

Environmental Disaster in the Volga-Akhtuba Floodplain in the Context of Global Climate Change: Legal Approaches and Methods to Decrease the Gravity of the Problem

A. P. Anisimov*, A. J. Ryzhenkov,
Volgograd Institute of Business, Russian Federation
*E-mail: anisimovap@mail.ru

Received for publication: 30 April 2016.

Accepted for publication: 28 July 2016.

Abstract

Based on the specific practical material related to one of the regions of Russia, the article examines the negative consequences for the environment and population caused by the global climate change. Mitigation and adaptation are two models of the national environmental policy which can be considered as the countermeasures. There are more possibilities to mitigate the consequences of climate change at the international and national levels; as well the governmental authorities of the federal entities are able to implement effectively the adaptation strategies. The solution of this task will require some efforts from the representatives of the whole scientific society, from biological and technical sciences to social and humanitarian ones. It can be explained by the complexity of this new challenge to the humankind of XXI century, which can be met only if the public morality is changed and the environmental ignorance is eliminated. With regard to Russia it is urgently required to develop new approaches to the organization of the economic mechanism in order to counteract the consequences of climate change, to reform the existing model of federalism, to develop new concepts and methods to compensate for any damages caused by global climate change, to keep the development of the theory of environmental disaster zones.

Keywords: Climate change; compensation for damage; environmental federalism; environmental fund; Volga-Akhtuba floodplain; environmental disaster zone.

Introduction

In Russian social life the global problems of climate change do not occupy any significant place. Most people sincerely believe that climate change happens in faraway Antarctica where the snow melts and because of this the small islands in the Pacific Ocean submerge. Somewhere far away typhoons and tornados, earthquakes, tsunamis and droughts occur, but it is not related to Russia by any means. In May and June of 2015 this comfortable worldview was abruptly broken in one of the provincial cities of southern Russia – in the city of Volgograd.

During this period, a real environmental disaster broke out between the Volga and Akhtuba, where the unique natural landscapes under the special state protection are located. By itself, the crisis has developed gradually within several years, the drought has been coming on and the water amount in water bodies has been decreasing. The disaster led to a series of formal and informal discussions between the representatives of various social, natural, technical and other sciences. In the course of these discussions various options to fill the Volga-Akhtuba floodplain with water from the Volga, to drill new deeper wells in the new aquifers were proposed, it was suggested to support financially the local governments, etc. That is when the question regarding the role of law in regulating of environmental crisis in the floodplain was raised, as well as whether it is possible to create the legal framework for ideas to rescue the floodplain expressed by the representatives of

other sciences. And then suddenly it turned out that Russian environmental legislation completely lacks the means and methods to combat such environmental disasters, there are no methods of calculating the amount of harm caused by them as well it is not possible to recover them from a non-existent party in fault. Moreover, the climate is not an object of the special protection in Russian environmental legislation, and it is never referred to in the major environmental laws. Since the similar problem earlier or later will appear in other regions of Russia (as well as in other countries of the former Soviet Union and Eastern Europe), there is a need to develop a national model of doctrinal environmental protection in the face of climate change. During its development the authors used the works of Russian, European and American writers who expressed a lot of interesting suggestions for overcoming the consequences of global climate change, as well as monitored the law and practice, both in Russia and in the countries of the former USSR, where the legislators have already faced this problem and outlined first measures to solve it.

Main reasons and consequences of the environmental disaster in the Volga-Akhtuba floodplain: facts, discussions, comments

Volga-Akhtuba floodplain: environment and geography

Volgograd region is a subject of the Russian Federation, included in the Southern Federal District, which occupies the area of 112.9 thousand sq kilometers. Its extension is more than 400 kilometers from the north to the south and from the west to the east, the region shares borders with Saratov, Rostov, Voronezh, Astrakhan regions, the Republics of Kalmykia and Kazakhstan.

The climate of the region is continental and is characterized by the large amplitudes of temperatures, lack of precipitation and repetitive droughts. The northwestern part of the region is in the area of forest steppe, the east one is in the area of semi-desert, which is near to the real desert.

The Volga-Akhtuba floodplain is a unique natural formation located between the riverbeds of the Volga and its arm Akhtuba, which extends for 450 km from Volgograd to Astrakhan. Below Astrakhan the floodplain develops into a vast delta and a coastal zone of the Caspian Sea. The Volga-Akhtuba floodplain with the delta is a single ecosystem, which is divided by administrative and territorial borders. 1.5% of the population of Volgograd region lives within the territory of the Volga-Akhtuba floodplain, where 46% of the population is urban residents.

The floodplain is the only area of Volga delta where the natural structure is preserved. Its territory is an inhabitation for more than 860 species of plants, 50 species of fish, 3 species of amphibians, 10 species of reptiles, 33 species of mammals, 242 species of birds, more than 1,500 species of insects and other invertebrates, which are not studied sufficiently.

The environmental significance of the Volga-Akhtuba floodplain and Volga delta is dictated by their climate-regulating and environment-forming role, biological and landscape diversity, the large number of different water bodies and other valuable natural complexes, meeting the criteria for key bird areas of international importance, and the biggest part of them not only have a significant impact on the overall environmental situation, but also have high productive parameters. The main environment-forming factor is a hydrological regime of Volga floodwaters passage, whereas the Volga is a typical lowland river, and the water runoff is mainly formed due to melting of snow (60%), groundwater (30%) and precipitation (10%) (Loboyko and Kuznetsov, 2009).

The role and importance of the Volga-Akhtuba floodplain in the lives of the region's population is much diversified. Fertile soil areas and favorable conditions of natural and artificial irrigation have created the excellent conditions for vegetable and fruit farming as well as for other sectors of plant cultivation. Hay meadows between the rivers are a source of feed in cattle breeding for adjacent Volgograd and Astrakhan regions. Finally, the area is used for ecotourism and fishing.

The value of the wetlands of the Lower Volga is of particular importance, as they are a vital link between the water catchment area and the sea, a kind of buffer of the Caspian Sea, which protects it from the adverse effects of agricultural, industrial and municipal activities that are carried out all over the river bed. Wetlands are rich in resources; they ensure the existence of diverse flora and fauna.

The global significance of wetland biodiversity in the Lower Volga is recognized at the national and international levels. Due to unique species diversity the wetlands of the Lower Volga region are recorded among 200 globally important regions in the list of the World Wildlife Fund. About the half of the Volga delta is covered by the Convention on Wetlands of International Importance, mainly as Waterfowl Habitat in 1971 (Ramsar Convention), and some lands of the Volga-Akhtuba floodplain are included in its prospective list (Vershina and Makovkina, 2015).

After the consideration of an application filed by the authorities of Volgograd region, the Volga-Akhtuba floodplain became the first Russian specially protected natural area of the regional importance, which was included in the World Network of Biosphere Reserves of UNESCO's Programme. This decision was made at a meeting of the International Coordinating Council of UNESCO's Man and the Biosphere Programme, held in Dresden from 28.06.2011 to 01.07.2011. At that time, the network included 580 objects from 14 countries (The Volga-Akhtuba floodplain was included in the World Network, 2011).

Considering the unique nature of the ecosystems in the floodplain, as early as in 2000 the Natural Park was created within this area, which is a kind of specially protected natural areas of the regional importance (Decree of the Head of Administration of Volgograd region, 2010).

In the Russian Federation there is a sufficiently extensive network of specially protected natural areas (SPNAs), including the reserves, national and natural parks, wildlife sanctuaries, natural landmarks, arboretums and botanical gardens. They differ from each other by the prohibition degree of economic and recreational activities in their territory. In any reserve all other economic activities except for ecotourism are expressly prohibited, but within the boundaries of national and natural parks not only tourist activities are allowed, but also limited economic activities, which do not destroy the natural objects. However, the majority of economic activities in the national and natural parks are prohibited (for example, exploration and production of hydrocarbons, use of toxic chemicals and substances, which do not degrade and affect the human body, the discharge of untreated and dirty sewage and drainage water, etc.) .

The legal status of natural parks has similar and different features with the status of national parks. The objectives of the national and natural parks are similar which are to create conditions for recreation (including large scale one), development and implementation of effective methods of environmental protection, maintenance of the environmental balance.

However, unlike the federal national parks, natural parks are regional specially protected areas and created by the public authorities of subjects of the Russian Federation according to the recommendation of federal environmental authorities. They are funded from the regional budget, and, unlike the national parks which have the internal structure clearly enshrined in the law, the list of functional zones of natural parks is not complete, i.e. the solution to this problem is left to the discretion of regional public authorities.

Thus, in the summer of 2015 the environmental disaster happened not just within the unique natural landscapes, but also within the boundaries of the regional specially protected natural area - the natural park included in UNESCO roster. Not the toughest protection regulations are established for this territory (in comparison with reserves), but there are a number of limitations of economic activity and measures for additional protection of the unique natural complexes, which are highly vulnerable to external anthropogenic impacts.

Analysis of the causes and consequences of the environmental disaster in the Volga-Akhtuba floodplain in the summer of 2015

The state of water, forests and other ecosystems of the floodplain varies greatly before 1961 and after. This date is the construction date of Volga Hydroelectric Power Station (HPS), and its appearance destroyed the natural process of the river overflow and filling the water ecosystems of the Volga-Akhtuba floodplain. The first case of a large-scale drought and destruction of ecosystems in the floodplain occurred in 2006, but then in the summer of 2015 the scope of the environmental disaster (and the damages caused by it) greatly exceeded all previous environmental crises in the floodplain.

Volgograd expert community expressed two reasons of the floodplain ecosystem destruction. The first group of experts (V. Loboyko) repeatedly stated that it was the fault of an energy company, which reduced the amount of water discharged through Volga Hydroelectric Power Station in order to obtain the profit, which led to catastrophic consequences for the floodplain (In the Volgograd region the deputies, 2009).

The second group of experts (S. Bologov) believed that the decrease in the volume of water discharged through the HPS was caused by objective reasons. Due to the decrease in snow cover and melt water, the reservoirs upstream the river were not filled (Volga-Kama cascade of reservoirs) and accordingly the water level in Volga reservoir decreased. The volume of discharge is also affected by the need to maintain the depth of the fairway for river vessels, fisheries needs, etc. To preserve the floodplain within its borders, the reclamation and artificial pumping of water is required (Sergey Bologov, 2015).

Along with the decrease in water discharged through the HPS, the floodplain ecosystems were negatively affected by the creation of numerous dams (including illegal, without any permission) in the floodplain by villagers, farmers and commercial organizations, which greatly hampered the natural movement of water during the seasonal flood by the natural routes as well as the massive construction of houses, roads, economic facilities, waste generation in the floodplain, which also negatively impacted the soil condition and the condition of the plant world. As a result, infrastructural and urbanization factors strengthening each other provoked the further reduce of the hydrological regime parameters and consequently the growth rate of impoverishment of water resources of the floodplain, which are the basis for the floodplain nature. At the same time the possibilities of the authorities and society in the fight against this problem are limited, in spite of the protection status, the floodplain is the place of residence of a significant amount of the population, and the economic activity is conducted within its territory (Shevandrin, Petrova, Voronin, 2014).

Even after the drought in 2006, biologists conducted the fieldwork in the floodplain. The analysis of vegetation performed by the All-Russian Research Institute of irrigated agriculture (VNIOZ) showed that the grasslands as a community of perennial herbaceous plants survived in the floodplain, but the species composition and structure of the stand significantly changed. The species typical for dry grasslands became to prevail in the floodplain meadows. The low content of major mineral elements in the soil was observed everywhere.

The transformation of the vegetation cover of meadows with the reduced vitality of grass species occurred mainly due to the lack or total absence of prolonged flooding of meadows. The existing practice of minor spring discharges of water by Volga Hydroelectric Power Station (not exceeding 25000-26000 cubic meters per second), and a short period of such discharges did not assure the flooding of all bottomland areas and the optimal water regime. Observed negative changes in the vegetation with the sharp decrease in the stand yield are associated with a decrease in water availability in the meadows. Non-regulated grazing of animals and wrong technologies of harvesting played an important role in the destabilization of plant communities. The herbage

productivity after the crisis was 1/2-1/3 of the herbage biocapacity. The vegetation biodiversity decreased. The changes of the majority of meadows were attributed to the class of moderate degradation with reduced ability of self-regeneration. It could be possible to restore their productivity by optimization of flooding regime in the lower course of the Volga, a radical improvement and regulation of their use (Timoshenko and Yudaev, 2011).

These trends have fully manifested themselves during the crisis in the floodplain in 2015. Thus, steppe feather grass and other herbs began to grow near a number of dried-up water bodies (for example, in the upper part of Verblud creek). Feather grass as plant species mostly inhabits the steppe grasslands, on dry open hills, rocks and stony placers. The appearance of the steppe plants in the floodplain is a signal that there is a change of ecosystems and that soon a desert will appear instead of an oasis. There are some concerns that it will happen in the next 10-15 years.

