NATIONAL REPORT OF THE RUSSIAN FEDERATION AT THE WORLD CONFERENCE ON DISASTER REDUCTION

TsSI GZ of the Ministry of Emergencies of Russia, 2004

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SECTION 1. POLITICAL COMMITMENTS AND INSTITUTIONAL ASPECTS

1.1. National policy, strategy and legislation in the field of disaster reduction

State policy in the field of population and territories protection from emergency situations of natural and anthropogenic character is permanently implemented in the Russian Federation, and this policy is the basic mechanism of reducing disaster risk on the territory of the country.

The policy includes the following:

- creation of relevant legislative and other standard-setting legal base;
- creation of state managerial, emergency-rescue and other structures intended for counteracting disasters, promoting the establishment of such structures in social and business spheres;
- all-round training of the population in the field of protection against disasters;
- state supervision and control in the field of natural and anthropogenic hazard, licensing of hazardous activity;
- state scientific-research policy in the field of protection of population and territories from emergency situations;
- reasonable state economic policy in this field, stimulating off-budget sources of its financing;
- participation under the aegis of UN in world integration processes on reducing disaster risks.

Laid in the basis of the legislation in the field of disaster risk reduction is the Constitution of the Russian Federation, Law of the Russian Federation "On Safety" dated March 5, 1991, and also federal laws "On Protecting the Population and Territories from Emergency Situations of Natural and Anthropogenic Nature" No. 68-ФЗ of December 21, 1994, "On Fire Safety No. 69-ФЗ of December 21 1994, "On Emergency-Rescue Services and Status of Rescue Personnel" No. 151-ФЗ, "On Radiation Safety of the Population" No. 3-ФЗ of January 9, 1996, "Of Industrial Safety of Hazardous Industrial Objects" No. 116-ФЗ of July 21, 1997, "On Safety of Water-Development Projects" No. 117-ФЗ of July 21, 1997, "On Sanitary Epidemiological Wealth of the Population" No. 52-ФЗ of March 30, 1999, and a number of others.

In 2003 more than 50 various legal acts were adopted at the federal level, this including: federal laws – 6, decrees of the President of the Russian Federation – 3, Decrees of the Government of the Russian Federation – 13, Orders of the Ministry of Emergencies of Russia – more than 30. All of them are either fully dedicated to the regulation of relations in the field of protecting the population and territories from emergency situations of anthropogenic or natural character, or contain legal norms in this field.

Federal Law "On Power Engineering" No. 35-ФЗ of March 26, 2003, contains a legal norm of a possibility of introducing the government regulation of purchase and sale of electric energy in emergency situations of natural and anthropogenic character; criteria and procedure of their determination is established by the Government of the Russian Federation (Art. 27).

Legal norms of the Federal Law "On Communication" No. 126-ФЗ adopted on July 7, 2003, establish that during emergency situations of natural and anthropogenic character determined by the legislation of the Russian Federation, authorized state bodies are entitled, in a procedure established by the Government of the Russian Federation, to the priority use of any communication networks and means, and also to the suspension or restrictions of the use of these communication networks and means.

Communication operators should provide an absolute priority right to all messages relating to safety of man on water, on the ground, in the air, space, and also to reports about large-scale accidents, catastrophes, epidemics, epizooties and about natural disasters, related to carrying out urgent measures in the field of government management, country's defense, state security and provision of legal order (Art. 66).

Considerable attention to problems of protection of population and territories form emergency situations of natural and anthropogenic character is given in the Federal Law "Of General Principles of Organization of Local Self-Management in the Russian Federation" No. 131-ФЗ of October 6, 2003. Legal norms of this law refer the participation in preventing and eliminating emergency situations to the problems of local significance and assign them to corresponding municipal structures as a function of local administration bodies (Articles 14-16). Property intended for preventing and eliminating emergency situations may be in the ownership of municipal structures (Art. 50). The law establishes the right of local administration of settlements and urban districts, in accordance with the articles of municipal structures, to take decisions of attracting citizens to implementing work, on a voluntary basis, which is socially significant for a settlement and urban district (including being on duty) at preventing and eliminating emergency situations. Related to socially significant work can only be the work that does not require special professional training. Attracted to the implementation of socially significant work shall be only adult, able inhabitants of settlements and urban districts in periods free from their basic activities or studies, on a free-of-charge basis and not more than once in three months. In this case the duration of socially significant work may not exceed four hours at a time.

