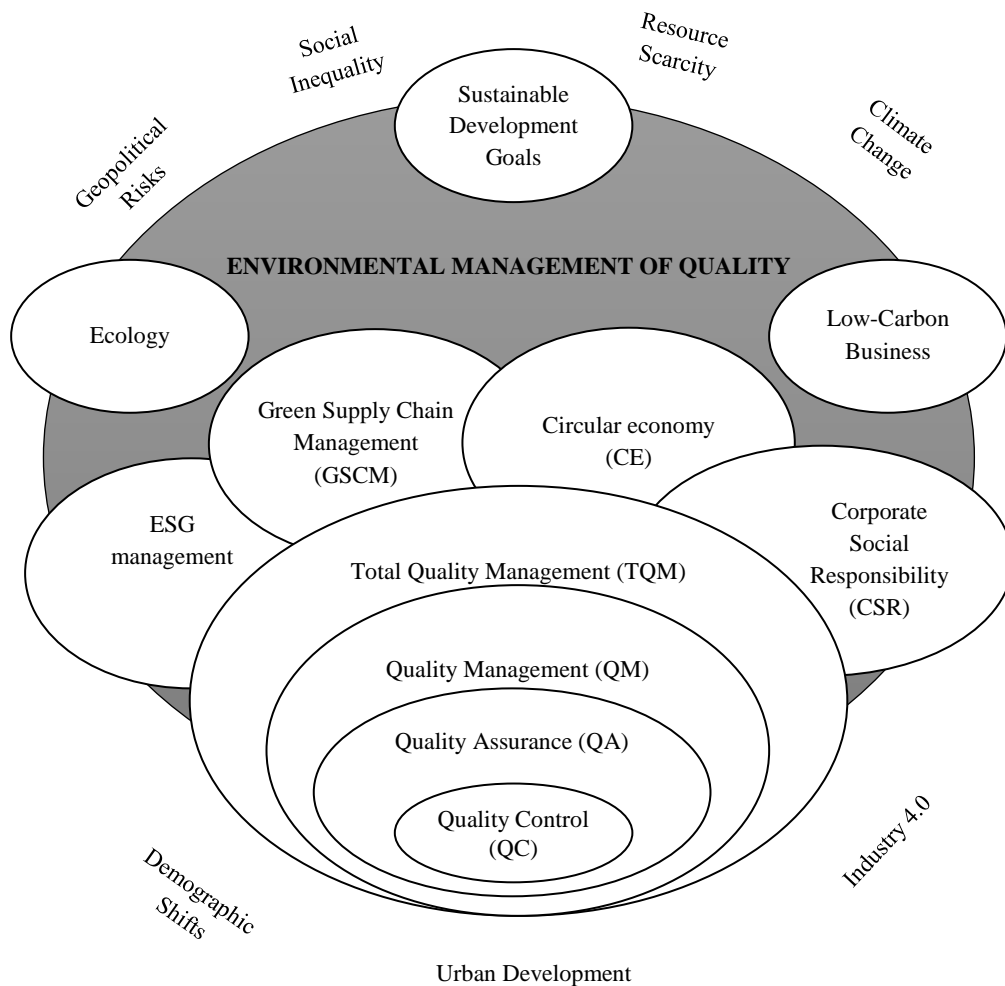
The next stage of evolution is connected with the Quality Assurance (QA) concept. Since the 1950s, the key aspect of quality management was the desire to prevent the manufacturing of low-quality products and defects. This approach was aimed at the use of standards not only for products but also for the process of production with a focus on prevention and detailed records of the processes. An important result at this stage was the development and implementation of standards of the ISO 9001 type, aimed at disseminating the best practices of quality management through the expansion and scaling of clear consecutive algorithms and processes.

Large progress in quality management was achieved at the next stage when quality was viewed as a joint responsibility of all structural departments of the organisation. This vision was realised as a response to the complication of business processes through the system approach and formation of the Quality management (QM) concept. Apart from actions aimed at determining the parameters of quality and processes, this concept allowed coordination of the activities of all departments (sub-systems) of management to ensure product quality and integrate them with the risk management system. The main indicators of successfulness of such quality management systems were the level of customer satisfaction and effectiveness of production and distribution processes.

