Problems of environmental management: international experience

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Abstract: The rational use of natural resources and environmental protection are crucial global issues. The article analyzes the experience of Russia and some foreign countries (Mongolia, China, and India) that have already launched a campaign aimed at developing environmentally friendly technologies. In Russia, this process has been recently initiated. The authors consider the problems of rational nature management in terms of protection of specially protected natural territories and implementation of innovative technologies by enterprises. Environmental threats hinder the development of specially protected natural areas and worsen the environment in specially protected areas. The article focuses on practical activities of environmental protection inspectors, presents statistical data on environmental offenses committed in specially protected natural territories of Irkutsk region. The development of environmental technologies is promising in Russia. "Green" and innovative technologies have already become the basis of many government policies and determine the development of new economic models. The experience of foreign countries shows a positive result of the use of the best available technologies, but the implementation of this mechanism requires time and various tools.

The federal law No. 7-FZ “On environmental protection” of January 10, 2002 defines the concept of environmental protection as activities of government agencies of the Russian Federation, government agencies of the regions of the Russian Federation, local government agencies, public associations and non-profit organizations, companies and individuals aimed at preserving and restoring the natural environment, rational management and reproduction of natural resources, preventing the negative impact of economic and other activities on the environment and eliminating their consequences [1]. The rational management of natural resources is one of the important goals of environmental protection. In the regulatory legal acts of the Russian Federation, the rational management of natural resources is defined as the rational use and reproduction of natural resources. It goes along with other measures aimed at protecting the environment. The field of environmental protection has a number of problems that should be solved.

A special place in the solution of problems of environmental sustainability, environmental protection and nature management belongs to legal means, and norm-setting in this area should be outstripping in nature [2]. Because of the presence of very different species, ecosystems, and types and levels of tourist activity, every country needs to carry out its own recreation ecology research, which is particular to its own environments. China has rich biodiversity, a large area, and a very large population. In addition,
millennia-old Chinese cultural values about relationships between nature and humans are centered around tian ren he yi-humans and nature as a unified entity, while Western values tend to separate humans from nature for conservation purposes [3].

Environmental protection is ensured by special rules for hunting, fishing, collecting resources of flora and fauna. At the legislative level, restrictions concern hunting and fishing and collection of fauna and flora resources. Violation of these rules involves administrative and criminal liability. In some cases, it is possible to prohibit the killing of some animals or the extraction of some plant resource. Since October 1, 2017, in Irkutsk region and the Republic of Buryatia, there has been a ban on omul fishing. Despite the unique status of Lake Baikal in the legal system of Russia, special Russian and international studies, great interest of public organizations and citizens, threats to the lake ecosystem are obvious: experts characterize its state as an ecological crisis [4].

One of the comprehensive measures aimed at the environmental protection is identification of natural objects that have special environmental, scientific, historical and cultural, aesthetic, recreational, health-improving and other values. For the protection of such natural objects, a special legal regime should be established, including the creation of specially protected natural areas (SPNA). Because of the presence of very different species, ecosystems, and types and levels of tourist activity, every country needs to carry out its own recreation ecology research, which is particular to its own environments. China has rich biodiversity, a large area, and a very large population. In addition, millennia-old Chinese cultural values about relationships between nature and humans are centered around tian ren he yi-humans and nature as a unified entity, while Western values tend to separate humans from nature for conservation purposes.

A legal measure for the protection of the regime of special natural territories is legal responsibility for violating the regime of protected areas. Disciplinary, administrative and criminal types of liability should be imposed for the environmental protection legislation violation.

Article 8. 39 “Violation of the rules on the protection and use of natural resources in specially protected natural areas” of the Code of Administrative Offenses of the Russian Federation of December 30, 2001 imposes administrative and legal liability for the regime violation or violation of other protection rules and the use of the environment and natural resources on the territories of federal natural reserves and national parks, as well as on the territories where natural monuments are located, or in other specially protected natural areas or protected zones [5].