The flood of 2015 was the lowest for the entire period of observations in the area of Volga Hydroelectric Power Station since 1881. According to the official information of the Joint-Stock Company (JSC) "RusHydro", which owns Volga HPS, the water reserves in the reservoirs of Volga-Kama cascade in 2015 amounted to 50.6 km³, which is 3.7 km³ less than the long-term average annual value and 8,7 km³ less than the water reserves at the beginning of 2014 (which was also a low-flow period). Due to the forecast of low water inflow to the reservoirs of the cascade there is a risk of not filling the reservoirs of the Upper Volga during the flooding in future years. The lack of water severely affected the production of electricity by all hydroelectric power stations of Volga-Kama cascade. Thus, Volga HPS generated 5892.10 mln kW per hour in 2013-2014, while in 2014-2015 only 4453.06 mln kW per hour was generated. Accordingly, the deviation was 24.4%. In accordance with the forecasts of "RusHydro" on the average for the coming years until 2029 Volga runoff will be 239 km³, when the standard rate is 264 km³, therefore, the reduction of the water content by 10% with respect to the medium-long-term value is expected. Just to increase the water discharge from Volga HPS is not possible even for technical reasons, the level of the reservoir cannot fall below a certain level, and otherwise the plant will not be able to work (Lack of water in Volga-Kama cascade, 2015). In summary the daily average discharge of water by Volga HPS from May 14 till May 26, 2015 was 14000 cubic meters per second. From June 6 till June 15 the water discharge was about 6 000 cubic meters per second (Spring special water pass was again extended at Volga, 2015). This value is several times less than the required water discharge, which should be 26000-28000 cubic meters per second during at least two weeks which could save the floodplain.

Climate change and reduction of water discharge by Volga Hydroelectric Power Station worsened the living conditions of flora and fauna. Small lakes have dried up completely, and large and medium reservoirs of the floodplain have lost from 50% to 90% of water amount. The consequence of the severe drought in 2015 was the fact that the groundwater level dropped by 1-2 meters. The spawning areas have fallen by 80%. Because of the strong shallowing there was a sharp decline in the oxygen content in water bodies. This caused an unparalleled phenomenon such as summer fish kills. The reduction in the amount and duration of floods, its displacement in time and temperature disturbances drastically reduced the reproduction of fish. The situation was aggravated by the fact that the rapid water fall prevented the normal movement of young and adult fish in the river.

As a result, in 2015 the reproduction of the most fish species has been completely lost, which are the main inhabitants of the Volga and Akhtuba. Similar hydrological and meteorological conditions were observed in 2006, when 30% of the lakes of the Volga-Akhtuba floodplain dried up, food reserves and fish fauna were lost. According to experts' opinion the floodplain has not still recovered from the impact of water lack in 2006 and taking into account the current situation the negative effect has been intensified many times.

Furthermore, severe winter conditions of recent years worsened the situation and led to a strong freezing of waters in the floodplain. When the thickness of the ice was up to 80 cm, the freeze-up was rather long and snow cover was thick, fish and other aquatic habitats often died in the most reservoirs of the Volga-Akhtuba floodplain (estimated damage from winter fish kills in some years was up to 300 tons of fish). Extremely low and short spring flood allowed the water and fish entering only main creeks. The spawning area in some years was only 12% of the long-term average value, and the effectiveness of spawning in the lakes was close to zero (Resolution of Volgograd Regional Duma, 2006).

The drought has sharply increased the number of forest fires, which adversely affected the condition of the floodplain. Since the special treatment of forests was not carried out in the floodplain, it caused an increase in pests destroying the leaves of trees, as well as the growth in the number of ticks. For the first time in many years of observations in the vicinity of Volgograd the bites of a steppe spider were recorded, while they inhabit the south areas, in the deserts of Central Asia (In Volgograd region the number of a steppe, 2015).

The impact of the crisis on people's health remains unstudied. The fact is that the less fresh water is in the region, the more mineral salts are in the soil, and the more ground water is salinized. The health of people depends directly on the quality of drinking water. In the area of the Aral Sea for the past 80 years, the number of cancer increased by 60%, and tuberculosis cases increased twice. Despite the fact that the possibilities of medicine are becoming wider, maternal and infant mortality has been increasing (Volga-Akhtuba floodplain is on the verge of environmental disaster, 2015).

The lack of water in the Volga-Akhtuba floodplain led to the fact that the local population was left almost without drinking water, kindergartens and institutions began to close. As a result, the situation became socially important. In May and June 2015 in the settlements located in the boundaries of the Volga-Akhtuba floodplain, there were cases of conflicts between residents of different villages fighting for the access to the drying lakes which were necessary for irrigation of crops. Desperate residents tried alone to dig a canal linking the Volga and Lake Peschanoe (located on Sarpinsky Island), as the result the lake was partially filled with water.

However, these actions violated the environmental legislation, and therefore the local authorities together with the police drew these people to administrative responsibility (Summer visitors and residents of Sarpinsky Island, 2015). In addition, in May 2015 in the village Tumak there were several fights for the access to drinking water, the amount of which in the wells was extremely low (The Volga-Akhtuba floodplain becomes like, 2015).

Floodplain drying, the lack of drinking water, large fires destroyed the most of the grass stand and deprived farmers of the possibility to irrigate their land. Farmers were forced to slaughter cattle and poultry because of the lack of hay and feed. Many farmers just stopped to cultivate their lands. Also it is important to add that local citizens tried to prevent the death of fish and crayfish, which arose due to the drying up of rivers, streams and lakes. Thus, in the village Leshchev the local people tried to catch fish and crayfish and to move them to other bodies of water. However, these actions fall within the scope of the Code of Administrative Offences, and if the competent authorities detect such actions these persons can be punished in accordance with this Code. In general the social costs caused by this drought and water shortage affected more than 77 thousand people living in 28 rural settlements.

Thus, the main cause of the environmental disaster in the Volga-Akhtuba floodplain in 2015 (as well as of previous ones, although smaller in crisis volume) is a decrease in meltwater and rainfall coming to the Volga, which led to its shallowing and reduction of water discharge through Volga HPS. In its turn, the decrease in discharge led to the death of the flora and fauna in the

floodplain, drying of many small water bodies (rivers, lakes, etc.). The objective problems overlapped the subjective factors related to the activities of local residents illegally erecting dams for their private needs, placing wastes in unauthorized places, constructing residential and other facilities, etc.

In our view, the foregoing consequences can be qualified in accordance with Article 1 of the United Nations Framework Convention on Climate Change convened in 1992, as “the adverse effects of climate change”, which are defined as “changes in the physical environment or biota caused by climate change, which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare”.

Floodplain saving measures adopted by the Governor of Volgograd region and forecast of further possible actions and decisions

The Governor of Volgograd region Andrey Bocharov launched a teeming activity, which resulted in some mitigation of the negative consequences of the drought in some areas of the Volga-Akhtuba floodplain. Initially due to the lack of water the Government of Volgograd region applied to the Government of the Russian Federation and the Russian Ministry for Civil Defence, Emergencies and Elimination of Consequences of Natural Disasters (EMERCOM) requesting to allocate 200 million rubles for the forced pumping of water in the Volga-Akhtuba floodplain. As a result, the subventions for water pumping in Volgograd region were allocated from the federal budget as the item “Preventing the depletion of water bodies”.

Interagency Task Force on regulating the operation modes of Volga-Kama cascade of reservoirs, which had the meeting in Moscow on April 28, 2015, established a timetable for the flood regime of Volga HPS (Volgograd authorities asked to allocate 200 million rubles, 2015). As a result, already in May 2015 the pumping of water into the water bodies of the Volga-Akhtuba floodplain was started. Usually the need for such works occurred in August. But in 2015 because of the winter with a lack of snowfall, the water deficit was observed in all the reservoirs of Volga-Kama cascade, which led to the water shortage. By means of pumping stations of the Volga-Akhtuba floodplain water was fed to lakes and creeks of the natural park with the total volume of 3.5 mln cubic meters, and by June 11, 2015 1.7 mln cubic meters reached Krasnoslobodsk water path, and 1.8 mln cubic meters was supplied to Kashirinsky water path (400,000 cubic meters of water, 2015).

In addition, a series of measures to improve the hydrological regime of the floodplains in the two lakes (Sazanie and Sotovo) was taken, new trees in the areas where forests suffered from fires were planted. The work on cleaning and environmental rehabilitation of small rivers in the Volga-Akhtuba floodplain were continued, although the environmental community made a number of criticisms regarding the inefficient expenditure of budgetary funds, the wrong sequence of actions for cleaning of small rivers and low intensity of water supply (Glinyanova, 2015).

However, if not to get distracted by specific issues, the package of measures for the protection of the ecosystems of the Volga-Akhtuba floodplain included:

1) research cluster of issues. In the summer of 2015, officials of the regional administration in collaboration with scientists and experts of the Ministry of Natural Resources and Ecology of the Russian Federation started to develop a long-term concept for watering the Volga-Akhtuba floodplain. As part of this concept they developed the design and estimate documentation which is required to obtain the federal funds to implement environmental measures in 2016, including the cleaning of river beds, the restoration and construction of hydraulic facilities and pumping stations. The latter measure means that new hydroelectric power stations with the capacity of 3-5 MW will be built, and they will be capable to regulate the discharge of water resources to the natural park

“Volga-Akhtuba floodplain” and keep water in lakes and small rivers (The Governor of Volgograd region, 2015). Along with the construction of mini HPSs, the alternative measures how to save the floodplain are discussed, they relate to the construction of the water pipeline from Volga to Kashirsky and Krasnoslobodsky water paths, bypassing the dam of Volga Hydroelectric Power Station.

2) Measures to manage the consequences and prevent environmental crises in the floodplain. First it should be noted that the lack of water together with hot weather led to the growing number of fires. To prevent them, in the summer of 2015, in the floodplain the forest belts and boundaries of settlements were plowed around. A number of decisions to prevent unauthorized dumps, which provoke fires, were made. It was planned to clean and deepen water bodies and water facilities to increase the pass-through capacity and improve the water supply to the floodplain during the low water floods. Nowadays it is discussed how to organize the breeding of the fish seed and stocking floodplain ponds with fish, which are recommended by fisheries science (instead of died plants and animal species). It is reasonable to record thoroughly all water bodies in the floodplain; it will allow having the information about their current and future state. The public proposed the Government to promote the reclamation of areas, which became heavily overgrown with weeds. The regular mowing of tough grass is required to maintain the high productivity and quality of hay meadows, which are the most valuable spawning area during the flood (Sazonov, Istomin, Kalyuzhnaya, 2015).

Many of the above mentioned actions aimed at the protection of the Volga-Akhtuba floodplain have already given a little effect, and likely it will be possible to reduce some of the negative effects of this drought in the floodplain. However, for the most part they are just technical measures that do not solve the problem of the floodplain protection based on the multifaceted approach. In our opinion, it is efficient to look for the essential solutions to solve this situation from the outlook to change the doctrinal models (and then the legal ones) related to the issues of climate change, to develop the effective measures to protect the environment, life, health and property of citizens. In this regard, we have tried to highlight a few of these “weak points” that require further discussions and conceptual decisions to be made at the legislative level.

The legal doctrine of global climate change and strategies to overcome its consequences: the experience of Russia and the USA

Russian legal doctrine of climate change

In the Russian Federation, the climate is not a special object of protection, and in this sense it is mentioned neither in Federal Law “On Environmental Protection” of January 10, 2002 No. 7, nor in any other environmental laws. The component of the natural environment, natural objects and natural complexes are distinguished as objects of environmental protection in Russia. According to the Federal Law “On Environmental Protection” these objects and components include natural landscapes, land, water, mineral resources, flora and fauna, as well as the ozone layer and near-Earth space (Article 1). Article 1 Federal Law No. 26-FZ “Natural Medicinal Resources, Health and Recreation Localities and Health Resorts” of February 23, 1995 refers to “medicinal environment” as a kind of natural medicinal resources, but does not explain their meaning. Climate protection is not mentioned in the legislative acts of the subjects of the Russian Federation either.

All references to the climate in Russian regulatory documents have by-law nature, and are dedicated to implementation of the Kyoto Protocol to the United Nations Convention on Climate Change. Several regulations of the Government of the Russian Federation and orders of the federal executive authorities (for example, the Russian Federal Service for Hydrometeorology and Environmental Monitoring) identified a number of technical issues regarding the monitoring, control

and limits of greenhouse gas emissions. In view of the foregoing it is not strange that there are no cases related to global climate change in the Russian judicial practice.

However, there is a political and environmental concept dedicated to global climate change - Climate Doctrine of the Russian Federation (approved by Decree of the President of Russia of December 17, 2009 No. 861-rp). But this document is not binding, and contains only a set of declarations, discussions and suggestions.

The situation with the environmental legislation in the countries of the former Soviet Union, namely Kazakhstan and Belarus, is slightly better. Thus, Article 5 Law “On Environmental Protection” of July 17, 2002 No. 126-Z, refers to the climate as an protection object, along with landscapes and natural resources (water, forests, land), specially protected natural areas and near-Earth space. The requirement to consider the impact on the climate while designing and operating thermal power plants is included in Article 39 of this Law. Articles 55-56 refer to the duties of legal entities to reduce the greenhouse gas emissions that affect the climate and the requirement that any activity affecting the environment shall comply with the environmental legislation. At the same time, they have the climatic state inventory of natural resources (Article 72) and the governmental control over the state of the climate as a part of the environment.