In accordance with the Decrees of the Government of the Russian Federation No. 261 of April 18, 1992 and No. 1113 of November 5, 1995, a single state system of preventing and eliminating emergency situations (RSES) was established. In accordance with the Decree of the President of the Russian Federation No. 991 of August 28, 2003 "On Improving the Single State System for Prevention and Elimination of Emergency Situations" the Ministry of Emergencies of Russia has been entrusted with the functions of organizing the search and rescue of people in inland waters and in the territorial sea of the Russian Federation, organizing and executing supervision in inland waters and in the territorial sea of the Russian Federation over the use of small-size vessels and bases (structures) for their anchorage, managing the activity of the State Inspectorate for small-size vessels of the Russian Federation.

In 2003 a number of decrees of the Government of the Russian Federation have been adopted in the field of protecting the population and territory from emergency situations of natural and anthropogenic character, improving RSES activity, social protection of citizens who had suffered from emergency situations, etc.

Thus the "Regulations of the Governmental Commission for Preventing and Eliminating Emergency Situations and Providing Fire Safety" approved by the Decree of the Russian Federation No. 11 of January 14, 2003, (with revisions introduced by the Decree of the Russian Federation No. 257 of May 6, 2003) determines that the Government Commission is a coordination body formed for ensuring the concordance of the bodies of executive power, state and other organizations with the purpose of implementing a single state policy in the field of preventing and eliminating emergency situations of natural and anthropogenic character and ensuring fire safety. The document has determined the basic tasks, functions and rights of the Commission, and also the procedure of its activity.

The Decree of the Government of the Russian Federation No. 65 of February 6, 2003, has declared effective the "Federal Aviation Rules of Search and Rescue in the State Aviation" that established the procedure (in peaceful time) for organizing and executing aviation search and rescue, involving aviation units and aviation enterprises being under the jurisdiction of executive power federal bodies that are the owners of the state aviation aircraft, for assuming attendance in the system of aviation search and rescue and executing search-and-rescue work, and also basic

requirements for the equipment of search-and-rescue powers and means with emergency and rescue property and outfit.

The Decree of the Government of the Russian Federation No. 177 of March 31, 2003, has approved the "Regulations of Organizing and Executing the State Monitoring of Environment (State Environmental Monitoring)" according to which the information received at carrying out the environmental monitoring is used in forecasting emergency situations and carrying out actions for their prevention. The Regulations have determined that the Ministry of Natural resources of the Russian Federation and other federal bodies of executive power, when carrying out the environmental monitoring within their competence, shall interact with the Ministry of Emergencies of Russia within the framework of the single state system of preventing and eliminating emergency situations. The norms of the said decree, as applied to the activity of Russia's Ministry of Emergencies, have been given concrete expression in the Order of the Ministry of Emergencies of Russia No. 200 of April 21, 2003.

The Decree of the Government of the Russian Federation No. 547 of September 4, 2003, "Regulations for Training the Population in the Field of Protection from Emergency Situations of Natural and Anthropogenic Character", and also basic tasks and forms of training the population how to act in emergency situations. The training in the field of population protection from emergency situations has been stipulated for all population categories: working and not working; persons studying in general-educational establishments and schools of primary, secondary and high professional education; managers of state power bodies, bodies of local administration and organizations; workers of federal bodies of executive power, bodies of executive power of subjects of the Russian Federation, bodies of local administration and organizations that are specially authorized to solve problems on preventing and eliminating emergency situations and are part of the management bodies of the single state system of preventing and eliminating emergency situations; chairmen of committees on emergency situations related to federal bodies of executive power, bodies of executive power, bodies of executive power of the subjects of the Russian Federation, bodies of local administration and organizations. The procedure of organizing the training of the population is given concrete expression in the order of the Ministry of Emergencies of Russia No. 577 of September 24, 2003.