The dominating concept of quality management today is realised through Total Quality Management (TQM) – a system approach in management, oriented towards constant and continuous quality management through attention to all processes and elements of the system. This approach goes

beyond direct operations of quality assurance and covers the sphere of assessment of the level of consumer satisfaction with company products. It is integrated with the stakeholder's concept, according to which it attracts the company's suppliers, consumers, shareholders, and various social groups to the company's quality management. The effectiveness of this system of quality management is manifested through the level

of personnel involvement, innovative activity, benchmarking, etc. (Hamid et al., 2019). Modern quality management is a complex multi-level system, which includes different levels and components of management. Within it, the evolution of the interpretation of "quality" from its narrow internal understanding to the wide perception of the interconnection with processes in the external environment is reflected.



**Figure 1.** Integration model of environmental management of quality in the system of sustainable business

Source: Formed by the authors based on (Aichouni et al., 2024; Akhmatova et al., 2022; Jum'a et al., 2024; Hamid et al., 2019; McAdam & Leonard, 2003; Siva et al., 2016; United Nations, 2024

The system of a company's quality management forms the internal core of the integration model of environmental management of quality in the system of sustainable business (Figure 1). Given the wide involvement of processes that are connected with sustainable development and ecology, expansion of the system of total quality management in the context of the research takes place through integration with such scientific approaches to sustainable development as Corporate Social Responsibility (CSR) (since the 1990s), Green Supply Chain Management (GSCM) (since late 1990s), ESG management (since 2004), and Circular Economy (CE) (since the 2010s). These approaches are based on the UN Sustainable Development Goals, environmental processes, and low-carbon production. Thus, environmental management of quality is a complex integration model, which is based on classical theories of quality management and is integrated with comprehensive concepts aimed at ensuring the green transition of business.

The model includes also important processes that surround it and determine risks and opportunities. These are climate change and decarbonisation, formation and development of Industry 4.0, demographic change and limited resources, organization and social inequality, and geopolitical instability (Abaidullayeva et al., 2023) and risks. Each of these factors determines possible directions for the development of environmental management of quality. This concerns primarily threats of geopolitical instability, reduction of resources, and climate change, as well as Industry 4.0 and urbanization.

A separate group of tools of this nature is found in Industry 4.0. They offer a completely new resolution to all the above problems through an increase in the level of information support and substantiation of managerial decisions, better personalization of business solutions, the use of new materials and technologies in the sphere of

food support, quality control, communications, etc.

The complexity of the above model requires more detailed consideration of its elements and blocks and their in-depth analysis. Thus, the basis of sustainable business is determined by the UN Sustainable Development Goals. They structure the directions for responsible activities of entrepreneurs, adopt the indicators of development, and offer tools to ensure them. The main directions of responsible activities of business in this context are formed by such components as tackling climate change or adaptation to changes, reduction of environmental pollution, preservation of resources and biodiversity, just distribution of resources and achievement of social justice, inclusion and development (United Nations, 2024). The key directions of environmental sustainability, according to the proposed model, are ecology and low-carbon production.

Multidimensionality of environmental management of quality is manifested in different approaches to sustainable development, in which is one of the components. Thus, within CSR, environmental management is one of the components of responsible management, which is set on the promotion of the ideas of social responsibility and ethics of business, as well as its interaction with stakeholders. From the position of ESG management, environmental management is an equal part, which characterises the environmental component (E), with the social (S) and governance (G) components. GSCM-based approach fully discloses the specifics of environmental quality management, but presents a wider concept and puts emphasis on the life cycle of products, optimisation of logistics, and interaction with suppliers. The circular economy, in turn, is a system approach to economic development, which is not limited by environmental management, ensuring the influence on economic and social processes and actively using technological innovations.

Each of the above approaches has a high level of institutionalisation in the form of generalisation of its provisions in the form of one or several standards. Within the offered model, the key standard is ISO 14001:2015 – the basic standard of environmental management. Its main parameters are aimed at the transformation of business according to environmental demands and sustainable development, which is combined with business effectiveness. They are presented by the following elements:

- The use of the system approach to management, stimulation of constant improvement of environmental indicators, and reduction of negative pressure on the environment;
- The use of the PDCA (Plan-Do-Check-Act) cycle as the main principle and basic tool for constant improvement of the company's effectiveness;
- Identification of the spheres and manifestations of the impact of each separate business on the environment and the set of tools that reduce the negative consequences of this impact (PECB, 2015).