For example, it is possible to stay on the territory of protected areas without a permit (free admission) or with a permit (paid visit). Staying in a protected area without a permit is a direct violation of the legal regime of protected areas. Citizens, organizations and officials are held administratively liable under the following articles of the Code of Administrative Offenses of the Russian Federation:

1. Article 8.28. Illegal wood logging, damage to forest plantations or unauthorized digging of trees, shrubs, lianas in forests.
2. Article 8.31. Violation of sanitary safety rules in forests.
3. Article 8.32. Violation of fire safety rules in forests.

According to the data provided by the administrative commission of the Federal State Budgetary Institution “Zapovednoye Pribaikalye”, in 2015, there were 264 administrative offenses committed in protected areas; in 2016 - 289 offenses, and in 2017 - 443 offenses. In 2018, the total number of offenses was 230. Their consequences were as follows: oral remarks - 16 cases, cancellation of administrative proceedings - 4 cases, fines – 73 cases; 157 offenders have not enforced the administrative regulation. The statistics on offenses in the field of environmental protection provided by the Federal State Budgetary Institution "Zapovednoye Pribaikalye" is shown in Figure 1.
Figure 1 The statistical data on offenses in the field of environmental protection provided by the Federal State Budgetary Institution "Zapovednoye Pribaikalye".

Like in any institution that deal with protected areas, in Zapovednoye Pribaikalye the activities of environment protection inspectors are not efficient. Half of administrative offense protocols are drawn up with significant violations of administrative laws. Inconsistencies are eliminated, administrative proceedings are suspended and offenders are not punished. As a rule, a copy of the protocol has to be provided to the offender. If the data and information in the old protocol has been changed, or a new protocol has been drawn up, the guilty person should be notified. However, some of the offenders are tourists, i.e. residents of other regions.

The state inspector has to have higher or secondary vocational education in hunting, biology, or forestry. He has to know the administrative legislation. It is necessary to hold training courses in accordance with the Russian substantive and procedural laws in order to avoid further violations when drawing up administrative offense reports. These shortcomings hinder the measures aimed to prevent violations of the legal regime of specially protected natural areas.

The legislation of the Republic of Mongolia also has a number of unresolved problems of legal regulation. One of the pressing problems is the lawful use of lands in protected areas. The PA management requires a PA development strategy. In order to improve the financing mechanism for the development of protected areas, it is advisable for each territory to develop management plans containing strategic goals and objectives for the development of protected areas. These plans should reflect specific measures for the development of protected areas, justify financial costs and evaluate their effectiveness. The use of management plans as a tool for the development of protected areas can facilitate the selection of the most optimal options for the development of protected areas.

The mechanism of interaction between the protected areas and the population should be improved in order to resolve or prevent conflicts in the field of nature management and protection of biological diversity. Protected areas and local people should interact to solve a wide range of issues: from sustainable development of ecological tourism to the preservation of cultural heritage.

Environmental threats hinder the development of protected areas and worsen the environment in specially protected areas. This is due to the large volumes of gold mining in river valleys, the illegal use of mercury and cyanides, and the lack of remediation measures. For example, in Mongolia, there are...
350 companies, of which 280 companies extract alluvial gold. The reclamation measures are not implemented.

Creation and protection of transboundary natural territories is one more form of international cooperation in the field of environmental protection. These areas can be created in the most significant (in terms of natural diversity) areas adjacent to the borders of neighboring states. The main condition for the effective functioning of transboundary specially protected natural areas is a bilateral agreement or an agreement between a large number of countries in order to develop joint scientific and tourism programs, as well as weaken border control [6].

Due to the complex rules, specific problems of environmental protection on the transboundary natural territory have not been solved. For example, in the valley of the Tuul river (Mongolia), 4,500 hectares of land were disturbed. Many rivers, near which gold is mined, flow into the Selenga river, which pollutes Lake Baikal. In addition, the gold mining operations cause damage to the Ono river valley located in northeastern Mongolia and the Trans-Baikal Territory of Russia. The river is the right side of the Shilka River (Amur basin).