Within the framework of regulatory judicial backing of Russian Federation international cooperation in the sphere of providing safety in emergency situations on June 20, 2003, the Government of the Russian Federation adopted the Decree No. 354 "On the Commission of the Russian Federation on Carrying out the International Strategy for Disaster Reduction". A base for establishing this Commission has been a resolution of UN General Assembly of December 21, 2001, that instructs to establish a Commission with a duty of coordinating the activity of executive power bodies, state and other organizations for ensuring the participation of the Russian Federation in realizing the International Strategy for Disaster Reduction. The decree of the Government of the Russian Federation of December 2003 approved the "Regulations of the Commission of the Russian Federation for realizing the International Strategy for Disaster Reduction" that determine its tasks, duties and rights.

The Decree of the Russian Federation No. 794 of December 30, 2003, approved the new "Regulations of the Single State System for preventing and Eliminating Emergency Situations (RSES)". Targets, tasks and structure of this system are considered in detail in Section 1.2.

At present the elaboration (at various stages) of draft federal laws is underway in the Ministry of Emergencies of Russia, these being as follows:

"Of State Rescue Forces of the Russian Federation (former name – "On the State Rescue Service"). At present a Concept and draft Technical Assignment for elaborating a bill have been developed, and their arrangement with the federal bodies of executive power concerned is carried out.

"On Making Amendments and Addenda to the Federal Law "On Fire Safety". The bill has been developed in accordance with the minutes of the session of the Russian Federation

Government commission on the problems of optimizing the budget expenses No. 2 of March 31, 2003, and at present is at the stage of arrangement.

"On Making Amendments and Addenda to the Federal Law "On Protecting the Population and Territories from Emergency Situations of Natural and Anthropogenic Character" and "On Civil Defense". The elaboration of this bill is connected with the adoption of federal laws "On Making Amendments and Addenda to Federal Law "On General Principals of Organizing Legislative (Representative) and Executive Bodies of State Power of the Russian Federation Subjects" No. 95-ФЗ of July 4, 2003, and "On General Principles of Organizing Local Self-Management in the Russian Federation" No. 131-ФЗ of October 6, 2003.

In the field of regulated social relations the legal acts adopted in the subjects of the Russian Federation solve the problems of organizing the target comprehensive planning of measures aimed at preventing emergency situations (ES) and raising the stability of enterprises functioning, ensuring the preparedness to the actions of management bodies, powers and means of RSES subsystems of Russian Federation subjects, organizing of communication, notification and information, improving the activity of the State Fire-Fighting service of the Russia's Ministry of Emergencies, preparing the population to actions in emergency situations and propagating the knowledge in this field, and also some other issues of RSES activity organization.

In 2003 47 legislative and 1388 standard-setting legal acts were adopted that regulate the relationship in the field of protection of population and territories from emergency situations of natural and anthropogenic character, however, the most part of the adopted laws is dedicated to introducing amendments and addenda to legislative acts that are currently effective in the subjects.

As the legal regulation of fire safety issues consolidates, new laws "On Fire Safety" have been adopted in the Republic of Adugheya, Khanty-Mansi Autonomous Region and Novgorod Region, and in the republics of Bashkortostan, Kalmykiya, Ingushetiya, Kabardino-Balkarsky Republic, Volgogradskaya, Orenburgskaya, Nizhegorodskaya regions and in the city of Moscow revisions have been introduced in the existing laws.

On December 30, 2001, a new Code of Administrative Law Infringements of the Russian Federation was adopted whose Article 20.6 envisages administrative penalties for the non-fulfillment of the requirements of norms and rules on preventing and eliminating emergency situations. In this respect in a number of Russian Federation subjects adopted laws of introducing amendments and addenda to the laws of subjects of the Russian Federation of administrative law infringements (Kaliningradskaya, Pskovskaya, Vladimirskaya, Ryazanskaya, Novgorodskaya regions and Khabarovsky Krai).

In some of the subjects laws are adopted that regulate the realization of regional target programs in the field of fire safety (Tambovskaya and Orenburgskaya regions), development of systems of eliminating emergency situations (city of Moscow, Leningradskaya region).

In the subjects of the Russian Federation active work is underway on adopting regulatory legal acts and organizational and procedure documents.

