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Integration of Enterprises as One of the Conditions for Sustainable Economic Development: International and Russian Practices

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Abstract: *Purpose*: the research focuses on the current conditions of sustainable development on the example of the best international and Russian practices. The four most important conditions have been identified based on a systemic analysis of the best practices for achieving sustainable development goals (SDGs). The study of the evolution of sustainable development has suggested that creating integration associations is one of the successful ways to overcome contemporary environmental and technological challenges. Statistical and expert methods have identified possible directions for further development of companies and industries in the conditions of active interaction of actors. The authors established four conditions for the implementation of SDGs: the level of institutional support for the implementation of SDGs, the level of technological development, the maturity of ecological culture, and the level of actors' integration interaction. The research novelty is that the conducted analysis showed that new qualitative growth in today's conditions (if they are met) would increase the resource efficiency of enterprises of system-forming industries and reduce their negative impact on the environment.

Keywords: sustainable development, resource efficiency, green economy, technological development, integration interaction

JEL codes: P28, O14, O14, O32, O44

Meeting the current needs of humanity is inextricably linked to using natural resources. The issues of limited resources began to be actively raised at the end of the 20th century when the

level of consumption of energy, materials, and water resources became comparable or close to the level of all natural reserves.

In 1972, the United Nations (UN) conference introduced the term "sustainable development" and identified the need to consider three components: social responsibility, environmental balance, and economic growth. This contributed to the fact that the problems of climate change, ecology, social inequality, and scarcity of limited resources began to be considered when forming the development strategies of the UN countries.

Sustainable development principles are implemented in the policies of various countries through a system of institutional, economic, and social measures, such as:

- Formation of strategic alliances and partnerships at the micro, meso, and macro levels;
- Support of projects for protecting and restoring terrestrial ecosystems and water resources;
- Development of strategic measures to combat climate change;
- Stimulation of resource-efficient and rational models of production and consumption that solve the problems of resource scarcity and increase of negative impact on the environment;
- Development of infrastructure and creation of conditions for effective implementation of innovations;
- Implementation of strategies of regions and territories fulfilling the reduction of social inequality and ensuring food security.

The research aims to study the current conditions of sustainable development on the example of the best practices of developed and developing countries.

Methodology

The sustainable development concept has evolved over the past 50 years towards increasing complexity and joint consideration of economic, social, and environmental aspects. A significant contribution to the formation of the sustainable development concept was made by the United Nations, the Club of Rome, and the International Institute for Systems Research (Austria).

The problems of the formation of the sustainable development concept and its measurement were dealt with by such Russian and international researchers as G. H. Brutland, K. Linnerud, D. H. Meadows, J. Randers, D. Stiglitz, W. V. Behrens, G. Daley, E. Holden, K. Frenken, A. Sen, J. -P. Fitussi, S. N. Bobylev, V. N. Shimov, and G. V. Gusakov (Meadows et al, 1991; Bobylev, 2017; Linnerud et al., 2021; Stiglitz et al., 2016). Numerous discussions on sustainable development issues at the international level led to the signing of the United Nations Millennium Declaration, consisting of eight chapters, in 2000 and 2012. All UN countries supported the strategy of the future of humanity based on the concept of sustainable development, which is based on the transition to a "green" economy. All UN documents related to the sustainability concept have received the support of all countries worldwide. This makes it possible to talk about sustainable development as the official paradigm of the evolution of humankind in the 21st century.

Together with the emergence of new challenges, the concept of sustainable development is evolving into independent directions, such as the closed-cycle economy (Pierce, Turner, 1989), the green economy, low-carbon development (Skobelev et al., 2020a), decarbonization (Yashalova et al., 2020), and resource efficiency (Kryazhev et al., 2020; Shelomentsev et al., 2021). Tools and mechanisms in the field of institutional management are being developed (the best available technologies (Skobelev, 2020b) and national and international standards for market regulation are being introduced.

To effectively modernize processes and introduce new environmental technologies, enterprises and organizations are integrated into network associations: clusters, industrial symbioses, and ecosystems (Smorodinskaya et al., 2015; Tolstykh et al., 2020a). Such integrations make it possible to jointly increase the competitiveness of each factor, meet the requirements of standardization, increase the resource efficiency of processes, and implement projects based on the SDGs.