Environmental Code of the Republic of Kazakhstan of January 9, 2007 No. 212-III recognizes the climate as part of the environment (paragraph 41, Article 1); it is one of the protection objects of the environment (Article 7); the compliance with the climatic requirements is defined as the government’s authority and specifically authorized environmental authority (Articles 16-17); the climate is subject to state environmental monitoring (Article 137); comprehensive studies of climate change and assessment of its impact on the economy and the natural resources of the Republic of Kazakhstan is one of the main areas of research (Article 186); the basic principles of climate protection are established (Article 310), etc.

The analysis of these laws of two former Soviet republics shows that the protection of environment has higher priority than in Russia (at least in terms of legislative formalization). The main emphasis of these regulations is to define the powers of the executive authorities in the field of climate protection, to establish the framework requirements for the climate protection and obligations of business entities. This experience is of a particular interest for Russia.

It should be noted that in Russia the climate processes have been directly affected for several decades, which is not regulated by any legal provisions, although environmental hazards of such activities are doubtless. In this case the matter of question is a forced intervention in hydro-meteorological processes.

In the USSR, the first attempt to create “good weather” was taken in the 1960s. By means of anti-hail rockets the special agent was introduced into clouds to weaken the process of hail growth. In the 1990s Russian scientists developed the technology of “creation of favorable weather conditions”, and in 1995 this technology was widely implemented to disperse the clouds during the parades on May 9. As a result, for example in 2012, the Air Force dispersed the clouds before the parade in honor of Victory Day in Moscow and 64 million rubles was spent for this (64 million was spent to disperse, 2012).

The Ministry of Natural Resources and Environment (MinPrirody) of the Russian Federation approved the action plan to adapt the technologies of active influence on weather conditions in Sochi during the preparation and holding the Olympic Winter Games 2014. In 2012-2013 some research activities were done to identify the specific application of these technologies in the Caucasus Mountains. The officials of the environmental authorities had the task to adapt the technology of cloud seeding to weather conditions of the North Caucasus and to overcome the possible abrupt temperature changes which were typical in the local climate. The measures for the

forced descent of avalanches and the use of artificial snow were developed (Forced weather changing for the Olympic Games, 2011).

The lack of regulatory instruments related to the impacts on hydro-meteorological processes is usually explained by the fact that technologies used to disperse the storm clouds are absolutely harmless for the environment (Dry ice, liquid nitrogen, 2005). The terrible weather disasters of recent years raise some doubts in this regard. The artificial and permanent influence on the biosphere of the Earth cannot but cause a catastrophe on a planetary scale sooner or later. This artificial influence on the weather from the standpoint of international law should be considered in connection with the national borders. Artificial changes in the existing distribution of natural rainfall in a particular area as downwards (cloud seeding) as upwards (artificial rain or snowmaking) out within one country undoubtedly can have a significant impact on the climate of other countries bordering with it (Baskin and Baskin, 1968).

Thus, there is no doubt that it is necessary to perform serious research to define the interrelation between the active intervention in the hydro-meteorological processes and the climate, as well as the regulatory control of this process. Unfortunately, climate change is not a priority for the Russian legal scholars, although some progress has been made. The development of international cooperation in the field of climate protection has been thoroughly analyzed, the strengths and weaknesses of the Kyoto Protocol and other international agreements have been evaluated, and the prospects for climate protection have been reviewed (Valeev, 2012).

In the only defended thesis on environmental and legal issues of climate change, the latter has been defined as a set of characteristics of the environment, ensuring the existence and maintenance of life on the Earth. The accent was given to the common tasks, principles and mechanisms in the field of protection of the ozone layer and climate, as well as the interdependence of the relevant geophysical processes (Seminikhina, 2010).

The most significant contribution to the legal theory of overcoming the consequences of global climate change was made by A.M. Solntsev. This author draws attention to the close relationship between climate change and protection of human rights. This aspect is particularly important as on March 28, 2008 the United Nations Human Rights Council adopted Resolution 7/231 on human rights and climate change, which states that climate change is essential for the full enjoyment of human rights. A.M. Solntsev emphasizes that climate change as an environmental problem potentially has harmful effects on the following rights: the right to adequate housing; the right to an adequate standard of living; the human right to access to water. According to expert estimates there are hundreds of thousands of environmental refugees and internally displaced persons in the Russian Federation (Solntsev, 2013). It is important to add that today the number of residents of the Volga-Akhtuba floodplain who fled their homes because of the drought caused by climate change is not registered, but this problem exists and is pending to be solved.

Finally, many Russian authors express noteworthy suggestions on improving the environmental legislation with regard to solving of climate change problems. In particular, it is proposed to amend the Federal Laws “On Air Protection”, “On Licensing of Certain Activities”, Code of Administrative Offences of the Russian Federation. Also it is proposed to amend a number of existing regulations of the Government of the Russian Federation (Kichigin and Khludeneva, 2009).

Yu.V. Solovey made some interesting suggestions, he believes that the legal regulation applicable to reducing of anthropogenic greenhouse gas emissions requires three new federal laws (he developed their drafts), which will define the basic concepts, mechanisms, methods and other issues for the regulation of greenhouse gas emissions. Among these laws he proposes a law “On State Regulation and Policy Regarding the Emission and Absorption of Greenhouse Gases in the

Russian Federation”; law “On Recording and Control of Emission and Absorption Levels of Greenhouse Gases in the Russian Federation”; law “On Property and Quotas for Greenhouse Gas Emissions in the Russian Federation” (Solovey, 2003).

Far from objecting to the proposals made, it is worth mentioning that there has been no complete doctrinal legal model of the development of national legislation in the field of overcoming the consequences of global climate change in Russia yet. Not attempting to answer all existing questions in one article, we just attract the attention to one fundamental fact. The efforts of the representatives belonging to various scientific areas will be required to create an effective legal model to prevent global climate change. With regard to the theory of environmental law, it is evident that the climate shall be recognized as an object of environmental protection both in Russia and in other countries of the former USSR. This will be a logical continuation of the development of the doctrine of Environmental Law in Russia, which has already passed several stages.

There had been no legislation regarding the nature protection until the middle of the XIX century in Russia. Even if the tsars forbade cutting trees or hunting in certain areas, they did not care about the nature, but about the sufficient amount of ship masts or maintaining their own hunting grounds.

As such, the process of nature protection within the current meaning of the term did not start until the middle of the XIX century, when the Russian legislators set two environmentally significant objectives: to ban the certain types of natural resource use (forestry, hunting, etc.) and to exclude some natural areas from economic use giving them the special protection status. Just then the first natural reserves Barguzinsky (1916) and Astrakhansky (1919) appeared.

Afterwards starting from the 1920s of the XX century the Soviet government passed from the protection of individual natural objects and systems to the protection of natural resources. The natural resources legislation was codified several times. In particular, the Land Code of the RSFSR was adopted in 1970, the Water Code of the RSFSR was adopted in 1972, the Forest Code of the RSFSR in 1978, and the Law of the RSFSR “On Protection and Use of Fauna” in 1978, etc. These laws focused on the use and protection of certain types of natural resources (forests, land, etc.).

The fundamental change in the doctrinal approach to understanding the range of objects of environmental protection happened in 1991, when on December 19 the Law of the RSFSR “On Environmental Protection” was adopted. For the first time the object of legal protection included not only the environmental state of natural resources or individual objects of flora and fauna, but also the state of the environment in general, and also the law provided for legal requirements to human activities in various sectors of the economy - in construction, industry, energy, agriculture, in specially protected natural areas, etc. The law distinguished three categories of objects protected by the environmental law: integrated (natural ecosystems, the environment in general and the ozone layer); differentiated (land, water, mineral resources, forests, air, wildlife); specially protected (state nature reserves, natural landmarks, etc.). This approach remains in the current legislation.

Within our approach it means that the new fourth stage of the environment protection has started. The legislation evolution from the protection of individual species of flora and fauna to the protection of individual natural resources, and from them to the requirements in specific areas of activities should logically reach the next level – the protection of the biosphere and the climate of the whole earth at the national and international level, which success depends not only on the activities of the central government but also on the initiatives of local communities, individuals and public environmental associations. Changing the concept of the object of environment protection should be followed by development of a range of measures ensuring effective counteraction to climate change, including administrative, economic, educational, international and other measures.

US legal doctrine of climate change

The global strategy to combat the effects of climate change

It is impossible to analyze the numerous scientific works (including legal ones) on all issues related to climate change within the framework of a single article. Therefore, in this section we have set a less extensive task: to analyze the scientific works on problems of legal regulation to overcome the consequences of climate change, which can help in the creation of the national doctrinal climate model.

The fact that the consequences of local climate change in certain regions have been studied in different countries once and again will facilitate the solution of this task, and some important recommendations expressed in this regard can help us in further research.

In 2008, the fishing industry and agriculture in Montana (USA) suffered significant losses due to the death of trout, when the temperature of water in the rivers reached 78 ° F. The average spring temperature has constantly increased in the state since the 1950s and continues to increase now. Higher average temperatures, earlier snowmelt and therefore decrease in the water velocity in rivers in the summer resulted to the rise in the normal water temperature, thereby the chances of trout to survive reduced. In the agriculture, the reduction of the total water amount available in the summer significantly complicated the irrigation. Thus, climate changes at the same time put at risk Montana trout, the fishing industry, agriculture and safety of citizens. As demonstrated by the death of trout in Montana, climate change modifies the basic conditions of the ecosystem existence in the United States and therefore begins to affect the economical system that depends on ecology (Craig, 2010).

Temperature effects create a variety of problems for people and have already affected a number of important areas of economic and social activity, including agriculture (with respect to the timing for spring sowing and the possibility of summer irrigation), forestry (with respect to fire-prevention and pest control), health (with respect to mortality caused by high temperatures, modifications of infectious diseases, spread of mosquitoes and new allergenic reactions). The climate influence on complex ecosystems can not be controlled in the framework of available knowledge and modeling systems. For example, the researchers believe that the spread of the mountain pine beetle in Montana and other states in the USA followed by the loss of millions of acres of forests is almost certainly caused by climate change (Craig, 2010). The increase in the number of known pests as well as the emergence of new species and their migration to the northern forests (where previously they could not live because of the cold climate) will inevitably lead to increased use of pesticides and other chemicals, and will have economic and environmental consequences. Thus, the further discussions how to protect the environment in the agriculture and forestry in order to ensure the environmental safety are quite logic.

Global climate change provides the mankind with two main survival strategies: the strategy of adaptation to climate change and strategy to mitigate such effects. The Intergovernmental Panel on Climate Change identified “mitigation” as the human impact to reduce the sources or to reduce the greenhouse gas emissions. In its turn, “adaptation” is a regulator of natural or human systems in response to actual or expected climatic changes or their effects, which soften the damage or provide new profitable opportunities. Measures to mitigate climate change are often preventive as they focus on the sources of climate change, while the adaptation is a measure to respond to the effects of already changed climate. Several categories of mitigation are distinguished in the scientific literature: the production of energy with fewer greenhouse gas emissions than typical fuels; technology to remove greenhouse gases from the atmosphere; land use, agriculture and forestry methods that reduce the volume of greenhouse gases in the atmosphere (Parker-Flynn, 2014).

Adapting to climate change is a very painful process; it requires putting up with a lot of losses. We should be ready that many species in their natural environment will not be saved, or the whole existing ecosystem will not remain unchanged in its today's location. Many plant and animal species are unlikely to survive climate change. New studies suppose that 15-37% of the terrestrial plants and animals ultimately will be killed as a result of climate change expected by 2050. For some of these species it will not be possible to find appropriate places for living anywhere else. Others will be unable to reach places where the climate is suitable for them (Craig, 2010).

However, we should support the position of Matthew D. Zinn, who believes that there are no contradictions between the mitigation and adaptation strategies. In the climatic system, even if there are immediate and drastic steps to reduce greenhouse gas emissions, there are no obstacles to climate warming, and they can only soften it. That is why some adaptation is inevitable, and the real debate should focus on how we should strive to mitigate the climate, and how much space we should leave for the adaptation.

The adaptation has its own potentially serious adverse effect on the environment. It shows the effects of climate change and includes a mechanism of indirect effects on the environment due to climate change. For example, climate change will reduce the mountain snowpack in some US western states, which will reduce the reserves of natural water. The construction of new dams with the aim to make up these losses will destroy the coastal and upland ecosystems above the dams and will significantly alter the aquatic ecosystems below them.

Therefore the policy of adaptation to climate change adds the risk of negative environmental side effects, not being able to reduce the severity of climate change in natural ecosystems. At the same time the adaptation policy can provoke a series of synergistic effects when these ecosystems will be exposed (Zinn, 2007).