Due to this, standard ISO 14001:2015 ensures an increase in the competitive position of the company, growth of the level of its innovative activity, improvement of the image in society, reduction of environmental risks of the company and environment of its functioning, and optimisation of costs due to reduction of waste and its recycling, as well as growth of the level of energy security (Badhan, 2020). This standard is integrated with other regulatory acts of the type, which action is aimed at environmental, social, and business stability and sustainable development. In aggregate, this group of standards strengthens the potential of the integration model of environmental management of quality in the system of sustainable business and covers the spheres of quality management, social responsibility

of business, the circular economy, and management of supply chains, waste, risks, and innovations.

The circular economy standard BS 8001:2017 defines principles and rules for the effective consumption of resources, their reuse, and recycling. It is based on the system approach, innovations, and cooperation, as well as the principle of three Rs (Reduce, Reuse, Recycle), which allows for bringing down to the minimum the volumes of the use of resources, dealing with the factor of their depletion, reducing the volume of waste, and raising the economic effectiveness of business (Nowicki et al., 2020).

Provisions of social responsibility in the ISO 26000:2010 standard determine recommendations for the positive social influence of business on society within the observance of human rights, sustainable labour relations, consumer rights protection, etc. The document also contains recommendations for environmentally responsible activities and ethics. In this context, principles of social responsibility allow integration of environmental and socially responsible activities of the company, contributing to the improvement of its image in the market (Nunes, 2017).

Standards of supply chain management ISO 20400:2017 offer instructions for implementing principles of sustainable development in supply chains. These algorithms are oriented towards ensuring environmental, social, and economic sustainability at all stages of the supply chain, as well as the possibility of tracking the movement of each material flow from the place of its appearance to the place of final consumption or disposal (Staal et al., 2018). Requirements for non-financial reporting within ESG GRI Standards allow measuring the effectiveness of environmental management of companies, ensuring accountability and transparency of business to stakeholders and society (Luo & Tang, 2022).



Assessment of life cycle according to the standards ISO 14040 and ISO 14044 focuses business priorities on understanding the consequences of their activities as to the influence on the environment. According to this, they determine the principles of comprehensive waste management and environmental design, which are set at the stage of product design and allow reducing the necessity for correction of waste management at each stage of the product life cycle (Finkbeiner, 2014). Innovations management according to ISO 56002:2019 provides recommendations and instructions regarding innovations management, with a focus on minimisation of the influence of business on the environment. They offer rational eco-design, improve product quality, and contribute to the effectiveness of energy and resource use (Hidayawanti et al., 2024).

Standards of risk management ISO 31000:2018 offer effective tools to reduce risks, mitigate their influence, and raise the level of resilience of businesses against threats. One of the directions of these standards is opposing environmental risks, including climate change and restricted access to resources, as well as observance of environmental demands and regulations (Ratter et al., 2024).

Quality management based on the standard ISO 9001:2015 ensures complex demands, principles, and categories as to the functioning of production and distribution sub-systems of the company. From the position of environmental management, this standard allows integrating of environmental demands into the system of quality management at the level of values and goals, as well as direct processes and procedures of management. Thus, the standard allows ensuring a high level of quality, which is combined with environmental sustainability and effectiveness of the company (Matias-Correia et al., 2024).

Thus, within the integration model of environmental management of quality in the system of sustainable business, factors and

approaches to quality management and environmental resilience management are imposed on a stable institutional basis, presented by the totality of standards of the sphere of management of social responsibility, product life-cycle, supply chain, innovations, risks, etc. Due to this, companies can achieve a comprehensive result and a high level of effectiveness within environmental management of product quality. From the position of four fundamental concepts of the model that cover corporate social responsibility, green supply chain management, ESG management, and the circular economy, their influence on environmental management of quality could be identified by aspects of quality, environmental influence, and sustainable development. Ensuring its specific influence, due to the combination of values, goals, and tools within the interaction of the above approaches, integrated results are also achieved

Each approach ensures versatile influence on all three components: quality, ecology, and sustainability. CSR offers a formalisation of environmental processes, facilitates the improvement of environmental indicators, and allows for the balance of economic and environmental indicators in the long term. GSC Management optimises the management of environmental quality due to the coordination of different stages of promotion of material flow, improving the quality of resources and ensuring a higher level of resource conservation. ESG management offers tools for measuring and reporting for companies that work in the direction of environmental, social, and managerial sustainability. The circular economy is focused on the cyclicity of production and recycling, as well as rational management of waste and resources.