Along with the decrees and orders on preventing emergency situations and protection of the population from emergency situations of natural and anthropogenic character documents of urgent response are actively adopted as well, especially, with respect to seasonal natural disasters that are probable on the subjects' territories, mostly, floods and forest fires.

In all in 72 subjects of the Russian Federation 1174 regulatory legal acts (NLA) were adopted on topics as follows:

general issues of protection of the population and territories from emergency situations of natural and anthropogenic character; development and realization of legal and economic norms for providing this protection – 411 documents which make 35% of the total number of NLA-s and organizational and procedure documents (OPD-s);

target scientific-engineering programs on preventing emergency situations and raising the stability of functioning of economic objects in extreme conditions – 25 (2.1%);

forming (creating) , preparing and keeping in readiness the management bodies, forces and means intended for preventing and eliminating emergency situations (ES-s); preparing the population to actions in conditions of industrial accidents and natural disasters – 322 (27.4%);

preparing the population for evacuation and carrying out emergency-and-rescue work at emergency situations – 89 (7.6%);

improvement of the system of management, information, notification and communication – 95 (8.1%);

procedure of financial and material and equipment supply for measures on protecting the population and territories and creating special reserves used in emergency situations – 159 (13.5%);

organization of state expert examination, licensing, supervision and control in the field of protecting the population and territories from emergency situations – 29 (2.4%);

improving the system of social protection of people suffered from emergency situations, carrying out humanitarian actions and measures on maintaining the public order in disaster zones – 44 (3.7%).

At present, dedicated to relations in the sphere of preventing and eliminating emergency situations of natural and technogenic character are more than 600 various regulatory legal acts of the federal level and more than 2500 acts of subjects of the Russian Federation regulating all basic relations in a field under review.

1.2. National structure on coordinating the work on disaster reduction

The foundation of the national structure for coordinating and executing the work in the field of reducing disaster risks is represented by the single state system of preventing and eliminating emergency situations (RSES) established in 1992. The new regulations of RSES is approved by a Decree of the Government of the Russian Federation No. 794 of December 30 "On the Single State System of Preventing and Eliminating Emergency Situations".

The RSES integrates management bodies, forces and means of the federal bodies of executive power, executive power bodies of subjects of the Russian Federation, bodies of local administrations and organizations that are authorized to solve problems in the field of protecting the population and territories from emergency situations, develop and realize legal and economic standards in this field, to realize target and scientific-engineering programs, ensuring the readiness of the forces and means, to train the population.

Basic targets of the system activity are as follows:

prevention of accidents appearance, as well as of catastrophes and natural disasters;

reducing the losses and damage from emergency situations;

eliminating emergency situations including the performance of emergency-rescue operations, and also other measures on eliminating an immediate threat to people's lives, on recovering the survival.

The RSES consists of territorial and functional subsystems and has five levels (Fig. 1.1):

federal level – covering the entire territory of the Russian Federation;

regional level – covers the territory of several subjects of the Russian Federation;

territorial level – covers the territory of a subject of the Russian Federation;

local level – covers the territory of a district (town settlement);

object level – covers the territory of an economic object.

At each level the RSES has managerial bodies; permanent working bodies of control, forces and means; reserves of financial and material-and-equipment resources; systems of communication, notification, information supply, special educational establishments.

Functional subsystems are created by the federal bodies of executive power to organize the work on protecting the population and territories from emergency situations within the field of their activity and economic sectors under their responsibilities. Functional systems of the RSES are based on management bodies, powers and means of ministries and departments that have their own specific tasks in the field of counteraction of emergency situations. In all there are more than 40 functional subsystems in the RSES, and they cover all aspects of the problem of preventing and eliminating natural and anthropogenic emergency situations.

