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SOCIAL, ENVIRONMENTAL, AND ECONOMIC FUNDAMENTALS FOR THE DEVELOPMENT OF A BIOSPHERE RESERVE IN THE MINING AREA OF SOUTH URAL[1]

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Annotation
The paper dwells upon the theoretical foundations and practical issues of the development of a biosphere reserve as a component of a major social, environmental, and economic system. Mining South Ural is a biosphere reserve that is cited as an example of how the success of its development depends on the opportunity and adequacy of adapting the requirements of the World Network of Biosphere Reserves regulations (the UNESCO Man and the Biosphere program) to the historical specific issues of the reserve and its surrounding areas. Particular attention is paid to the specific matters of how the biosphere reserve has been formed under the conditions of the spatial integration of natural and urbanized areas of the old industrial region. The paper demonstrates the specifics of creating project-based solutions and drafting a biosphere reserve management plan for industrially developed areas.

Key concepts:
biosphere reserve, UNESCO, social, environmental, and economic system, management-plan, specific issues, adaptation, spatial integration, systemic approach, projects of development.

World Network of Biosphere Reserves has been founded under the UNESCO Man and the Biosphere program[2], which unites the natural areas of different countries to test the principles and instruments for establishing a balanced human-nature interaction for the sustainable development of both. The biosphere reserve being created in the mining area of Chelyabinsk Region opens up new opportunities for the harmonic social, environmental, and economic development of this territory, while also creating new organizational and administrative challenges regarding its establishment and activities over the area of multiple municipalities. The complex multidimensional nature of the research subject, which is in essence a test site for finding and testing a new, better and more harmonious human-nature interaction, requires the researchers to use almost all the known scientific methods for studying such a subject based on the fundamental principles of the systematic approach.

Sustainable development and conceptual fundamentals of establishing a biosphere reserve

The fundamental principles of the integrated social and environmental development, as adopted at the UN Development Conference in Rio de Janeiro in 1992, are a triune concept covering all the major aspects of global changes currently underway [1], with an emphasis on environmental, social, and economic changes[3],[4]. The unifying point in this concept is the developmental sustainability of the world people community. However, as most of the matters and issues the concept covers are of social nature, it is mostly associated with the issues of environmental conservation and development.

Of course, there are some general global areal development problems; however, when solving them, the areal and national 'refraction' might vary dependent on how

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[2] UNESCO – MAB Biosphere Reserves Directory [electronic resource]. URL:http://www.unesco.org/mabdb/br/brdir/directory/database.asp (accessed on September 8, 2017).

[3] REPORT OF THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT [electronic resource] http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm (accessed on September 8, 2017).

[4] United Nations Conference on Sustainable Development, Rio+20 [electronic resource]. URL https://sustainabledevelopment.un.org/rio20 (accessed on September 8, 2017).

fundamental is the perception of the essence of phenomena and their consequences.

As of now, fundamental differences occur increasingly frequently, sometimes transforming into contradictions in the assessment of the long-term trends in environmental, social, and economic development. The relevance and severity of these problems might vary in time and from area to area.

The fundamental contradiction of the triune sustainable development concept manifests itself in the real actions taken by areal administration institutions, and is due to the objectively existing collision of their main interests. General public wants a better quality of life, businesses want to generate profit and accumulate capital, the government wants to stay legitimate. These interests may collide, which will create disagreement in their actions [2] and make it difficult to find a common ground.

One should also note the difference in the spatial localization of the areas of responsibility for the components of development. The social sphere mostly acts on a regional level. Economy is increasingly global, extraterritorial, and viewed in the light of national economic programs. Environmental issues mostly manifest themselves on a local, or municipal level.

One should also note the temporal differences. The performance of economic projects is usually forecast and considered for a relatively short term of three to eight years. For social projects, the span covered by forecasts and considerations might make up to ten to fifteen years; whereas for environmental projects, it is no less than twenty years. Considering the above, it would be rather inadequate to develop an integrated social, environmental, and economic project using the existing standards for business projects, management plans, and other investment planning tools.