Integrated results of the model are formed due to synergy and emergence of factors and are manifested through substantial quality changes in the form of an increase in the effectiveness of using resources, reduction of the negative influence on the ecosystem,

reduction of climate change, better adaptation to them, improvement of companies' image, an increase in competitive advantages, etc., which is achieved against the background of constant and continuous improvement.

## **5. Discussion**

The study of environmental management of quality from the position of modern understanding of sustainable development of business focuses on its value and ability to combine environmental responsibility, corporate resilience, and production quality. This vision has a large scientific potential. However, it is peculiar for a range of reservation and discussion aspects, which require further research and substantiation.

It is necessary to elaborate on coordination of standards which action is aimed at ensuring sustainable development and resolution of environmental problems. These standards belong to different groups and often seek opposite values. Thus, certain demands for product quality do not conform to the principles of the circular economy and sustainable development, and some environmental norms reduce the economic effect of companies and restrict the possibilities of ensuring product quality. Development and application of the unified approach to these standards in the context of environmental management of quality is a relevant task, which requires systemic and in-depth research.

Another important need is detailed and practice-oriented research of the concepts and approaches to sustainable development from the position of quality management in business. The results of this research should be the development of real tools, algorithms, and mechanisms that can strengthen environmental processes in business and quality management. It is important to combine economic, administrative, and socio-psychological stimuli to integrate

environmental norms into the systems of quality management of companies at the strategic level. One cannot ignore the roles of the government and local authorities, organisations of the public sector and global institutions. Thus, the integration model of environmental management of quality in the system of sustainable business requires expansion through the inclusion of the above elements.

The proposed model can be improved and supplemented due to rethinking it by practising entrepreneurs. From this position, it has a large potential for the preservation of the environment and improvement of product quality, as well as stimulation of innovations and creation of long-term value.

Despite the large potential and advantages offered by the model for environmental quality management in the context of sustainable development, there are many challenges and reservations as to its implementation. This is connected with large investment costs, the necessity to use novel technologies, and the application of intellectual potential. Detailed elaboration on the sources of resource support of the above processes will allow improving the level of substantiation of the model and strengthen its ability for mass realisation and scaling. In this context, attention should be paid to network tools, such as open science, smart environment, networks of public initiatives and stakeholders.

Thus, future studies of the problem must include a more systemic view of practice-oriented approaches and real tools of implementing sustainable practices into quality management through environmental management. They must be based on network ties and innovations with special attention to digital technologies, including the Internet of Things, artificial intelligence, cloud technologies, smart cities, 3D printing, etc.

## 6. Conclusions

The modern vision of environmental management of quality goes far beyond traditional quality management and environmental approach in management, forming a complex system aimed at ensuring the sustainable development of business in the conditions of increasing environmental challenges, global risks, and social expectations. According to this, the rational formation of an integrated model of environmental management based on combination with the elements of quality management systems and approaches of sustainable development offers effective tools for business structures, which would help them solve complex tasks on sustainable well-balanced development.

The basis of this integrated model is the system of quality management, which includes all levels and stages of development and is combined with four fundamental concepts in corporate social responsibility (CSR), green supply chain management (GSCM), ESG management, and the circular

economy (CE). Each of these concepts makes a specific contribution to the formation of a comprehensive system of environmental management of quality. In aggregate, they form additional results which are based on synergy and the emergence of systems.

Formation of the integration system of environmental management of quality, which is based on a combination of current processes in the sphere of quality management, environmental management, and sustainable development, uses a formed system of international standards of quality, environmental and responsible management, and takes into account the influence of current processes and risks, including Industry 4.0, depletion of resources, climate change, and social and demographic pressure. Due to this, it has the potential to solve managerial, environmental, and institutional problems by coordinating the provisions of different approaches and concepts of sustainable development and management within one model, joint values, and motivation.

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