Lakes Baikal and Khubsugul and their landscape surroundings are unified natural systems whose unique properties depend on the processes occurring in the landscapes of their basins. The Baikal-Khubslugul basin belongs to the territories whose sustainable development is of great international importance.

One of the most effective measures in the field of environmental protection is the use of the best (available) technologies, as well as the implementation of various innovative technologies in order to minimize the negative impact on the environment. The best (available) technologies (BAT) are "green" technologies. It is shown that achievement of design BAT effectiveness in the coal, oil, and gas industries largely depends on the availability and proper use of basic elements of the eco-economic management system, especially environmental impact assessment and monitoring [7].

Coal mining has a number of adverse environmental impacts. Coal mining disrupts almost all elements of the landscape. Changes in the shape of land leads to a rupture of the integrity and continuity of these landscapes. The vegetation cover is removed and overloaded or moved to the side. Dust, exhaust fumes and diesel odors are harmful to sense organs.

First, to minimize water pollution, wastewater treatment plants can be built and used. Secondly, pit drainage can be used as a BAT. With open drainage systems, water collectors with pumping stations are located at the lowest levels of the quarry. Thirdly, the consumption of industrial water can be reduced. Fourth, it is possible to recover the soil layer after mining operations. In order to restore the damaged flora, one should plant trees. Fifth, in order to reduce the negative impact on the atmosphere, dusty surfaces can be irrigated with water. This is a simple and cheap way to minimize emissions. This method is well suited for open pit coal mining.

In order to reduce the impact of production wastes, it is possible to use such BATs as the proper arrangement of tailings. The tailing dump is a special hydraulic structure that stores or detoxifies the waste of mineral processing factories: gold, uranium, platinum, copper, coal, etc. for further disposal or subsequent processing using modern technologies. In addition to the developing technologies, one should implement organizational measures to green the enterprise. For example, one can support environmental public organizations, develop environmental programs, and implement environmental management and monitoring systems into the company management system.

These measures are being implemented in the Russian Federation and abroad. For example, in China, coal is still the main energy source, but the priority use of coal aggravates the environmental situation. China consumes 8-9% of the world's energy, accounting for 13.5% of carbon dioxide emissions and 15.1% of sulfur dioxide. Air pollution by these substances is the cause of "acid rain", both in China and abroad. Coal is one of the most "environmentally dirty" fuels which emits 1.5 times more carbon dioxide in comparison with oil. A high level of coal consumption causes the environmental degradation. At the same time, in order to reduce the country's coal dependence and the detrimental effect of coal consumption on the environment, China has made attempts to diversify energy sources, increasing the share of hydropower to 6%, natural gas to 4%, nuclear energy to 1% and other renewable energy sources
to 1%. The Chinese government plans to diversify energy sources and reduce the volume of coal consumption. In particular, it is planned to reduce the volume of coal consumption to 65% in 2017. This problem is relevant in large cities, where the level of air pollution is very high [8]. As of December 2018, China has participated in renewable energy projects in 45 BRI countries, with a total installed capacity of approximately 33.95 GW. Amongst all BRI countries, those most favored by China’s renewable energy investment are the United Arab Emirates, Ukraine, Pakistan, Egypt and Myanmar [9].

In many Chinese cities, a rapid increase in the number of cars affects the environment. China is rapidly modernizing the energy industry, and aims to create a resource-saving society with respect for the environment. Beijing is going to reduce the share of coal by using other sources of energy. According to the State Energy Administration, there are more than 500 coal mining facilities that do not meet safe production standards and industry development requirements. To improve safety conditions at coal mines in 2017, three billion yuan (US $ 437 million) were allocated by the government. The government prohibited to open new coal mines until 2019. Since 2011, it has burnt more coal than all other countries combined. And its reliance on this fossil fuel adds up: China emits around one-quarter of the world’s greenhouse gases, the largest share of any country. But these figures are only part of the story: China is also the world’s most prolific producer of wind energy, with the capacity to make more than twice as much as the second-largest generator, the United States. And it has about one-third of the world’s solar-generation capacity, building more systems last year than any other country [10]. It is worth pointing out that Russia, having a state border with China, is extremely interested in minimizing the negative impact of industrial activities on the environment. E. P. Zharkov notes that the environmental problems created by China have a negative impact on neighboring countries, primarily on the States of Korea, Mongolia, Russia and Japan. So violation of standards of loading on pastures lead to violation of the top layer of the soil, contributing to its transformation into dust and sand [11].