All of the above mentioned trends were observed in full in 2015 within the Volga-Akhtuba floodplain. To mitigate the negative effects it is necessary to develop a full range of measures (economic, political, legal, administrative and others) that should be addressed in a special law on the adaptation and mitigation of climate change. It is worth emphasizing that none of laws is able to comprise the whole range of measures to prevent the effects of climate change because it is a comprehensive interscientific issue, rather than a purely legal one. During the development of a new climate change strategy (including its legal section) it is required to proceed not only from the tasks to mitigate climate change (by reducing greenhouse gases), but also from the adaptation strategies to the adverse effects of climate change. The latter one can appear in the form of grants awarded by the government to cultivate new drought-resistant varieties of plants; to subsidize the installation of new irrigation systems (such as drip irrigation); to develop new pesticides and new technologies to prevent the soil salinization; to naturalize new species of flora and fauna; to implement new economic models for the employment of population affected by the drought; to create a mechanism to protect the rights of environmental refugees and internally displaced persons; to develop a health care system due to the risk of new diseases caused by climate change; to develop a control system, etc.

The latter aspect is of particular importance for Russia because in this country the main environmental authority, the Ministry of Natural Resources and Ecology of the Russian Federation (MNR), regulates both issues of environmental protection and use of natural resources. Because of this, sometimes "conflict of interest" may occur, which is solved not in favor of the environmental protection. However, it does not have any functions in the field of the policy of mitigation of and adaptation to the consequences of climate change, including the functions to coordinate the actions of other environmental bodies in terms of reducing greenhouse gas emissions.

At the same time we are not talking about creating a single environmental “super authority“, which would subjugate all other executive bodies, performing certain environmental functions. Power centralization in one super authority can slow down the decision-making process, encourage excessive confidence in the only correct point of view, and increase the number of errors. Creation of an integrated management structure is more important than a structural merger, in such system each agency takes into account the adverse effects of climate change in the neighboring regions (and within its own jurisdiction), and the controlling authority should pay particular attention to related areas of their competence and coordinate the entire system of environmental authorities. This model is optimal because greenhouse gases are emitted by every sector of human activity, including energy, industry, transport, agriculture, forestry, etc. Therefore, the direct management from the only center will be difficult. That is why none of the US agencies has any power in all sectors affecting the climate (Wiener, 2008).

In this regard, if the Ministry of Natural Resources receives the functions of the coordinating body to overcome the impact of climate change it will increase the efficiency of settlement of environmental issues in Russia. Setting of new tasks of urban planning can be considered as an example such coordination field of tasks to mitigate the effects of climate change. Today such tasks are defined in the Urban Planning Code, providing for the land-use planning at the federal, regional and local levels. The existing and soon-to-be public facilities should be indicated at the respective schemes. In the light of the strategy to mitigate climate change, such schemes of land-use planning can include new types of energy facilities, which are planned to be built in the future, associated with the use of renewable energy sources (solar batteries, wind generators, etc.). This approach will reduce the level of greenhouse gas emissions. In addition, it is possible to include the forecasts of internal migration of the population and allocation of the industrial facilities resulting from these forecasts. However, the accuracy and feasibility of these plans requires reliable forecasts of climatologists, meteorologists, biologists and other specialists.

During the implementation of the new management model in overcoming the impacts of global climate change the Ministry of Natural Resources also has to consider the synergistic effect of climate change and traditional environmental risks (such as industrial emissions), as well as to provide a series of measures to prevent emergencies.

Role and importance of the moral objectives of the society as a strategy to counter global climate change in the USA and Russia

Combating climate change can not be effective when only legal mechanisms are used. One of the measures which can not be directly controlled by law is formation of higher moral obligations of all citizens and their communities. This obligation includes a willingness to litigate the governmental decisions that enhance the climate crisis. The Catholic Church plays the important role in the formation of moral obligations of citizens; it holds the active position regarding the necessity to prevent climate change, rational use of natural resources. It calls people for living in harmony with the God, to protect future generations, to admit that the poor suffer more than the rich as a result of climate change. The leading US Protestant churches have also called for changes in the politics and human behavior through the National Council of Churches.

There are numerous ways which allow every citizen to personally contribute to reducing greenhouse gas emissions. For example, people can stop using plastic bags for food. Americans use 100 billion of them every year, and for their production millions of barrels of oil are required. People can install small home solar panels, buy products grown in their state or the municipality at a local store, which will reduce the cost of their shipping and the amount of vehicle exhaust gases. In fact, people will also derive some benefit from this (Brown, 2010).

Another problem is that in the face of environmental changes that break the usual way of life, including the rising sea level or frequent and severe storms, people's attitude towards the environment and measures for its protection will not remain static. Environmental changes caused by warming climate may weaken the public commitment to environmental protection in a variety of areas. Climate change will destroy some of the human relationships with the environment, which was important for the public support of the environmental protection. Disasters enhanced by climate change, such as hurricanes, floods or water shortage can transform the public understanding of the environment from the admiration and desire to protect it to hostility from a position of strength (Zinn, 2007).

These considerations of American scientists have a direct relation to the creation of a new moral attitude to the problems of climate change in Russia, including the impact of the local environmental disaster in the Volga-Akhtuba floodplain. In our opinion, one of the causes of the environmental crisis in Russia is a mechanistic perception of the nature, as a place of work and rest fully controlled by man, confidence in the fact that all processes in the area of interaction between the nature and society can be regulated by law. This approach entails disastrous consequences, the causes of which are hardly studied in Russian social science. However, the world and nature have been perceived this way for many centuries, which is even reflected in classical Russian literature. "Nature is not a temple, but a workshop, and a man is the workman in it" says Evgeny Bazarov, the main character of "Fathers and Sons" by Ivan Turgenev, to his young friend Arkady (Turgenev, 1862).

In case of change in the vector of national ideology in Russia and republics of the former Soviet Union, the environmental ethical viewpoints of the outstanding humanist of the XX century Albert Schweitzer can be used. He is the author of the most important ethical principle of "reverence for life".

The essence of this principle is the recognition and affirmation of the highest meaning of life. In Schweitzer's view the life is the innermost among all other things that nature has created, and therefore it requires a great respect. One of the principles of his ethics arising from this background is the principle of "man and nature". The principle of "man-nature" is intended to regulate the attitude of people to nature in all its aspects. Suggesting and justifying this principle as one of the basic in ethics, A. Schweitzer thereby expands the scope of morality, including the standards of people's relation to nature in it, along with norms of human relations (Petritskiy, 1989).

Changing the moral attitude of citizens towards nature will allow to solve many issues in combating climate change, to involve citizens in environmental education actions, to develop the environmental volunteer movement. In the long term, this could lead to the emergence of strong "green political parties" in Russia which could lobby implementation of environmental (including climate) policies, requirements and activities in legislative bodies of the federation, its subjects and municipalities. The rise in the environmental legal culture will allow (in the case of the Volga-Akhtuba floodplain) to decrease poaching, to reduce the number of illegal dumps that occur after the picnics, to reduce the construction of unauthorized dams and canals by citizens.

To achieve all these goals, the federal, regional and local authorities of Russia should now take measures to promote the civil society and to reduce the environmental ignorance. It will stimulate the legitimate activity of citizens, creation of public environmental organizations combating climate change, filing lawsuits to protect environmental rights, organizing rallies, demonstrations and referendums on the general environmental and climate issues. The Russian Orthodox Church can play the important role in improving the moral standards of the population; it declared its position on urgent environmental issues on February 4, 2013 (The position of the Russian Orthodox Church, 2013). At the same time, the Protestant Church of Russia also announced

its vision of the relationship between the environmental and spiritual crisis and made a number of proposals for the participation of the faithful in the protection of nature (The social position of the Protestant churches in Russia, 2015). Implementation of these measures is the most important task of modern Russia.

Economic mechanism for mitigation of the consequences of climate change: experience of the USA, Russia and some countries of the former USSR

Along with administrative and moral strategies for overcoming the consequences of climate change, economic and legal methods, including the general and specific measures, are especially important in this process. General measures imply a range of ways of farmers' adaptation to the effects of climate change, including their transfer to new varieties of grain crops which would respond differently to the temperature change, CO₂ and water availability. A certain effect can be achieved by changing the date of sowing of seeds, construction or reconstruction of irrigation facilities. Adaptation by means of technologies is also possible. The USA historically settled many of their agricultural issues by using achievements of genetic engineering technologies, which greatly increased the yield even in terms of climate change. Moreover, innovative methods excluding GMO, which are high technologies of traditional yield increase, can be also used to counteract climate change. Another way of agricultural adaptation to the consequences of climate change is development of agricultural insurance. The US government wants to transform crop insurance and support in case of natural disasters into prognostic tools for minimization of risk mitigating the consequences of climate change (Janda, 2015).

A separate variant discussed in the US legal science is possible introduction of a carbon tax, that is a tax on emissions of carbon in the form of greenhouse gases. Such a tax can be attributed to both producers and consumers of the corresponding products. This tax can be levied on goods that emit greenhouse gases, like cars or gasoline, or directly on emissions of greenhouse gases (Parker-Flynn, 2014).

Among other general economic methods we should point out trade in quotas on emission of greenhouse gases at the national level. In the countries of the former USSR such a mechanism is most well represented in the Environmental Code of the Republic of Kazakhstan. The Code stipulates the procedure for establishment of quotas on emission of greenhouse gas emissions for users of natural resources, as well as a market mechanism for trade in quotas on emission of greenhouse gases.

In Russia this area is poorly developed. Article 17 Federal Law "On Environmental Protection" stipulates measures of state support by means of provision of tax and other benefits for introduction of the best available technologies and other measures for reduction of negative effect on the environment, though there is no mechanism of implementation of this measure in the legislation.

The special economic and legal regulator of counteraction to climate change includes creation of environmental funds spent on implementation of environmental measures and compensations for the suffered persons, including those affected by climate change. There are three levels of such funds: international, sub-regional and national. At the international level, one of the first funds was the International Fund for Compensation for Oil Pollution Damage, which was established in October 1978. In addition, there is the Global Environment Facility – an international financial institution, which was established in 1991 and unites 176 countries. Its purpose is to improve the global environment. This organization provides funds to support various projects in developing countries in the field of biodiversity, climate change, protection of international waters, fight against degradation of land resources and the ozone layer as well as against organic pollution of the nature (GEF activity, 2015).

The necessity of establishment of a special environmental fund is mentioned in the Report of the UN Conference on Sustainable Development, Rio + 20 (paragraph 191), recognizing the importance of mobilizing funding to support national actions aimed at mitigation of the consequences of climate change, adaptation measures, technology development and transfer and capacity-building in developing countries. In this regard, the launching of the Green Climate Fund was approved (The Future We Want, 2012). At the national level, environmental funds are established in the majority of developed countries of the world. In Germany, Bundesstiftung Umwelt DBU (German Federal Environmental Foundation) is one of the largest European funds promoting innovative environmental projects. Since 1991, 8800 projects have received financial support in the amount of over €1,5 billion. The fund focuses on promotion of projects in the field of environmental technology, environmental protection, environmental communication, etc (The Deutsche Bundesstiftung Umwelt DBU, 2015).

However, the Superfund established in the USA in 1980 as a result of adoption of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) has become most famous. The purpose of this act consisted in gradual clearing of large areas contaminated by waste disposal which created a great danger for man and nature. Any operating organization engaged in waste disposal in the environment, regardless of the presence or absence of its fault, was obliged to compensate the costs incurred by the authorities in connection with the cleanup and compensation for damage to third parties. Such activities, primarily cleanup of unowned territories, were financed at the expense of the Superfund. 86% of the fund consisted of tax liabilities of chemical and oil companies and 14% were formed at the expense of the state budget (Klochenko, 2007).

For the first five years of the existence of the Superfund Act the US Government filed 200 cases on the basis of this legislative instrument, in 580 cases work on clearing sites included in the National Priority List began. Judicial practice significantly expanded the area of application of the Act, which started to cover also the substances (for example, types of fuel) which were not on the initial list but, among its components, included one of the substances directly subject to the Superfund Act (Vylegzhanina, 2005). The cleanup program proved to be quite expensive, with costs comprising approximately \$ 1.5 billion annually. However, the program led to substantial progress in rehabilitation of about 1,000 hazardous waste sites of approximately 1,550 in total, which were identified as enough hazardous for federal intervention (Biber, 2009).

However, in 1995, Congress allowed the Superfund tax to expire, and the trust balance fell from \$3.8 billion in 1996 to zero in 2003. Instead of polluters paying, the U.S. Treasury has since subsidized cleanups (Abate, 2013). Meanwhile, many believe it just to recover taxes paid in the Superfund by including mining and mineral processing industries in the list of their payers (Kloekner, 2010).

Another type of environmental funds of the USA is the BP Fund established to pay compensation to the victims of the oil spill in the Gulf of Mexico. As of March 28, 2013, the fund had paid about \$10 billion of compensation of the \$20 billion placed in the fund. Despite the large amount paid from the fund, many claims were denied due to lack of documentation proving causation of the suffered damage. Many claimants could not prove that the damage was caused by the BP oil spill and not the result of Hurricane Katrina. Meanwhile, The BP fund could provide a framework for a climate change relocation fund. In this context, however, identifying responsible parties will be much more difficult than it is in the oil pollution context. It is much easier to show causation of a spill from a specific source than the causes and contributors of severe changes in climate conditions over time from the emission of greenhouse gases, especially when the greenhouse gases are emitted worldwide by thousands of different sources. Nevertheless, the

precedent of the BP Oil Spill Fund, to compensate for environmental harms can still provide a valuable foundation for a climate change relocation fund (Abate, 2013).