Results

The analysis of numerous successful international and Russian practices in the field of sustainable development makes it possible to identify the four most important conditions for achieving the SDGs, which can be divided into “hard” and “soft” in accordance with the tools on which these conditions depend (Figure 1).

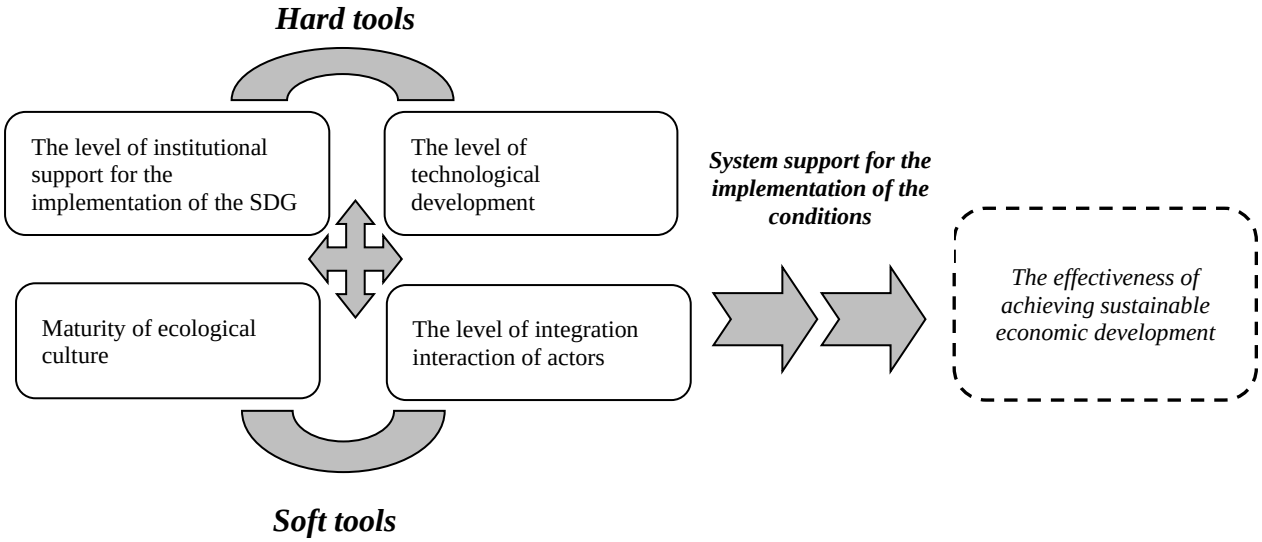

Figure 1

Conditions for implementing the SDGs

Source: Compiled by the authors

It seems appropriate to consider each condition in more detail.

1. The level of institutional support for the implementation of the SDG, defined in the priorities and national development strategies, creates the basis and directions of development for all market participants and lays down priorities for planning and restrictions in current activities. State measures to support the initiatives of market participants in the

field of sustainable development and green projects make it possible to develop project infrastructure and modernize the technological base.

Thus, institutional support tools in the form of regional programs and national strategies in the well-known industrial symbiosis of Kalundborg stimulated the region's development and created conditions for implementing green projects.

In the Kemi-Tornio Region of Northern Finland, business and innovation support programs stimulate the development of priority areas of industry. A strict producer responsibility system makes it possible to implement programs for responsible consumption and the return of raw materials to secondary circulation.

Another successful example of supporting "green" projects at the institutional level is the Sotenas municipality in Sweden. The municipality needed support to increase competitiveness and ensure sustainable development. According to the experience of Kalundborg, the creation of a Symbiosis Center in Sotenas was carried out. This program realization made it possible to unite regional companies in implementing sustainable development programs and receive venture financing "Fourier transform" (Tolstykh et al., 2022).

The implementation of the national project "Ecology," which provides enterprises with the opportunity to introduce recent achievements of science and technology and considers the goals of environmental protection, can be considered one of the measures of institutional support for the sustainable development principles in the Russian Federation.