These specifics mean that a number of issues associated with the region-specific implementation of the triune concept have yet to be addressed. The problem is for the most part related to the adequacy of area-specific practical implementation of regulations and fundamental principles, rather than the essence thereof. There is a great range of possible solutions, each containing a great number of unique risks that are yet to be studied in detail.

This fully applies to the establishment and development of biosphere reserves in the Russian Federation, with the main focus on addressing environmental challenges. However, it is this problem that prevents business and the public from actualizing their interests that arise from the traditional Russian view of environmental problems in general; thus, it hinders the establishment and development of reserves.

Biosphere reserves are usually created on the basis of the existing specially protected natural areas (SPNA), i.e. national parks and reserves. Those form the primary areas of biosphere reserves with an emphasis on the long-term environmental conservation and protection functions. Primary areas are surrounded with buffer zones where economic activities may take place and be developed as long as they are compatible with natural conservation goals and are not to have harmful anthropogenic effects on the primary areas. In this respect, the development of biosphere reserves is regulated by a number of environment-related requirements, including those adopted on an international level. Those include the World Network of Biosphere Reserves regulations, the UNESCO Man and the Biosphere program, and a number of other Russian and international documents[5].

However, for the outer transitional area in which the biosphere reserve and other adjacent areas should cooperate, the socioeconomic becomes very important, whereby the efficiency of municipal and regional projects and programs has to be concerned. The list of relevant matters in relation thereto lies not within the area of environmental concern; the problems of projecting and actualizing the social, environmental, and economic areal development become more significant [3].

Whether these territories will develop successfully or not depends on the adequacy and efficiency of the practical implementation of the general regulations. The scope of sustainable development aspects under consideration is very broad in such cases. From individual areas of areal planning to 'green' economy establishment projects[6] [4], [5]. For each specific case of a biosphere reserve, one has to find the best option of how to implement general regulations and standardized project solutions. Based on practical requirements, one also has to elaborate a number of conceptual provisions and draft a management plan to specify the conditions whereunder social, environmental, and economic development can be efficient.

Solving this problem requires a very skillful tuning of the existing project management paradigm and spatial development/environmental management problem-solving practices.

[5] SEVILLE STRATEGY FOR BIOSPHERE RESERVES http://www.biodiversity.ru/programs/management/doc/sevstrategy/ss-content.html (accessed on September 8, 2017).

[6] Sustainable development: Rio challenges Report on Human Development in the Russian Federation 2013 [electronic resource]. URL http://www.undp.ru/documents/NHDR-2013.pdf (accessed on September 8, 2017).

Systematizing such experience of adaptive design on the basis of a readily available regulatory framework is of importance for this task.

For Russia and Chelyabinsk Region in particular, such problems are unique even in the manner they are stated, as the country lacks experience of successful solutions. However, in some non-standard cases of spatial development, the results of such adaptation are crucial. We believe this fully applies to the Mining South Ural biosphere reserve project currently being developed (hereinafter the Mining Reserve) and established in the territory of a very special mining area in South Ural, Chelyabinsk Region, where unique and protected natural areas border old industrial cities and settlements.

Below we dwell upon the main points relating to adapting the general provisions of sustainable development for establishing a reserve in the South Ural mining area, including:

1. Conditions for the establishment and development of a biosphere reserve given the social, environmental, and economic specifics of the South Ural mining area.

2. Specifics of forming a biosphere reserve in spatially integrated natural and urbanized areas.

3. Adapting the biosphere reserve project solutions and management plan to industrially developed areas.

Conditions for the development of a biosphere reserve given the social, environmental, and economic specifics of the South Ural mining area

The development of the industrial mining area in South Ural is determined not only by the general processes characteristic of the Urals [6], [7], but also by a number of specific local features that are of essence for establishing a reserve. One should note the following:

A disproportionate geometric shape and the so-far existing transport structure of the territory. The South Ural mining area in Chelyabinsk Region is first of all a relatively narrow area not exceeding 200 kilometers in width while having over half a million inhabitants. A compact group of industrial towns and medium-size cities has been historically founded and built in the valleys between the ridges where the southern part of the Ural ridge crosses important Europe-Asia routes. The industrial development of these company towns was first of all associated with the mining industry and metallurgy. Since late 19th century, integration was boosted by an important national-level infrastructural problem being solved in the 20th century, i.e. by the Trans-Siberian Railway being constructed. The M5 Federal Highway was later built in the same direction.