The countries of the former USSR also have their own little experience in arrangement of work of environmental funds. At the moment, Russia and Kazakhstan have no environmental funds: all payments for pollution and environmental fines are charged directly to the budget, then some funds for environmental protection are allocated from the budget. As a result, the expenditure side is insignificantly associated with the extent of the damage actually caused to the nature and not quite enough. In the Republic of Belarus (art.84 Law of the Republic of Belarus No.126-FZ of July 17, 2002 “On Environmental Protection”), the environmental fund remained almost in the form of the environmental fund which operated in Russia in the 90s. We observe a similar situation in Ukraine as well (art.47 Law of Ukraine “On Protection of the Natural Environment”).

In the period of the existence of the environmental fund in Russia in the 90s of the last century, it was governed by Resolution of the RF Government “On Federal Environmental Fund of the Russian Federation and Environmental Funds in the Territory of the Russian Federation” No.442 of June 29, 1992. The environmental funds of federal, regional and local significance formed a unified system of extrabudgetary environmental funds which included funds received from payment for emissions, discharges of polluting substances into the environment, waste disposal and other types of pollution; amounts received under claims for compensation of damages and penalties for environmental offenses; funds from sales of confiscated hunting and fishing tools and products illegally obtained with their use.

Distribution of the revenue side of the Federal Environmental Fund, for example, in 1998, included payments for pollution within limits and standards (62% of revenues), payments for pollution in excess of the established limits (21%), penalties (5%) and compensation for damage (5%). The most part of the revenues consisted of payments for pollution of air basin (34.8%), surface water (33.6%), disposal and utilization of waste (31.2%). The resources of the environmental funds were distributed in the following ratio: 60% - for implementation of environmental measures of local significance; 30% - for implementation of environmental measures of regional significance; 10% - for implementation of environmental measures of federal significance (Vedenin, 2000).

The resources of the system of environmental funds could be spent, among other issues, for payments of compensation to citizens for damage which affected their health because of pollution or other negative impact on the environment. These payments could be made in cases when it was impossible to establish the causer of the environmental damage.

According to Article 6 Federal Law “On the Federal Budget for 1995”, resources of the specialized environmental extrabudgetary fund, along with the resources of other specialized funds, were consolidated in the federal budget and assigned the status of specialized budgetary funds. According to Federal Law “On the Federal Budget for 2001”, on January 1, 2001 the Federal Environmental Fund was liquidated. This decision was motivated by the fact that many federal and regional specialized funds proved ineffective, became a source of misuse of resources and corruption. A number of extrabudgetary funds (Pension Fund, Compulsory Health Insurance Fund) continue to exist until now. After the liquidation of the Environmental Fund the level of corruption in Russia has not decreased but the security of citizens’ environmental rights has deteriorated sharply. In this regard, we consider early resumption of work of the Environmental Fund extremely important.

The Environmental Fund, from which compensation to the citizens affected by climate change could be paid in terms of absence of a certain causer of the damage, would provide a valuable foundation for payment of compensation to the persons affected by the severe drought and

its consequences in the Volga-Akhtuba floodplain in the summer 2015 (subject to the necessary system of evidences also in judicial proceedings). It is beyond doubt that reestablishment of the Environmental Fund requires amendments to the Budget and Tax Codes of Russia, as well as adoption of the special law “On Environmental Funds”. This will require discussion of numerous details, which goes beyond the scope of this article. We would only like to note that this work is already underway in Russia.

Development of legal means to counter the consequences of global climate change at the national level

In the previous section we considered a range of provisions on the general strategy of overcoming the consequences of global climate change. Further we will suggest three proposals on the reform of applied legal methods of counteraction to climate change in Russia taking into account the experience of the USA and the EU.

Theory and practice of environmental federalism in the USA and the EU

In the USA, there have been ongoing discussions about finding a balance of interests of the federation and the regions (states) in settlement of environmental issues (including those regarding climate protection) for many years. Supporters of a strong federal role in environmental issues put forward three arguments in this favor.

First, environmental efforts of the states may be insufficient or nonexistent, and in this case a federal role is required. State legislatures may be closely identified with polluting industries, while a strong federal role in environmental policy making will help to protect important national environmental interests.

Second, since pollution often crosses state boundaries, regional officials may be unwilling to impose restrictions on sources that produce pollution for neighboring states. They may seek to attract new industries to their states, but there will inevitably be a “race to the bottom” that will provide little protection to residents of other states from environmental risks. Third, there is a need for expertise and centralizing research. Having 50 separate state agencies conducting research on the environmental and health effects of various pollutants and formulating regulatory strategies is inefficient and duplicative (Bryner, 2002).

In their turn, supporters of expansion of state powers believe that this is particularly important in circumstances involving unique land and water formations or new or evolving environmental concerns. The federal government has less knowledge of local concerns and conditions and, therefore, a reduced capacity for responding quickly to changed circumstances. States are more capable than the federal government of quickly reacting to these threats at the local level and adapting their regulations accordingly. That is why federalism should be used to empower all levels of government in order to provide for more effective environmental protections. Empowering multiple levels of government in the country increases environmental protections, because if one level of government fails to act, another level of government can respond quickly to the problem (Cuskelly, 2012).

A compromise between these two opposite vectors was named “cooperative federalism” – a flexible system of federal legislation positing cooperation of states and the federal center through interacting closely in settlement of environmental issues. Cooperative federalism is a system that rejects a nationally uniform approach to environmental problem solving, allows states to make decisions to meet their own particular needs subject only to federally mandated minimum standards (Yee, 2008).

In the absence of a general federal centralized approach to the issue of reduction of greenhouse gas emissions, an initiative for development of the corresponding legislation is now

mainly focused on the level of some states, where measures for emission inventory and other plans of actions are developed and trade in quotas is encouraged. We will mention only two examples of such successful climate legislation. Thus, a significant success was achieved in climate protection by the State of Oregon. In 1997, its legislature enacted a special law directed at reducing greenhouse gas levels. It required all new power plants to reduce their greenhouse gas emissions by 17%. This requirement was fulfilled and the pollutants began to pay certain amounts to a special fund which used them to reduce greenhouse gas emissions into the atmosphere through different programs (Olmsted, 2008).

The State of California was granted special authority in the field of fight against greenhouse gases under the Clean Air Act (CAA), which preempts all other states from regulating mobile source emissions of these gases. As a result of regular use of this possibility, residents of the state received catalytic converters, low-emission vehicles, and unleaded gasoline, among other technologies (Carlson, 2003).

Except the achievements at the level of particular states, the USA actively develops interregional cooperation in the field of climate. Thus, in November 2004, California Governor Arnold Schwarzenegger, Oregon Governor Ted Kulongoski, and Washington Governor Christine Gregoire, announced in a joint press release that they approved thirty-six recommendations in five areas of action jointly developed by all three states. This project was named “West Coast Governors’ Global Warming Initiative”. The same press release touted four of these five areas intended for achieving greenhouse gas reductions. These areas implied adoption of standards to reduce greenhouse gas emissions from vehicles, expansion of the markets for energy, development of renewable resources, and alternative fuels, etc. Therefore, the mentioned states moved ahead in large part to fill the vacuum that has been left by the US federal legislation.

In February 2007, the West Coast Governors adopted a new program titled “Western Climate Initiative” (WCI) adding Arizona and New Mexico as full members. Later Utah, British Columbia and other states joined them. Like its predecessor, the WCI cited a lack of federal leadership in climate issues as a major factor in its creation (Olmsted, 2008).

This brief review shows that the American model of federalism allows both initiatives of particular states in settlement of issues regarding counteraction to global climate change and conclusion of interregional agreements that strengthen their coordination.

Interesting experience in interaction of the center and regions is suggested by the European Union. Within the framework of its established legislation and practice it can be assumed that the EU environmental policy is not instead of the national environmental policies of the EU member states but exclusively along with it. In contrast to the EU competence, competence of the member states in protection, maintenance and improvement of the environment is not limited. While the European Community is not engaged in a certain field of environmental protection, the EU member states can take all necessary and reasonable measures, excluding some particular specified cases. Thus, a EU member state is not entitled to issue regulations on environmental protection limiting a free flow of goods through the boundaries, allocate state subsidies for environmental protection or issue tax instructions contradicting provisions of the Treaty on European Union (Kremer and Winter, 2007).

Already in the early 1990s the European Community began to take measures to prevent climate change. The EU approves distribution of liabilities which as a whole is expected to reach 8% reduction in greenhouse gas emissions. The contribution of individual countries varies in accordance with their level of economic development: while Germany from 1990 to 2012 was to reduce its emissions by 21%, the corresponding obligation of Great Britain was 12.5%, Italy 6.5%; France was

not obliged to reduce emissions, Spain could even increase its emissions by 15%. This distribution of liabilities was legally enshrined in 2002, when the EU ratified the Kyoto Protocol.

In order to achieve reduction of emissions without extra costs, the EU introduced trade in quotas for greenhouse gas emissions which covers about 10 000 companies, which cause 45% of all emissions, in its territory. The companies receive quotas for each ton of carbon dioxide which they emit. If they invest in technologies reducing emissions, without using quotas at the same time, they may sell these quotas. And, on the contrary, they may buy quotas, if they emit more harmful substances and investments in reduction of emissions are too expensive (Kremer and Winter, 2007).

In accordance with Article 1 of the Constitution, Russia is a federal state. At the same, in contrast to many other world federations (the USA, Canada, Germany, etc.), possibilities of subjects of the federation in Russia are rather limited. This follows from the doctrine of “strengthening the vertical of power” implemented by the central government, within the framework of which subjects of the federation settle only minor issues (including those in the field of environmental protection), and only in cases when federal laws include direct references to rulemaking of subjects of the federation.

A typical evidence of this conclusion is the Order of the Supreme Court of the Russian Federation of July 7, 2003, which upheld the decision of Samara Regional Court on rejection to supplement the Charter (Fundamental Law) of Samara Region with the rule attributing issues of introducing a special regime of the regional zones of environmental emergency situation and environmental disaster to the competence of Samara Region. Arguments that subjects of the federation are entitled to exercise their own legal regulation regarding issues of joint competence before adoption of federal laws were not accepted. The system of the “vertical of power” created in Russia may be quite effective in case of fight against terrorism or implementation of global projects (for example, construction of the Trans-Siberian Railway or organization of the Football World Cup). However, this model impedes settlement of environmental issues. In this regard, the most relevant objective is to carry out decentralization of power in Russia.

It is necessary to abolish some bureaucratic excesses like federal districts and to relocate the center of the management process and financial flows to the regional and local levels. This decentralization, along with changes in the tax system, will shift the center of political activity to the lower level, provide conditions for new efficient managers of the regional tier, launch the mechanism of economic competition among the regions. In addition, it is necessary to achieve division of some federal taxes between the center and the regions, thereby increasing financial revenues in regional and local budgets. It is necessary to adopt the rule of “two keys” allowing municipalities to coordinate all projects of federal companies in their territories, which will further increase the significance of local authorities and strengthen its financial base. The regions should be also allowed to set their own standards in the field of construction, nature management and conditions of implementation of infrastructure programs. The country actually has to become a federation - with different taxes, various economic conditions, etc. Only such a “difference of potentials” will allow the regions and municipalities to develop independently, rather than by means of handouts from the center (Inozemtsev, 2015).

In the course of implementation of environmental decentralization it is reasonable to establish minimal federal environmental standards which may not be abolished by the regions (for example, the need for environmental expertise of projects or minimal rates of environmental fees for emissions). Except for these basic principles, subjects of the federation should gain maximum freedom in implementation of environmental functions, including in the field of trade in quotas for greenhouse gas emissions.

With regard to the problems of the Volga-Akhtuba floodplain, which suffered from drought due to climate change, this would mean, first, adoption of regional laws on counteraction to consequences of climate change in the floodplain with development of own individual regional strategies for nature protection. Second, this would allow to establish interregional cooperation between the subjects of the federation located in the basin of the Volga River. Today the Volga River and the hydroelectric power stations on it are not in the field of management of the subjects of the federation regarding any matters, they are managed by the federal government bodies, which is not always effective. Third, the transfer of authorities to lower levels will establish intermunicipal cooperation, which is now hardly developed in the field of environmental protection. There are only a few examples of it. Thus, in order to solve the issue of construction of a new solid waste landfill, intermunicipal preparatory negotiations were held in 2008 in the city of Chelyabinsk with neighboring municipalities, whose interests were directly or indirectly affected by that construction (Potential of intermunicipal cooperation, 2008). However, there is now no interaction between municipalities and/or subjects of the federation regarding climate change.

Compensation for damage caused by climate change

At the moment, many world countries face the issue of compensation for damage caused by global climate change. For example, in the summer of 1998, a drought that ranged from Texas to the Carolinas of the USA resulted in an estimated \$6 to \$9 billion in losses to the agriculture and ranching sectors. As a result of the 1999 drought, 34 counties in New York State declared an agricultural disaster with losses of about \$2.5 billion, and it estimated Pennsylvania crop losses at \$500 million, with some farmers losing as much as 70 to 100 percent of their crops. Two years later, drought cost the State of Washington between \$270 million to \$400 million in damages to agricultural production, a loss of 4,600 to 7,500 agricultural jobs. To address the recurring problems of drought in this region, Congress authorized draining of the Everglades, including levees and 16 pump-stations to direct water flow. These measures impaired the state of the natural hydrologic environment, reduced the Everglades to about half its original size and resulted in a 90 percent reduction in the population of wading birds. Groundwater pumping caused extensive environmental damage, the hydrological connections were destroyed (Craig, 2010).