2. The level of technological development. The sustainability of the development of industries is carried out through the transition of system-forming companies to the best technical and technological solutions for industrial production processes (Skobelev, 2020c). That is why the concept of the best available technologies is a component of the national project "Ecology" aimed at achieving priority indicators of negative impact on the environment and ensuring the long-term sustainable development of Russian companies (National projects, n.d.). The concept of the best available technologies is widespread in many countries worldwide. It has become an instrument for implementing the principles of sustainable development. In world practice, there are different approaches to what technologies can be defined as the best available technologies. Official "vertical" and "horizontal" reference books have been formed in accordance with the technological level of the countries in the EU countries, Russia, the USA, and China. For the USA, the law and regulations prescribe factors that are considered when implementing industrial programs. For China, Russia, and the European Union, criteria are being established through the involvement of expert technical working groups, which set the limits for standards based on the results of the assessment of technological characteristics, environmental impact, and economic aspects.

Another criterion in the EU and Russia is also considered: preference is given to technological upgrades integrated into the technological aspect rather than technologies "at the end of the pipe."

In China, the USA, and the EU, the legislation prescribes criteria for the best available technologies that determine the minimum level of technology modernization that companies should consider. Russia has created a system of financial penalties and benefits based on the results of monitoring the best available technologies of enterprises.

3. The maturity of ecological culture reflects the need to involve society and increase the level of national responsibility in addressing environmental development issues.

Considering examples of high ecological culture, it is worth noting the practice of Japan in the processing of electronics, when devices are disassembled to the smallest parts and sent for subsequent processing. In each apartment building, there are paid boxes for collecting used equipment. In recent decades, Japan has reached a waste recycling rate of 46% (Omega, n.d.). The system of separate garbage collection has become entrenched in the mentality of people and has become part of the culture of the "garbage-free" country of Sweden, which has reached 99% of recyclable waste. Of these, about 49% is burned for energy, about 50% is used as secondary raw materials, and only less than 1% ends up in landfills (Ohrey, 2020).

In Russia, the development of environmental education, culture, and upbringing is regulated by the Government Decree of 2012 "Fundamentals of the state policy in the field of environmental development of the Russian Federation until 2030" and in the Federal law "On environmental protection" (January 10, 2002 No. 7-FZ, as amended on July 2, 2021) (Russian Federation, 2002; Presidential Executive Office, 2012). In schools, environmental education is carried out by additional lessons through design and research activities or within the framework of separate topics in the main subjects. Many major universities have started training specialists in the field of green economy. For example, the National University of Science and Technology "MISIS" (NUST MISIS) implements master's programs "Technological leadership for sustainable development of companies," "Engineering solutions for the closed-loop economy," and "Environmental innovation management" in the field of sustainable development. Higher School of Economics (HSE) trains students on the programs "Company sustainable development management" and "Environmental economics and sustainable Development." Lomonosov Moscow State University trains specialists in the program "National models of sustainable development." The MIREA – Russian Technological University has established the Department of the best available technologies and regulatory practices, the task of which is to introduce students to the best Russian examples in the field of waste recycling and conduct research in the field of secondary resources. Besides, scientific conferences, forums, and olympiads for students and postgraduates are held annually at the sites of Lomonosov Moscow State University, Plekhanov Russian University of Economics, NUST MISIS, MGIMO, and other universities to popularize environmental policy.

Scientific research institutes (Federal State Autonomous Institution "Environmental Industrial Policy Center," Federal State Budgetary Scientific Institution "Caspian Fisheries Research Institute," and "Research Institute of Nature"), federal and municipal libraries, the financial structure "Sber," the organization "Greenpeace," and many other institutions and

organizations are actively engaged in promoting successful practices in environmental development in Russia.

IV. The Level of Actors' Integration Interaction

Achieving the SDG at the micro, meso, and macro levels is impossible without the cooperation of all market participants. To solve innovative, technological, and environmental problems, many enterprises are currently implementing the following types of integrations (Figure 2).