Contrast (asymmetry) of spatial development. The development of the South Ural mining area has been associated with the prolonged focal development of some of its parts. Most of its population inhabits relatively small urban areas, whereas municipalities have 60 to 90 percent of their areas covered by natural Ural forests.

Complex spatial structure and presence of monotowns. In general, the mining area can be viewed as a polycentric entity that was formed by multiple settlements with a few core cities; the entity has a radial-linear shape and a non-homogeneous structure. There are a few cities that feature the closest ties. At the core are the cities of Miass and Zlatoust, having a combined population of over 350 thousand persons. The historical urban development of the company towns in this area has so far resulted in the so-called 'monotown problem'. The developmental prospects of such monotowns and their adjacent areas vary greatly and depend on the basic technology of the established enterprises representing various areas of the Urals' traditional heavy industries.

Complicated administrative division, i.e. too large number of municipalities and settlements. As of now, almost all of the cities and peri-urban settlements are within a hourly drive from each other. This creates good conditions for mutual integration and agglomeration processes. This applies to the cities and towns on the borders of the reserve: Miass, Zlatoust, Karabash, as well as other towns: Kusa, Chebarkul, Satka, Bakal, Tryokhgorny, Katav-Ivanovsk, Ust-Katav, and other settlements, including urban-type settlements, suburban settlements, and villages.

Agglomeration processes with circular migration. As of today, close and stable industrial, labor, cultural, social, and recreational relationships have been established between the settlements of the urbanized mining area in South Ural. Some indicators including the urban population proportion as well as the number and the location of settlements display a trend and all preconditions to further integration. Developmental prospects of these areas are today associated with the inter-municipality cooperation project currently underway in the region: the South Ural Agglomeration (hereinafter the Mining Agglomeration).

Environmental problems: severe technological burden on the environment. This is largely only applicable to individual sites; however, some situations are exceptionally negative, i.e. the town of Karabash and some other places. One should also note that in some places, natural resources that formed the backbone of industry

have been depleted, resulting in local economic activities being phased out. The development of the biosphere reserve must focus on elaborating the environmental aspect in a long-term run for the entire mining area we have specified.

All these and other specific conditions mean there is a whole range of additional requirements to the sustainable and efficient social, environmental, and economic development of these areas. That means that establishing the Mining Reserve falls out of the traditional scope of managing such projects and will involve a transition to a whole new level of coordinating the spatial development of the existing territorial entities. The development of the biosphere reserve becomes one of the set of problems relating to achieving a harmonic spatial development in this area of South Ural; when solving this problem, one inescapably has to take into account the following:

1. Establishing a biosphere reserve spanning across multiple municipal entities in Chelyabinsk Region will involve establishing regional-level inter-municipality administrative bodies as a part of the region's and the Mining Agglomeration's administration system.

2. Establishing the reserve will involve stepwise municipality- and inter-municipality level elaboration of the key points of social, environmental, and economic development. For that purpose, one will have to review and adapt the conventional solutions related to areal planning, agglomeration development strategies, spatial monotown development strategies, regional and municipal target programs. Addressing these issues will enable a transition to drafting new test projects and sets of measures to be initiated by the reserve. In some cases, taking the steps specified above might require long-term reiterative efforts.

Specifics of forming a biosphere reserve in spatially integrated natural and urbanized areas

What makes the areas chosen for the Mining Reserve so unique is that cities and major factories and plants are immediately adjacent to unique natural areas, including Specially Protected Natural Areas (SPNA), for details, see [8]. The Mining Reserve is fundamentally composed of three SPNA:

- Taganay National Park;
- Arshinsky Sanctuary;
- Turgoyak Natural Site.