As we noted earlier, the Volga-Akhtuba floodplain also suffered considerable financial losses caused by drought. The exact damage caused by the drought in 2015 is still to be estimated, however, according to experts, the loss caused to the agricultural producers and the population living in the floodplain by the similar draught in 2006 comprised from 2.5 to 18 billion rubles within the boundaries of Volgograd region, and about 11 billion rubles in Astrakhan region. Astrakhan Biosphere Reserve, Natural Park of the Volga-Akhtuba floodplain and numerous floodplain reserves were seriously damaged. It is still impossible to estimate the damage caused to the floodplain to the full extent, as there is no available official methodology for its calculation (Vasilieva, 2006).

No wonder that Russia has no lawsuits for damages caused by climate change. There are such claims in the USA. For example, the plaintiffs in *Comer v. Murphy Oil USA* filed suit against energy production companies, alleging that the defendants' greenhouse gas emissions contributed to climate change and the intensity of Hurricane Katrina. The plaintiffs sought monetary damages for property loss caused by Hurricane Katrina. In *Connecticut v. American Electric Power*, the plaintiffs filed suit against electric power corporations, claiming that the defendants' greenhouse gas emissions were contributing to climate change, and claiming that climate change harmed and continues to harm the plaintiffs' residences and property. The plaintiffs sought an injunction, which would place a cap on the defendants' greenhouse gas emissions. However, both of these cases were dismissed by the district court (Jaffe, 2011).

In September 2006, California Attorney General filed lawsuit regarding global warming public nuisance caused by the activity of the six largest U.S. automakers, alleging that the automakers' emissions contributed to global warming and that the State had suffered property damage. California sought billions of dollars in money damages for past harm. In September 2007, the district court dismissed the case (Boutrous, 2008).

Therefore, in the US trials for global warming public nuisance had no effect. They were based on the thesis that certain industries (the oil, electric utility, and automotive industries) are allowed to emit too much CO₂ and other greenhouse gases and in this regard should be required to reduce their emissions by the courts. But federal courts possess neither the institutional expertise nor constitutional prerogative to make such complex policy determinations. To adjudicate a "public nuisance" claim based on global warming, the courts would be required to sort through and balance an array of competing interests – including environmental, industrial, commercial, foreign policy, security, and consumer choice concerns – and decide how much CO₂ and other greenhouse gases assigned to the industries they should be allowed to emit. It is simply not the role of the courts to engage in such policymaking (Boutrous, 2008).

However, do these failures indicate the need to completely abandon attempts of judicial protection of climate rights? It seems not to be so. Most probably, this implies the need for theoretical study and finding ways of development of legal redress for damage associated with climate change.

1) judicial protection of citizens' environmental rights requires further development of proof theory and enhancement of the role of the science of climatology. The fact is that sources of carbon emissions are located in different places, travelling all over the world with air flows. Moreover, emissions come from a host of sources large and small. This makes it impossible to say whose CO₂ is responsible for, say, the fact that the island nation of Tuvalu may soon be completely swallowed by the ocean. Additionally, it may be nearly impossible for plaintiffs to show that increased concentrations of CO₂ are responsible for their injuries in a certain place (Reese, 2015). Adoption of objective decisions and determination of causation require special expertise, but the science of climatology is not ready for them.

2) a certain issue consists in the fact that in one state plaintiffs can file lawsuit against emitters of greenhouse gases, however, what should be done by them if such emitters are located in the territories of other states or even other sovereign states? It was noted in scientific literature that in cases when emission is released in one state and affects interests of other states, there is a number of types of environmental externalities between them. The main type of this externality is direct harm to common resources which transcend state boundaries. An obvious example of this type is the emission of greenhouse gases.

Greenhouse gas emissions from one state do not physically invade but directly harm another state. This creates impact on the common atmosphere in both states felt by all users of that common resource. The key aspect is that harm caused to residents by greenhouse gas emissions is not only environmental but also psychological. This is observed in the fact that citizens of other states may be deprived of the enjoyment of visiting the unique resource or simply knowing that it exists. For example, decisions to allow intense resource use in a state park may upset citizens of another state that appreciate the park (Hall, 2008). Detailed doctrinal and regulatory development of the latter category is still ahead.

3) development of a novel theory of liability in the field of climate. Today it is true that even in the USA plaintiffs trying to succeed against greenhouse gas emitters hardly have a chance to prove their claims at court. However, it will be possible in case of creation of the novel theory of liability. For instance, faced with claims by mothers that the drug diethylstilbestrol (DES) caused

cancer in the daughters of some patients to whom it was prescribed, and knowing that those mothers likely could not prove who made the particular pills they took, the California Supreme Court imposed liability on all DES manufacturers in proportion to their market share. But this sort of innovation is not common, and is mostly limited to highly unusual cases like the DES suits. Moreover, though liability likely will be found in some jurisdictions, it is far from certain that we will be able to impose it on the largest emitters and compensate for the harm. The reason for this is simple: politics (Reese, 2015). Meanwhile, along with expansion of the environmental crisis, this theory, quite possible, could be used as a model of compensation for environmental harm.

4) the issue of calculation of compensation to victims of climate change includes, primarily, the issue of proving causation.

a) the issue of multiple actors and de minimis contributions. The causation issue is whether an action contributes enough greenhouse gases to cause a legal harm from climate change. Accordingly, the fundamental legal question is, when does harm result from the aggregate effects of multiple actions? And what is the minimum threshold at which an actor will be liable for contributing to the harm?

b) after emission greenhouse gas persist in the atmosphere for many years. It is known that 50 percent of the initial volume of carbon dioxide released into the environment remains in the atmosphere after one hundred years, and 37 percent of the initial volume of emissions remains in the atmosphere after twelve years. These scientific aspects of climate change pose legal challenges to proving causation. The persistence of greenhouse gases in the atmosphere means that the number of emitters responsible for causing climate change includes both present and past emitters. Therefore, as the total number of emitters increases, the proportional responsibility of each emitter decreases. This has consequences for a causation analysis, because an entity that is an emitter will be liable for harm only if it is also a proximate cause, and thus a “substantial factor in bringing about the harm”.

c) difficulty in tracing causation between particular emissions and the total harm. The fact is that scientists are now not able to trace the path of particular emissions in the atmosphere and determine what exactly happens to those emissions, including how long the gases remain in the atmosphere. For example, if our hypothetical coal plant in Ohio released carbon dioxide ten years ago, we cannot identify with any certainty where along their lifecycles those emissions are, and consequently, what portion of those emissions remain in the atmosphere. This aspect of greenhouse gas emissions poses a legal problem in proving causation of emissions and harm. At first glance, it seems that the requirement of this causation is not a problem in the context of climate change, because every emitter of greenhouse gases contributes to climate change. It would seem that holding a defendant should be held liable for harm that it did not cause, given that contemporaneous greenhouse gas emissions have the same effect on climate change regardless of where they are emitted. Presumably, a plaintiff only needs to know who emitted greenhouse gases, and in what quantities, and can apportion liability based purely on quantity of gases emitted. Some greenhouse gases, however, have different effects on climate change depending on where they are released. For instance, nitrous oxides released by aircraft at high elevations contribute more to global warming than an equivalent amount of nitrous oxides released at sea level. Thus, one could not claim that emitters of nitrous oxide have contributed to climate change in direct proportion to the amount of nitrous oxide they have emitted. To do so would be to impose too much liability on some entities, and too little on others. Furthermore, even for carbon dioxide, which appears to have the same effect on climate change regardless of where it is released, the inability to trace particular emissions still poses a problem. This is because various processes are constantly removing carbon dioxide from the atmosphere. Thus, the fact that an entity emitted ten tons of carbon dioxide into the atmosphere ten

years ago does not mean that all ten tons are still in the atmosphere and contributing to climate change (Gerhart, 2009).

5) national issues of calculation of compensation for damage caused to nature. The Constitutional Court of the Russian Federation points this out, stating that the environment as a special object of protection has the exclusive property of self-neutralizing negative human impact, which makes it difficult to accurately calculate the damage (Decree of the Constitutional Court of Russian Federation, December 21, 2011). Accuracy of calculations of environmental damage appears difficult due to the fact that not all of the harmful effects are observed at the moment of their occurrence, remain intact for a long time and can be calculated in monetary terms (real damage). It is even more difficult to prove the existence of the loss of profit associated with use of certain natural resources (forests, water bodies). Meanwhile, in order to impose liability in the form of compensation for environmental damage, it is necessary to prove the existence of such conditions in the aggregate as occurrence of the damage and its extent, illegality of the behavior of the party which caused the damage, its fault and the causation between the unlawful conduct and the occurring harmful effects (Pratsko and Chikildina, 2014). However, it is extremely difficult to submit these evidences. As a result, in Russia and other post-Soviet countries the civil procedure for compensation of environmental damage is insignificant, which does not correspond to the real situation: flow of fines increases, but the opposite pattern can be observed with the compensation for environmental damage (Badalov, 2011).

However, it would be unnecessary pessimism to argue that in terms of compensation for environmental damage in Russia and in the post-Soviet space nothing has been done. The need for compensation of “common” environmental damage (soil, forests, wildlife, etc.) led to the emergence of a special legal concept of “liquidated damages” in Russian legal science (Sadikov, 2009). With regard to environmental torts, this legal concept is enshrined in paragraph 3 Article 77 Law of the Russian Federation “On Environmental Protection”, according to which the environmental damage caused by a subject of economic and other activities shall be compensated in accordance with the rates and methods of calculation of the amount of damage to the environment, and in their absence, based on the actual costs of rehabilitation of the environment, taking into account the incurred losses, including loss of profit.

The rates and methods are related but not identical procedures of compensation for damage caused to natural objects and complexes. The difference between them consists not in what natural resource is damaged but in “simple” or “complex” procedure for determination of the amount of damage. In terms of rates calculation of the amount of damage is carried out using a “simple” formula: for example, the number of illegally destructed trees of certain species (or wildlife units) is multiplied by the coefficient stipulated by the corresponding rates, or a fixed amount is paid for each unit of the destroyed objects. In case of methods (for example, water pollution) such calculations are difficult or impossible, which gives rise to a more “complicated” formula for calculation of the damage.

These methods may include coefficients that take into account natural and climatic conditions, various environmental factors of the state of water bodies, indexation coefficient, which takes into account the inflation component of economic development, coefficient which takes into account the intensity of the negative impact of harmful substances on the water body, etc (Rebikov, 2011). Thus, the legal system of Russia has a rather developed scheme of compensation for environmental damage caused to local natural resources (for example, oil spilled in several hectares; forest cut down in several forest areas, illegally poached animals, etc.). In this regard, the rates and methods are available; with all their faults, in general they cope with the set tasks.

However, in case of complex environmental damage in Russia there are no appropriate methods for its calculation and collection procedures. That is why, for example, the damage caused by the accident at Chernobyl Nuclear Power Plant was compensated by the state. This implies the need for development of a special comprehensive methodology for compensation for environmental damage caused by climate change, which will make it possible to apply it in the future in cases similar to the disaster in the Volga-Akhtuba floodplain. Development of this methodology should become a matter of international experts, including climate scientists, economists, biologists and other experts; the role of lawyers in this process will be minimal due to objective reasons. The function of legal science will consist in development of new legal guarantees of implementation of the research results, consideration of corruption and other risks.

What is the peculiarity of our concept? Traditional studies of Russian and post-Soviet science focus on the fact that damage is caused to natural resources (land, forest, water, etc.), and this resource belongs to private, state or municipal property. Therefore, it is necessary to compensate for such damage to the owner (private or public). Within the framework of our concept, the damage is caused not to one or more natural resources but climate as a more complex and higher object. This object can not be owned, as the damage from climate change is felt by everybody – from a common farmer to the federal government, the owner, the forests of which are constantly on fire and the rivers dry up. Hence, in the course of development of the methodology for compensation for such damage, the emphasis should be placed not only on punitive measures (fines and compensations), but also on provision of conditions under which it is unprofitable to pollute the environment with greenhouse gases.

In this regard, the most common argument of our opponents is that after the development of this methodology entrepreneurial activity in Russia will become unprofitable, and the capital will move to other countries, which will lead to an increase in unemployment and a decrease in revenues in the budget. Hence it follows that representatives of entrepreneurial communities should take part in finding a compromise in the discussion of the proposed concept. If such a compromise in the course of the dialogue will not be found, sudden storms, floods and droughts will go on, thereby creating a negative incentive to its inevitable further search.

We should point out that we suggest focusing not on collection of sums for damage in case of bringing perpetrators to tort liability but on measures for rehabilitation of the environment (when it is possible), recovering the original state of ecosystems. As a way of rehabilitation of the environment of companies – emitters of greenhouse gases can finance or participate directly in the technology of extraction of carbon dioxide from the atmosphere.