Environmental policy (i.e., the manufacturer subsidy policy) captures the practice that the government subsidizes the manufacturer based on the costs of its investments in emission-reducing technologies. Specifically, the government can choose to subsidize a proportion of the manufacturer's green technology cost so that the manufacturer only needs to assume part of the technology cost, which encourages the manufacturer's emission-reducing investment initiative to control emissions. The manufacturer subsidy is also commonplace in practice [12]. Currently, efforts are underway to change over to a system for technological regulation of negative environmental impacts using the best available technologies (BAT) [13].

Digitalization is a global trend that allows us to increase the productivity of assets. Digitalization of exploration and geodetic works in the coal industry is an important development direction. Over the past few years, ground-based laser scanning (TLS), airborne laser scanning (ALS) and mobile laser scanning systems (MLS) have been developed. Laser scanners are used in a wide range of survey workflows, including inventory surveys, subsidence surveys, general topographic 3D surveys (ground and underground). Modern technologies make it possible to analyze objects without using traditional mining methods and causing damage to the environment.

The Angloamerican company is going to implement its own exploration innovation. SQUID is an exploration technology that can locate and map ore deposits. This superconducting quantum interference device is useful for detecting hidden metal deposits that are masked by other conductive metals. It can be adapted for drone flights. Currently, closed coal mining is becoming more labor-intensive and dangerous due to the deep bedding of rocks. Among the priority tasks of innovative development in the field of coal mining are: 1) improvement of productivity; 2) safety of production, including automation of processes in order to exclude the participation of people at some stages; 3) reduction of emissions into the environment. Innovative solutions developed and applied by one of the world's leading coal producers Angloamerican are crucial. Innovations are being implemented as part of the FutureSmart Mining program. This project aims to make coal mining operations safer, more efficient, accurate and sustainable at a lower cost.

The technology for developing deep coal deposits is Underground Coal Gasification (UCG). The reactor for the UCG system is a natural geological formation containing untreated coal. The UCG
consists of two offset wells drilled in a coal seam and a pressurized oxidizer. It is used to ignite a coal seam. The oxidizing and gasification agents are fed through the injection well, and combustion and gasification products are recovered from the production well. Oxygen and steam introduced instead of air produces the most useful gas product. The main constituents of the product gas are H2, CO2, CO, CH4 and steam. The ratio of these gases depends on the type of coal and efficiency of the gasification process. This innovative method is applied in India. India's total reserves are about 302 billion tons of coal. Coal mines in the Kaitha and Thesgoda 'C' blocks are deeper than 300 m with over 150 tonnes of coal reserves. Conventional mining is not suitable for these blocks. For the development of undeveloped coal reserves, underground coal gasification is one of the most suitable technologies, which is economically viable and environmentally friendly. The Longwall Top Coal Caving (LTCC) technology excavates thick coal seams from 5 to 12 m in length in a single pass of the longwall machine, improving productivity of the operation. The thick coal mining technology is promising. The technology has already been implemented in a number of mines in China and Australia. This technology can increase the recovery of resources in thick layers such as Austar Greta. Using the LTCC mining method, additional 80% of coal can be extracted which improves the productivity of mines [14].

The development of the economy affects the state of the environment, but this influence may vary. The expansion of existing production facilities and the creation of new ones increase the impact on the environment, contributing to the deterioration of atmospheric air and water and the increase of the amount of generated waste [15].

Thus, the solution of these problems will ensure the rational nature management and high-level environmental protection. BATs are available in almost every industry. Enterprises should minimize the impact on the environment, ensure safety of workplaces. The funds spent on greening and BAT implementation will help preserve natural wealth and resources, the environment, health of workers, and bring companies to a new stage of development.

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