Thus, the biosphere reserve is located next to major cities in the central part of the mining area, spanning across five municipalities. These are three urban districts: Zlatoust, Miass, and Karabash, plus two municipalities (rayons): Kusinsky and Nyazepetrovsky; all of them vary greatly in social and economic terms.

On the map (see Figure 1), the reserve is marked with a large-scale 'greenwave' over the urbanized strip of the central mining area going along the Ural ridge. Where the agglomeration processes shall be intensified is marked by a symbolic 'horseshoe'.

Some territorial portions of various cities and settlements, including the largest city of Zlatoust, are therefore within the reserve itself. Along a considerable portion of its borders, the Mining Reserve is adjacent to other settlements which differ greatly from the standpoint of economic and social-infrastructure development.

The heterogeneity of the established social, environmental, and economic qualities of individual settlements impedes the development of standardized and unconditionally applicable solutions for all areas. Contradictions are particularly noticeable in the central part of the mining area, where the major cities of Miass and Zlatoust have been engaged in a long-term rivalry for resources and leadership. This necessitates new compromise solutions.

That major municipality-level developmental trends in the mining area differ in directions means that social economic risks of unbalanced development, including investment risks, are inescapable intensified [9]. These risks will further be inevitable projected onto the development of the reserve. This makes evident yet another unique feature of the Mining Reserve. The transitional area of the Mining Reserve borders a number of very important and heterogeneous borderline areas, which to a great extent determine the multidimensional development of this area as a whole and affect the functionality and development of the reserve in particular. The emergence of such areas of influence presents even more challenges to be addressed when establishing the reserve, while also impeding their agreement since such areas might differ in terms of developmental priorities.

The largest city in the vicinity of the reserve is Zlatoust; for this city as well as for the number of adjacent settlements, the key economic areas are metallurgy and mechanical engineering, which is conventional for the Urals. The second largest city of Miass is being transformed into a center of high-tech manufacturing and precision engineering, including that for military and space industries. The small town of Karabash, known for the anthropogenic burden it has inherited from the past, is now developing as a potential member of the new, highly efficient non-ferrous metallurgy cluster.

All these circumstances predetermine considerable discrepancies in the quality of life, the technological culture, and the mentality of