This issue is well developed in American science and is called “carbon sequestration”. There are a range of these possibilities: the burning of biofuels for energy, with the capture and sequestration of the emitted carbon dioxide; the management of natural and agricultural landscapes to maximize the absorption and retention of carbon; the introduction of minerals to the oceans (for example, iron) that would increase the ability of the oceans to absorb and sequester carbon dioxide (plankton plays an important role in the capture of carbon dioxide); the development of systems to absorb carbon dioxide directly from the atmosphere, etc. However, effectiveness of these proposals has not been proven by science yet. Some of them, such as the fixation of carbon directly in the atmosphere, will be not only a direct but also expensive way to address the problem (Biber, 2009).

A separate method of settlement of the issue under consideration is government intervention and compensation for catastrophe victims. It can take a variety of forms. In some cases (for example, in France), the government forces potential victims to purchase comprehensive insurance; in others (for example, in the State of California), the government replaces the primary insurer and directly provides coverage to potential disaster victims. In yet other situations (for example, with

terrorism risk), the government acts as a reinsurer of last resort and intervenes when the magnitude of loss exceeds a specific threshold. The government may also provide an additional insurance layer – for example, in nuclear liability conventions, the government supplements compensation provided by the operator of the power plant if its funds are not enough. Finally, the government may provide direct compensation to victims of catastrophes either through structural fund solutions or on an ad hoc basis. These various forms of government intervention have been criticized in the literature. Most of the criticism concentrates on government provision of ex post compensation on an ad hoc basis (Bruggeman, Faure, Heldt, 2012). However, more and more countries are expanding compensation.

Russia is no exception in this process, having adopted several federal laws stipulating the procedure of payment of monthly compensation to the victims of major environmental disasters. Among them are the victims of the accident at Chernobyl Nuclear Power Plant in 1986, the citizens (including soldiers and rescuers) affected by the accident at the Production Association “Mayak” and the charge of radioactive waste into the Techa River in 1957, etc. In recent years, they have been joined by the citizens affected by the forest fires. For the compensation to the latter, the area of the subject of the federation is recognized by the decree of the President of Russia as an emergency area, and the executive authorities of this subject of the Russian Federation receive subsidies to fight against the fire and to pay compensation to the citizens, regional regulations are adopted, lists of affected persons are made. These natural disasters generate fundamentally new environmental relations between citizens and the state which assumes responsibility for compensation for the environmental damage. However, we do not call to impose all the consequences of all potential natural disasters on the state. In this case, good preventive measures would include environmental insurance of the risk of consequences as a result of natural disasters. Direct involvement of the state is necessary in extreme cases, when other options of compensation for damage are not available (it is impossible to recover all the damage from the Director of Chernobyl NPP caused by him due to violation of the safety rules).

This implies the need to find a reasonable balance between the state participation in compensation for damage caused by global climate change and companies emitting greenhouse gases. It seems that in this case we could apply the theory of “mass environmental torts”, which is developed by John Fleming (the USA, 1994) and Alena Kodolova (Russia). In the USA, the issue of civil liability of operating companies for mass torts is settled positively: there are court rules on compensation for damage, including, that to persons affected by environmental disasters. Meanwhile, in case of determination of mass torts the very tort and a catastrophe are often equated. It is necessary to distinguish mass torts and events beyond human control. Mass torts committed during operation of environmentally dangerous facilities are an action (action or omission) which causes a large-scale man-made accident, in the result of which damage is caused simultaneously to both life and health of a large number of people, property of individuals and legal entities, the state and the environment. In order to solve this problem efficiently, it is necessary to establish a limit of liability of the operating company for mass torts within the amount of financial provision (fund) determined in respect of each object by the competent state authority. In addition, subsidiary liability for damage should be imposed on the state as a subject authorizing such activity by means of licensing and state examinations (Kodolova, 2009).

It seems necessary to develop the theory of “mass environmental torts” with a creative approach, bring it to new heights. Combination of payments at the expense of state and municipal environmental funds (subsidiary) and funds of companies emitting greenhouse gases will enhance the guarantees of environmental human rights regarding mitigation of the consequences of global climate change. At the same time, these methods will work together with other civil instruments of

compensation for damage caused to local natural resources and the administrative payments of compensation in case of global environmental disasters (for example, Chernobyl NPP). It goes without saying that use of the civil law instruments should be accompanied by the necessary system of proof of damage, causation, etc. In addition, the effective solution to the complex problem of climate change includes foundation of specialized environmental courts in Russia and other countries of the world. This need is caused by the growing number and scale of environmental issues; the adoption of comprehensive environmental legislation in many countries; the activation of the position of civil society (including active participation of non-governmental organizations in court proceedings); the inability of courts of general jurisdiction to administer justice effectively in the field of environmental protection, etc. (Preston, 2008).

Specialized environmental courts in Russia and other countries of the world will ensure specialization of the courts (judges in environmental courts will have large experience in consideration of environmental disputes); increase the efficiency of their work; provide an opportunity for the state to show its citizens its concern regarding environmental issues and its intent to influence the current situation in a positive direction; reduce costs due to the establishment of its own procedures; ensure uniformity of judicial practice on environmental issues; expand the subject composition of judicial proceedings (since it will be possible to file suits arising from the public interest, class suits, etc.); provide a possibility to set priorities in consideration of cases requiring urgent resolution (in the courts of general jurisdiction environmental cases are usually considered in accordance with the time of their receipt and are often postponed because of their complex and integrated nature) (Solntsev, 2013). All these peculiarities will come in full force in “environmental” cases.

Development of the concept of environmental disaster zones

Long-term restoration of ecosystems destroyed due to global climate change is possible in two ways. First, if disturbed ecosystems are located within the boundaries of specially protected natural areas (for example, the Volga-Akhtuba floodplain within the boundaries of the natural park), they may be restored by the staff of the park, who in such cases (severe degradation of the quality of natural ecosystems under the influence of climate change) are allowed to interfere in natural processes with the purpose of restoration. Such experience is well developed in the USA (Steinhoff, 2012). “Ecological restoration” of specially protected natural areas should be understood as the process of returning a damaged ecosystem to the state most similar to natural conditions and processes (Steinhoff, 2014). Such actions may be performed in Russia, subject to available staff and financing.

Another way of restoration of ecosystems damaged from climate change is creation of environmental disaster zones, which are understood as the territory zones where, as a result of economic or other activity, profound irreversible changes of the environment occurred and caused significant deterioration of health of the population, disturbance of the natural balance, destruction of natural ecosystems, degradation of flora and fauna. Unfortunately, at the moment, the possibility of creation of environmental disaster zones in Russia still exists only at the level of scientific doctrine. The very possibility of creation of such areas is mentioned in Article 57 Federal Law “On Environmental Protection” of January 10, 2002. However, in order such areas could emerge, a separate law should be adopted. Once State Duma of the Federal Assembly of the Russian Federation discussed the corresponding law in draft, nevertheless, it was withdrawn a few years ago, and the legislative authority has not returned to this issue again. The reason for this is that creation of environmental disaster zones requires considerable financing, and the environment has not been the priority of the state policy in Russia in the recent years. However, in case of adoption of such a

law in the future and creation of an environmental disaster zone, the destroyed area will be localized and a special authority will start its salvation and restoration.

This authority, for example, could perform: internal zoning of environmentally neglected areas with establishment of environmental regulations stipulating the regime of protection zones and the parameters of limited economic use; maintenance of the register of environmentally neglected areas (by analogy with the register of specially protected natural areas); environmental monitoring; legal recovery of funds from violators of environmental legislation who caused damage to natural objects and complexes; coordination of restoration works. The latter measure involves placing a state order for works to restore natural complexes and areas, as well as control of the quality of such works. These measures can be applied also in cases when there is no specific party which caused the damage and the degraded land (publicly owned) is restored at the expense of the budget.

With regard to the Volga-Akhtuba floodplain, it would mean that certain degraded areas will be withdrawn from the natural park with the status of environmental disaster zone. This is due to the fact that the Decree of the Head of the Administration of Volgograd Region of June 17, 2010 “On Approval of the Provisions on the Natural Park “Volga-Akhtuba floodplain” clearly stipulates its objectives, which consist in preservation of forest ecosystems in the floodplains of the rivers Volga and Akhtuba, as well as wetlands of international importance; preservation of highly productive floodplain meadows, hayfields, pastures, etc. But what should be done if the unique natural complexes, for the protection of which the park was created, degraded or simply ceased to exist (forests were destroyed by fire, ponds dried up, etc.)? In this case there is simply nothing in the park to study and protect. There may be simply no biological possibility for these unique ecosystems to adapt to climate change, they may be lost forever.

This, however, does not mean that the state and society should abandon these territories for final destruction. In this case it is necessary to change the legal regime of these areas, this will entail use of other models of financing salvation of dying nature. When in the summer of 2015 the Volga-Akhtuba floodplain suffered from a severe drought, the special fund of the Ministry of the Russian Federation for Civil Defence, Emergencies and Elimination of Consequences of Natural Disasters (EMERCOM) played a major role in financing the rescue measures. However, EMERCOM has its own specific objectives – putting out fires, fight against floods, etc. That is why receipt of such finances by the Governor of Volgograd region to save the floodplain deserves a high appreciation, but these receipts may not be permanent.

Financing of the affected areas should have stable and permanent nature rather than emergency one, and comply with the plan approved by the legislative authority. In addition, we believe that several different kinds of these environmental disaster zones should be distinguished, and they should come under the jurisdiction of the federal, regional and local authorities, with the appropriate level of budgetary financing. This will be still another manifestation of environmental federalism, which is so necessary for Russia.

In the course of development of the theory of “environmental disaster zones” the experience of other countries of the post-Soviet space should be taken into account. It consists in the fact that, along with the framework law stipulating the general procedure of creation of environmental disaster zones, laws relating certain environmental disaster territories may be adopted. During formation of Russian laws on environmental disaster zones, a number of provisions of the Laws of the Republic of Kazakhstan may be used, for example, Law of 30.06.1992 No. 1468-XII “On Social Protection of Citizens Affected by the Environmental Disaster in the Aral Sea Region”. It is worth paying attention to Articles 65-67 of the Law of the Republic of Belarus of 17.07.2002 “On Environmental Protection”, which distinguishes three kinds of areas of environmental concern: areas of environmental risk, environmental crisis and environmental disaster. This differentiation of areas

of environmental concern makes it possible to reveal deterioration of certain territories and to take the necessary measures to restore natural complexes at the early stages. Finally, there are a number of interesting provisions in the Model Law “On Environmental Disaster Areas” of 03.12.2009, adopted at the 33rd plenary session of the Interparliamentary Assembly of CIS Member Nations.

Conclusion

The environmental disaster which happened in the summer of 2015 in the natural park of the Volga-Akhtuba floodplain due to the processes of global climate change gives rise to considerations about development of new international and national environmental strategies. There are two models of counteraction to climate change: mitigation and adaptation. Possibilities regarding mitigation of the consequences can be better implemented at the international and national levels; the adaptation strategy can be quite successfully performed by the authorities of the subjects of the federation. Fulfillment of this objective requires efforts of representatives of the whole range of sciences, from biological and technical, to social and humanitarian ones. It can be explained by the complexity of this new challenge to the humankind of the XXI century, which can be met only by changing the public morality (in which church plays an especially important role) and eliminating environmental ignorance. Representatives of legal science will have also something to do. With regard to the situation in the Russian Federation, they will have to participate in construction of the economic mechanism for counteraction to the consequences of climate change, reformation of the existing model of federalism, development of new concepts and methods of compensation for damage caused by global climate change, further development of the theory of environmental disaster zones. Consideration of the experience of the USA, the European Union and certain countries of the former USSR, which were able to gain the first experience in counteraction to this issue, can be of great importance in this process.

References

- Abate, R.S. (2013) Corporate Responsibility and Climate Justice: a Proposal for a Polluter-Financed Relocation Fund For Federally Recognized Tribes Imperiled by Climate Change. *Fordham Environmental Law Review*, 25, 19-37.
- Badalov, S.K. (2011) Issues of civil liability for environmental damage in the Republic of Tajikistan (Candidate thesis), Tajik national university.
- Baskin, Y.J., Baskin, A.Y. (1968) International legal aspects of artificial weather modification. *Jurisprudence*, 4, 105.
- Biber, E. (2009) Climate Change and Backlash. *N.Y.U. Environmental Law Journal*, 17, 1342-1358.
- Boutros, T.J., Lanza, Jr, Lanza, D. (2008) Global Warming Tort Litigation: The Real “Public Nuisance”. *Ecology Law Currents*, 35, 84-86.
- Brown, C. (2010) A Litigious Proposal: A Citizen’s Duty to Challenge Climate Change, Lessons from Recent Federal Standing Analysis, and Possible State-Level Remedies Private Citizens Can Pursue. *J. Env’tl. Law and Litigation*, 25, 391-395.
- Bruggeman, V., Faure, M., Heldt, T. (2012) Insurance Against Catastrophe: Government Stimulation of Insurance Markets for Catastrophic Events. *Duke Environmental Law & Policy Forum*, 23, 186.
- Bryner, G.C. (2002) Policy Devolution and Environmental Law: Exploring the Transition to Sustainable Development. *Environs*, 26, 2-3.
- Carlson, A.E. (2003) Federalism, Preemption, and Greenhouse Gas Emissions. *University of California, Davis*, 37, 283.
- Craig, R.K. (2010) “Stationarity is dead” – long live transformation: five principles for climate change adaptation law. *Harvard Environmental Law Review*, 34, 10-69.