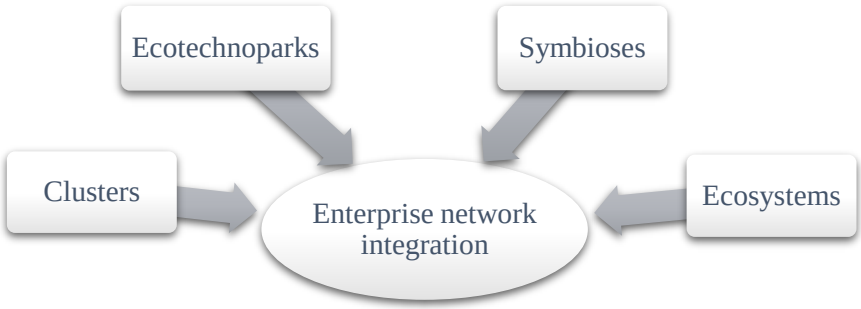

Figure 2

Forms of integration interaction of enterprises

Source: Compiled by the authors

Forms of network integration associations of enterprises are reflected not only in world practice but also at the regional levels in Russia. It seems appropriate to consider them in more detail.

The cluster type of integration involves a cross-industry network alliance of enterprises and organizations entering into interactive cooperation at various stages of value chains and product life cycles, realizing the interests of the territory and providing maximum innovation and flexibility to all actors (Smorodinskaya et al., 2015). One of the cluster's goals is to create or develop new technologies, products, and services, as well as to realize the competitive advantages of the territories. An example of a cluster implementing the SDG is the Norwegian cluster "AYDE," created to solve the problems of the processing industry. All members of the association are implementing a program of sustainable and innovative development to reduce the negative impact on the environment and increase resource efficiency (Mikkola et al., 2016). Another successful example of integration in the field of sustainable development is the cluster Biocluster.dk, created in Denmark in the Midtjylland region. The cluster's tasks are aimed at the development of closed-cycle models, bioeconomics, reduction of negative impact on the environment, and support and development of regions. To this end, platforms are being created within the cluster to disseminate scientific knowledge and stimulate further development of innovations.

Russian examples of network integrations in the field of waste recycling and water circulation optimization can be the clusters formed in the cities of St. Petersburg, Kazan, and Kemerovo.

Eco-industrial parks contribute to technological development and the coordination of economic development and environmental protection. According to the UNIDO definition, eco-industrial parks are understood as "production and service companies located on the same territory that achieve sustainable development through cooperation in resource management and environmental impact" (UNIDO, 2019; Kovalchuk, 2021). Within the framework of the UN program on resource-efficient and clean products, 33 industrial parks appeared in 12 countries from 2012 to 2020. Successful examples in a world practice are eco-technology parks in Japan (Kawasaki), the USA, and South Korea, which make it possible to efficiently use energy, reduce the negative impact on the environment, and reduce resource consumption by involving them in re-circulation (recycling of bottles, paper, electronics, reuse of plastics, metals, etc.).

Industrial symbiosis can be interpreted as the integration of enterprises when "waste from one enterprise becomes resources or energy for another enterprise" (Yeo et al., 2019). Industrial symbiosis "traditionally involves individual industries in a collective approach to creating competitive advantages, including the physical exchange of materials, energy, water, or by-products" (Tolstykh et al., 2020b).

An example of industrial symbiosis is the Kemi-Tornio symbiosis (Lapland), which includes by-product exchange companies. Another example of a successful industrial symbiosis is Handelo in the municipality of Norrkoping in Sweden, where the activities of the association's companies are focused on the reduction and commercial use of household waste and industrial by-products suitable for energy generation.

In Russia, an industrial symbiosis was created in 2013 in the Kemerovo Region to form a full production cycle for the extraction and enrichment of iron ore. This made it possible to save jobs at mining enterprises and create effective interaction between the Kemerovo Region and Khakassia. An industrial symbiosis was formed in St. Petersburg ("Baltic Industrial Symbiosis (BIS)") for the creation and implementation of clean technologies in the urban environment.

The ecosystem model, which creates a special friendly environment for generating and implementing innovative projects, is currently being formed. The most important thing in this form of integration is collaborative maturity, which makes it possible to create values from various data streams through the interaction of actors. The ecosystem model can be considered an evolutionary development of all previous integrations.

Conclusion

The experience of successful Russian and foreign practices demonstrates that the effective implementation of sustainable development goals requires a system of balanced conditions, including institutional mechanisms for supporting enterprises and projects in the field of green economy, maturity of ecological culture, integration interaction of enterprises, and a high level of their technological development. Ensuring these conditions will create a favorable environment in society for the effective achievement of sustainable development goals by all economic entities, encourage enterprises to implement projects in the field of

resource efficiency, and reduce the negative impact of production processes on the environment.

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