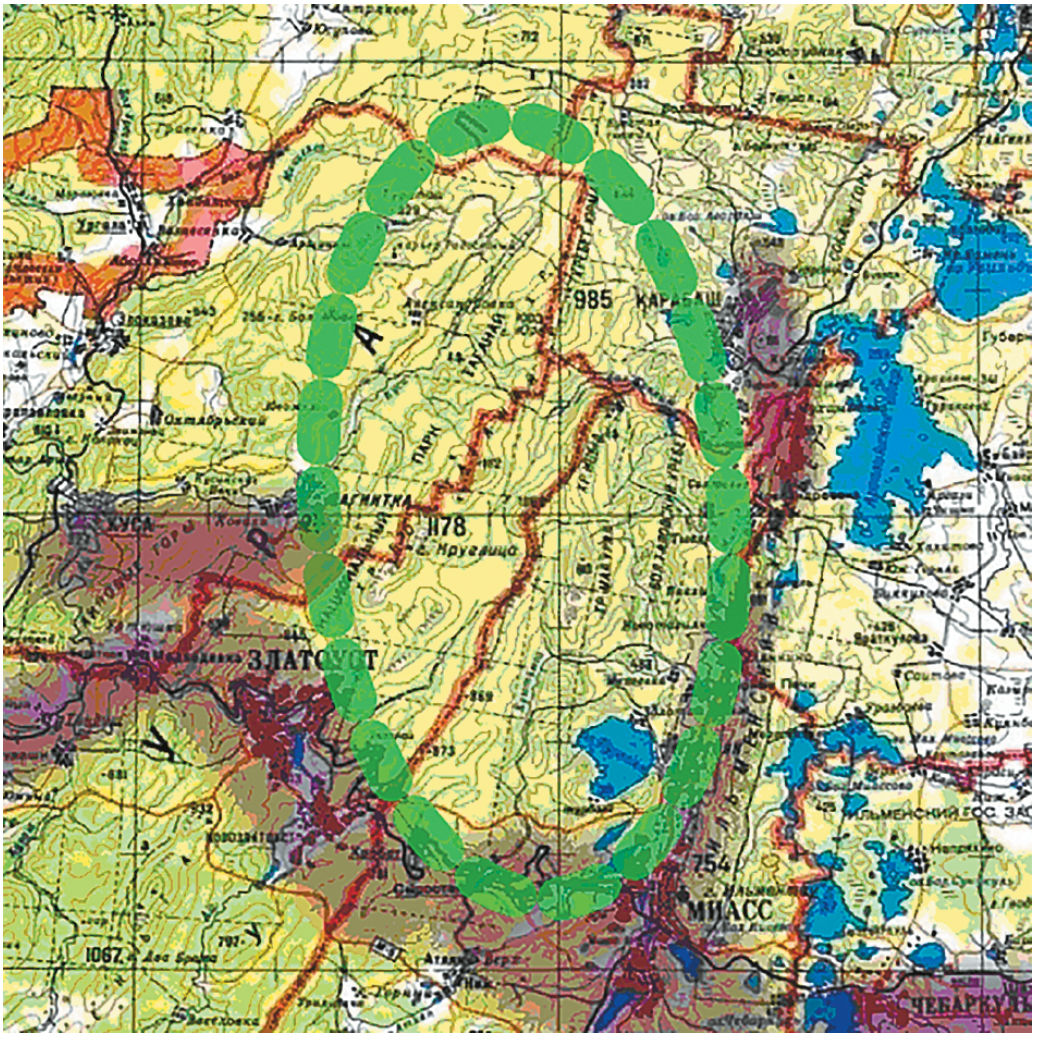

Figure 1. Central part of the South Ural mining area in Chelyabinsk Region; agglomeration process area (shaded) and promising biosphere reserve location

those who live in different municipalities of the mining area. They affect many aspects of economy, social sphere, and the anthropogenic burden. The technological burden on the environment differs as well.

Under such conditions, the problem of establishing a mining biosphere reserve becomes a part of the more general set of problems relating to setting a large-scale general trend in the social, environmental, and economic development that would integrate the interests of five municipalities. The reserve in its joint development with the municipalities will automatically inherit all the benefits, problems, and risks each municipality has gained.

In such a situation, the efficient development of the reserve can be achieved by doing the following:

1. The initial multi-directional development of different areas inescapably requires stepwise establishment of new urban and natural space around the reserve. When making forecasts for projects, the temporal range of forecasting has to be maximized depending on the specific site for which a forecast is made; as such, forecasts have to cover 15 to 50 years as of today.

2. Forecasting and preventively smoothing newly arising contradictions and collisions in the socioeconomic development of such areas requires particular attention. Thus, further urbanization simultaneously results in the development of peri-urban areas and increase in anthropogenic and technological burden on their environment, which correspondingly leads to increased risks for the reserve and the municipalities.

3. Structural socioeconomic transformation projects should be analyzed extraterritorially from other agglomeration processes taking place within the area. This applies to the diversification of economy, implementation of eco-friendly production processes, expansion of services, etc. In this situation, municipalities have to elaborate a common approach to zoning, drafting and harmonization of future development master plans, implementation to integrated infrastructural projects (roads, tourism projects, cultural sites and venues, health and education facilities, etc.).

4. Settlements, especially those in the vicinity of natural sites such as forests and lakes, require indvudal socioeconomic development forecasts with an emphasis on rational environmental management.

The main opportunities, competitive advantages, and risks of establishing a biosphere reserve are given in the SWOT table below.