- Craig, R.K. (2010) Adapting Water Law to Public Necessity: Reframing Climate Change Adaptation as Emergency Response and Preparedness. *Vermont Journal of Environmental Law*, 11, 720-721.
- Cuskelly, G. (2012) Factors to Consider in Applying a Presumption Against Preemption to State Environmental Regulations» *Ecology Law Quarterly*, 39, 310.
- Decree of the Head of Administration of Volgograd region of June 17, 2010 No. 917 “On Approval of the Regulation for the Natural Park “Volga-Akhtuba floodplain”. Legal Reference System “Consultant Plus”, [Electronic resource], access date: June 22, 2015.
- Decree of the Constitutional Court of Russian Federation, December 21, 2011, No. 1743-O-O “About refusal in acceptance to consideration of the complaint of Limited Liability Company “Uva-Moloko” on infringement of the constitutional rights and freedoms by Part 2 Article 69 Water Code of the Russian Federation and Paragraph 3 Article 77, Paragraph 1 Article 78 Federal Law “On Environmental Protection”. Legal Reference System “Consultant Plus”, [Electronic resource], access date: 09.07.2015.
- Dry ice, liquid nitrogen and iodized silver will guarantee the good weather in Moscow (2005) <<http://cybersecurity.ru/prognoz/4189.html>> (access date: 25.06.2015)
- Fleming, J.G. (1994) Mass Torts. *American Journal of Comparative Law*, XLII, 508-509.
- Forced weather changing for the Olympic Games (2011) <<http://sochi-24.ru/sochi-2014/pogodudlya-olimpiady-izmenyat-prinuditelno.201191.37566.html>> (access date: 25.06.2015)
- 400,000 cubic meters of water was pumped to the drying floodplain ponds (2015) <<https://news.mail.ru/inregions/south/34/economics/22320252/?frommail=1>> (access date: 24.06.2015).
- GEF activity (2015) <http://nature.gov.kg/index.php?Itemid=81&id=147&lang=ru&option=com_content&view=article> (access date: 01.07.2015)
- Gerhart, M. (2009) Climate Change and the Endangered Species Act: The Difficulty of Proving Causation. *Ecology Law Quarterly*, 36, 187-190.
- Glinyanova, I. (2015) Addressing the issue of the Volga-Akhtuba floodplain the Regional Committee of natural resources invented... a bicycle <<http://gg34.ru/society/20396-2015-05-18-07-00-13.html>> (access date: 25.06.2015)
- Hall, N.D. (2008) Political Externalities, Federalism, and a Proposal for an Interstate Environmental Impact Assessment Policy. *Harvard Environmental Law Review*, 32, 56-57.
- Inozemtsev, V. (2015) How could Russia become a federation? <<http://snob.ru/selected/entry/94765>> (access date: 03.07.2015)
- In the Volgograd region the deputies addressed a complaint about the work of the Volga Hydroelectric Power Station to the prosecutor's office (2009) <<http://www.kavkaz-uzel.ru/articles/150699/>> (access date: 24.06.2015).
- In Volgograd region the number of a steppe spider's bites increased due to the hot weather (2015) <<https://news.mail.ru/inregions/south/34/society/22631228/?frommail=1>> (access date: 14.07.2015)
- Jaffe, J. (2011) The Political Question Doctrine: An Update in Response to Recent Case Law. *Ecology Law Quarterly*, 38, 1035-1036.
- Janda, P. (2015) Fire, Flood, Famine, and Pestilence: Climate Change and Federal Crop Insurance. *Colo. Nat. Resources, Energy & Envtl. L. Rev.*, 26, 97-101.
- Kichigin, N.V., Khludeneva, N.I. (2009) Legal mechanism to implement the Kyoto Protocol in Russia: Scientific and practical guide. Moscow: Institute of Legislation and Comparative Law under the Government of the Russian Federation.

- Klochenko, L.N. (2007) Civil legal regulation of insurance of the liability for environmental pollution: comparative legal analysis. (Candidate thesis) Moscow State Institute of International Relations of the Ministry of Foreign Affairs of the Russian Federation.
- Kloeckner, J. (2010) Developing a Sustainable Hardrock Mining and Mineral Processing Industry: Environmental and Natural Resource Law for Twenty-First Century People, Prosperity, and the Planet. *J. Env'tl. Law and Litigation*, 25, 157-159.
- Kodolova, A.V. (2009) Mass environmental torts in Russian and foreign law. *Economy and law*, 6, 52-58.
- Kremer, L., Winter, G. (2007) Environmental law of the European Union. Moscow: Gorodets.
- Lack of water in Volga-Kama cascade in 2015 (2015) (access date: 24.06.2015) <http://www.rushydro.ru/upload/iblock/7b0/070515_Prezentatsiya_T_Haziahmetov.pdf>
- Loboyko, V.F., Kuznetsov, P.I. (2009) Biodiversity conservation in major wetlands of the Lower Volga under anthropogenic impact. *Bulletin of Nizhnevolsky Agrarian University Complex*, 3, 25-40.
- Olmsted, J.L. (2008) The Global Warming Crisis: An Analytical Framework to Regional Responses. *J. Env'tl. Law and Litigation*, 23, 145-177.
- Parker-Flynn, J.E. (2014) The Intersection of Mitigation and Adaptation in Climate Law and Policy. *University of California, Davis*, 38, 6-17.
- Petritskiy, W.A. (1989) A. Schweitzer and his letters from Lambarene. In: A. Schweitzer Letters from Lambarene. Moscow: Nauka.
- Potential of intermunicipal cooperation of the city of Chelyabinsk with the surrounding territories (2008) <<http://www.vsmsinfo.ru/dokumenty-i-materialy/materialy-proshedshikh-meropriyatij/2680-potentsial-mezhmunitsipalnogo-sotrudnichestva-goroda-chelyabinska-s-okruzhayushchimi-territoriyami>> (access date: 03.07.2015)
- Pratsko, G.S., Chikildina, A.Y. (2014) Lawsuits of Rosprirodnadzor for compensation for the environmental damage. *Bulletin of Volgograd State University. Series 5 "Jurisprudence"*, 2, 24.
- Preston, B.J. (2008) Operating an Environment Court: the experience of the Land and environment Court of New South Wales. *Environmental and Planning Law Journal*, 25, 385.
- Reese, B. (2015) Too Many Cooks in the Climate Change Kitchen: The Case for an Administrative Remedy for Damages Caused by Increased Greenhouse Gas Concentrations *Michigan Journal of Environmental & Administrative Law*, 4, 369-373.
- Rebikov, I.Y. (2011) Compensation for damage caused to natural objects and complexes (Candidate thesis), Volgograd state university, Russian Federation.
- Resolution of Volgograd Regional Duma of September 28, 2006 No. 14/448 "On the Appeal of the Volgograd Regional Duma "To the Chairman of the Government of the Russian Federation M.E. Fradkov Regarding the Environmental Situation in the Volga-Akhtuba Floodplain Caused by Water Shortage in Volga-Kama Cascade". Legal Reference System "Consultant Plus", [Electronic resource], access date: 25.06.2015.
- Sadikov, O.N. (2009) Losses in civil law of the Russian Federation Moscow: Statut.
- Sazonov, V.E., Istomin, A.P., Kalyuzhnaya N.S., Kalyuzhnaya I.Y. (2015) Methodological and legal aspects of restoration and environmental rehabilitation of water bodies (in terms of the Volga-Akhtuba floodplain) *Electronic scientific and educational journal "Brinks of knowledge"*, 4, 9-19.
- Seminikhina, V.A. (2010) Legal regulation of climate protection: comparative legal analysis (Candidate thesis). Institute of the state and law of the Russian Academy of Sciences, Russian Federation.

- Sergey Bologov about the Volga-Akhtuba floodplain (2015) <<http://vpravda.ru/News/Society/20973>> (access date: 24.06.2015).
- Shevandrin, A.V., Petrova, E.A., Voronin, A.A. (2014) Features of the social economic development of social economic semi-stable natural systems (in terms of the Volga-Akhtuba floodplain). *Modern problems of science and education*, 6, 438.
- 64 million was spent to disperse the clouds before the Victory Day parade in Moscow (2012) <<http://cursorinfo.co.il/news/mivzakim/2012/05/09/10-22/>> (access date: 29.6.2015)
- Solntsev, A.M. (2013) *Modern international law about the environment protection and environmental human rights*. Moscow: Book house "Librokom".
- Solovey, Y.V. (2003) *Kyoto on the threshold of Russia: basic concepts of legal regulation of greenhouse gas emissions in the Russian Federation*. Moscow: Jurist.
- Spring special water pass was again extended at Volga Hydroelectric Power Station (2015) (access date: 24.06.2015) <<http://bloknot-volzhsy.ru/news/na-volzhskey-ges-vnov-prodlili-vesennyi-spetspopus-601632>>
- Steinhoff, G. (2012) *Naturalness and Biodiversity: Why Natural Conditions Should Be Maintained Within Protected Areas*. *Wm. & Mary Env'tl. L. & Pol'y Rev.*, 37, 77-92.
- Steinhoff, G. (2014) *Restoring Nature in Protected Areas*. *Arizona Journal of Environmental Law & Policy*, 5, 305.
- Summer visitors and residents of Sarpinsky Island in Volgograd are "fighting" for water (2015) <<http://v102.ru/society/50810.html>> (access date: 24.06.2015).
- The Deutsche Bundesstiftung Umwelt DBU (2015) <<https://www.dbu.de/359.html>> (access date: 01.07.2015)
- The Future We Want: Outcome document adopted at Rio+20, UN Conference on Sustainable Development, held on June 19, 2012 (2012) <<http://rio20.net/en/documentos/>> (access date: 01.07.2015)
- The Governor of Volgograd region suggested a way to save the Volga-Akhtuba floodplain (2015) <<http://v102.ru/ecology/51086.html>> (access date: 25.06.2015).
- The position of the Russian Orthodox Church regarding urgent environmental issues (2013) <<http://www.patriarchia.ru/db/text/2775125.html>> (access date: 01.07.2015).
- The social position of the Protestant churches in Russia. Section 15 "Environmental problems" (2015) <<http://www.uralcoc.ru/library-articles-18.html#17>> (access date: 30.06.2015).
- The Volga-Akhtuba floodplain becomes like a desert (2015) <<http://bloknot-volzhsy.ru/news/volgo-akhtubinskaya-poyma-stanovitsya-pokhozhey-na-6004232>> (access date: 24.06.2015).
- The Volga-Akhtuba floodplain was included in the World Network of Biosphere Reserves of UNESCO's Programme (2011) <<http://guart.livejournal.com/57810.html>> (access date: 24.06.2015)
- Timoshenko, M.A., Yudaev, I.G. (2011) Reproductive capacity of the ecosystem of the Volga-Akhtuba floodplain. *Alternatives of the regional development*, 2, 458-459.
- Turgenev, I.S. (1862) *Fathers and sons* <http://az.lib.ru/t/turgenev_i_s/text_0040.shtml> (access date: 25.06.2015)
- Valeev, R.M. (Ed) (2012) *International environmental law: textbook*. Moscow: Statut.
- Vasilieva, E. (2006) The problem of the Volga-Akhtuba floodplain needs comprehensive settlement <<http://www.kavkaz-uzel.ru/articles/102130/>> (access date: 09.07.2015)
- Vedenin, N.N. (2000) *Environmental law: textbook*. Moscow: Right and law.
- Vershinina, S.A., Makovkina, L.N. (2015) Water bodies of the Volga-Akhtuba floodplain. *Online scientific and educational journal VGSPU "Brinks of knowledge"*, 4, 22.

- Volga-Akhtuba floodplain is on the verge of environmental disaster (2015)
<<http://www.meteovesti.ru/news.n2?item=63568321498>> (access date: 24.06.2015).
- Volgograd authorities asked to allocate 200 million rubles to combat the water shortage (2015)
<<http://www.kavkaz-uzel.ru/articles/261503/>> (access date: June 24, 2015).
- Vylegzhanina, E.E. (2005) Main trends in development of environmental law of the European Union (Doctor thesis) Diplomatic academy of the Ministry of Foreign Affairs of the Russian Federation.
- Wiener, J.B. (2008) Radiative Forcing: Climate Policy to Break the Logjam in Environmental Law. N.Y.U. Environmental Law Journal, 17, 219-220.
- Yee, K. (2008) A Period of Consequences: Global Warming Legislation, Cooperative Federalism, and the Fight Between the EPA and the State of California. University of California, Davis, 32, 188.
- Zinn, M.D. (2007) Adapting to Climate Change: Environmental Law in a Warmer World. Ecology Law Quarterly, 34, 63-65.