Adapting the biosphere reserve project solutions and management plan to industrially developed areas

Under such conditions, the management plan for developing a biosphere reserve should be drafted and implemented based on a project approach. Some projects are naturally intermunicipal and cannot be seen as lying entirely within the scope of the biosphere reserve. Projects for the development of the Mining Reserve and its adjacent territories can be classified as follows:

1. Projects under individual federal and regional programs.

Table 1.

SWOT analysis: economy, society, and ecology of the South Ural mining area: reality, opportunities of, and threats to, the Mining Reserve

Strengths: 1. Geographical location, which is historically close to the Eurasian transport routes. A rare combination of major cities and small towns with unique natural landscapes, including the forests that cover more than two thirds of the total area. 2. High urban population density; area is sufficient for making socioeconomic transformations of settlements while keeping the considerable natural sites pristine. 3. Existence of protected and specially protected natural areas that lay the foundations for the development of new forms of environmental management and the establishment of a biosphere reserve. 4. The established socioeconomic centers, i.e. the cities of Miass and Zlatoust, have a population of over 350 thousand persons. Integration and agglomeration processes are being intensified in the area. 5. There exists a full-scale system of health, education, culture, sanatoria and resorts, as well as other facilities that lay the foundations for the development of human capital and the creation of a modern world-class service sector.	**Opportunities:** 1. Prospects of using the developing West-East transport corridors (the M5 Highway and the railways). 2. Agglomeration processes and projects (including those for the central part of the mining area); advanced-development areas and innovative projects being established. 3. Major cities of Miass and Zlatoust can serve as the drivers for transformation and have all opportunities for efficient economic and sociocultural development, as well as for addressing environmental issues. 4. Demand for efficient environmental management is combined with opportunities therefor, including such socioeconomic activity as environmental tourism. 5. Various settlements bordering the natural areas can be used as interaction points for efficient environmental management.
Weaknesses: 1. Limited and non-homogeneous development of transport infrastructure, including one within the mining area. Airports are too remote from the center of the mining area (Chelyabinsk is 150 km away, Yekaterinburg and Ufa are more than 250 km away). 2. Some of the settlements are environmentally problematic, e.g. Karabash and some others: aside from soil pollution (including pollution with heavy metals) and atmospheric emissions, major cities also face clean water problems. Negative image of industrial areas.	**Threats:** 1. Reduced federal and regional investments into road and infrastructure development. 2. Slower socioeconomic development compared to other territories that are close to the megacities; the indestructible image of an industrial hinterland, less competitive and less attractive. 3. Multiple unfavorable factors combined for the years to come: industrial stagnation, reduced investments, low budget income growth. Monotown

3. Some areas display signs of being monotowns that used to be company towns and now have problematic prospects. 4. Stagnation processes and limited opportunities for economic modernization and territorial transformations. Obsolete industrial structure, some portions of which were established as far back as in the 30s to 50s; hence the depreciation of fixed assets and low investment attractiveness of older enterprises. 5. Low budgetary security; expenditures exceed income if new commitments are made. 6. Negative migration dynamics. Flight of the population, including urban population. High morbidity and mortality in a number of places. 7. Integrated and efficient governance is problematic. Too large number of small municipalities. Non-homogeneity of conditions for business development, including small businesses.	problems being exacerbated. Negative social consequences, migration of the population. 4. Inefficient inter-municipality cooperation. An amorphous state of the common inter-municipality institutional environment; uncertain common strategic prospects with increased risks for social development and investments. 5. Inefficient environmental management of lands and forests; reduction in environmental activities and projects.

2. Inter-municipality cooperation and agglomeration projects.

3. Project portfolios of individual municipalities.

4. Projects proper, initiated by the biosphere reserve itself as continuous stepwise regional projects, covering:

- environmental protection (also through innovative approaches);
- development of land and forest management;
- infrastructure development;
- development of the sociocultural environment, in particular environmental and educational tourism;
- establishing a green economy, including the creation and development of wind power sources, implementation of complex wood processing technology, implementation of other projects tailored specifically to this or that area.

While there are multiple possible sources of funding, these projects have one problem in common: lack and limitedness of investments, especially from the budget. Unfortunately, this problem is expected to persist in the near future. This challenge is combined with a rather unfavorable economic situation in the region [10]. The territory of the reserve itself is peripheral for the municipalities and is not a top priority when it comes to allocating their limited and insufficient funds.

Transparency, guaranteed prospects, stable business relationships and environment governed by relevant regulatory documents become an importance factor in the dynamics of the reserve areas. This is crucial for the initial stage of establishing the reserve and is also an important factor for the confidence in, and the investment attractiveness of, the mining area, the reserve, and individual municipalities.

The low investment attractiveness and poor budgetary security of the municipalities in the mining area where the reserve is located can be smoothed by using such a legal incorporation form as a public-private partnership (PPP). The definable prospects of the development of the reserve cover quite a significant time period of 30 to 50 to 70 years, making some projects more investment-attractive.

One should specifically note some aspects that can improve the efficiency of how compromise solutions are made under PPP and inter-municipality cooperation projects when addressing the issues of establishing the developing the reserve:

- drafting the general principles and approaches to PPP organization, including those that concern environmental management;
- a notification-based approach to projects, combined with using a veto principle when it comes to inter-municipality administration;
- minimizing the irretrievable losses for the environment over the entire timeframe covered by the prospect forecast (up to 30 years) is a mandatory condition of social, environmental, and economic efficiency;
- some components of limitation practices can be generally adapted to solve specific problems; thus, emissions at industrially dangerous sites can be quota-limited.

Besides the project-specific results, we have to take into account the synergetic impact such projects may have on this or that area when implemented in a combination. Such impact enables:

1. A faster implementation of technological innovations for the green economy.

2. An increase in the attractiveness of the area for eco-friendly businesses, including ecotourism.

3. A greater emphasis on the reference value of the reserve as a forest area that develops in a long-term protected state.

4. A reduction in the risks to lose the diversity of rare flora and fauna, to have wildlife migrate to, and resettle in, adjacent areas.

5. Greater opportunities for environmental education and partnership with local self-governance.

Establishing a biosphere reserve under such conditions should be seen as a continuous and evolving process which transforms the areas where new technology is implemented, and helps achieve a relatively harmonious social, environmental, and economic development of the regional society. This equally applies both to protected areas and to other territories in Chelyabinsk Region, where the negative technological impact is pronounced. Furthermore, one also has to realize that future may see not only new risks, but also new and previously undiscovered development prospects related to the synergetic impact produced by the components of a heterogeneous social, environmental, and economic system with contrasting characteristics. This applies to the new fields and trends in resource-saving economy, to the growing employment in high-tech green economy using resources and new technologies that have not been in use until recently, to the better quality of life of the people who realize the value of natural resources and try to use them rationally.

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СОЦИО-ЭКОЛОГО-ЭКОНОМИЧЕСКИЕ ОСНОВЫ РАЗВИТИЯ БИОСФЕРНОГО РЕЗЕРВАТА В ГОРНОЗАВОДСКОЙ ТЕРРИТОРИИ ЮЖНОГО УРАЛА

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Аннотация
Рассмотрены теоретические основы и практические проблемы развития биосферного резервата как элемента большой социо-эколого-экономической системы. На примере биосферного резервата «Горнозаводский Южный Урал» показано, что его успешное развитие во многом определяется возможностью и корректностью адаптации требований Положения о всемирной сети биосферных резерватов Программы ЮНЕСКО "Человек и биосфера" к исторически сложившейся специфике территории резервата и его окружения. Особое внимание уделено специфическим вопросам формирования биосферного резервата в условиях пространственной интеграции природных и урбанизированных и территорий старопромышленного региона. Показаны особенности разработки проектных решений и формирования менеджмент-плана биосферного резервата для индустриально развитых территорий.

Ключевые понятия:
биосферный резерват, ЮНЕСКО, социо-эколого-экономическая система, менеджмент-план, специфика, адаптация, пространственная интеграция, системный подход, проекты развития.