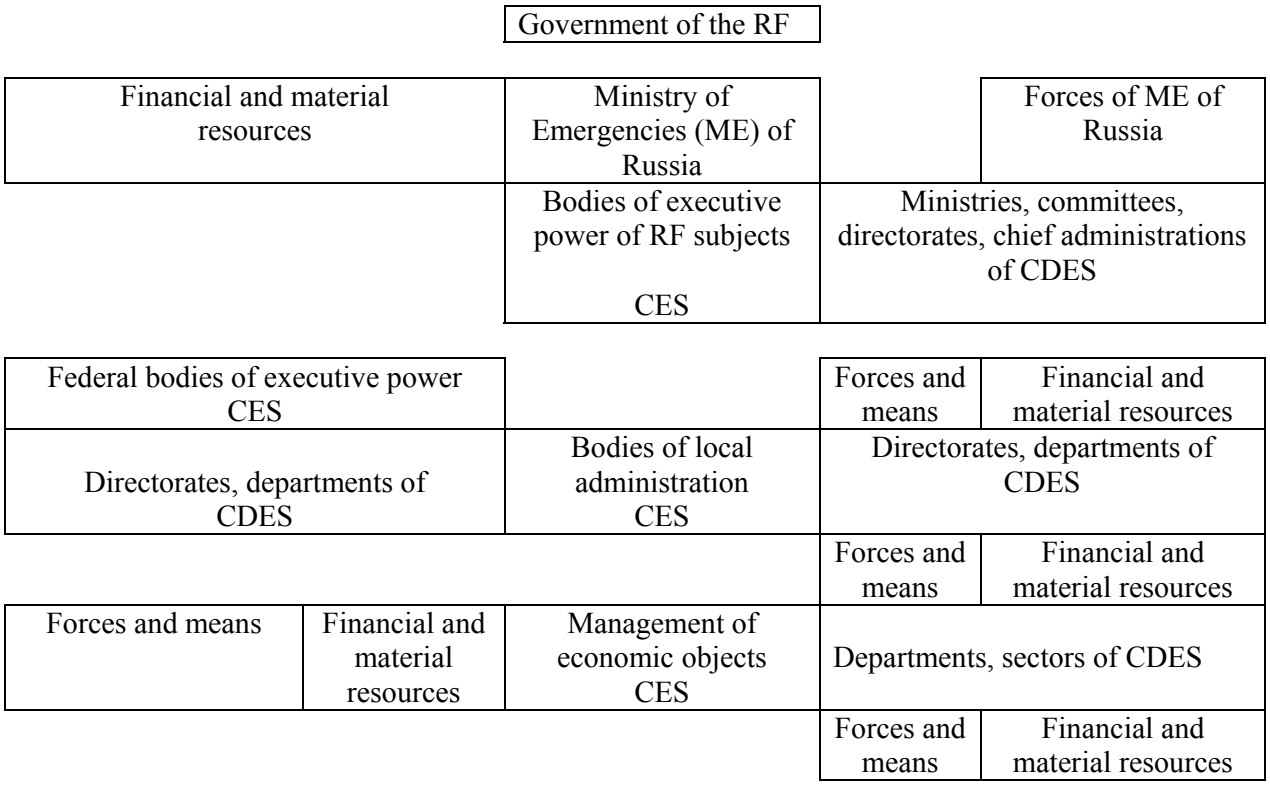
Territorial subsystems are created in the subjects of the Russian Federation for preventing and eliminating emergency situations within their territories. They are intended for organizing and realizing measures on protecting the population, national property, from emergency situations on territories under their responsibility included in the composition of the Federation subjects.

Coordination of activity of the territorial subsystems is carried out by special bodies – regional centers of the Ministry of Emergencies of Russia.

RSES management is realized by the Government of the Russian Federation. This duty is assigned to the Ministry of Emergencies of Russia in what it relates to realizing the state control

and coordination of activity of federal bodies of executive power in the field of protecting the population and territories from emergency situations.

Single State system of preventing and eliminating emergency situations (RSES)



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Functional subsystems *Territorial subsystems*

Fig. 1.1

A Government Commission for prevention and elimination of Emergency Situations and Ensuring Fire Safety has been established. Included in the Commission are heads of ministries and departments or deputy heads of ministries and departments who realize control and supervision over the safety of potentially hazardous objects of economy and dangerous natural phenomena, and also objects that have potentially hazardous objects within their jurisdiction; forces and means of prevention and elimination of emergency situations.

Related to the forces and means of the single system are specially trained forces and prepared means of the federal bodies of executive power, bodies of executive power of subjects of the Russian Federation, bodies of local administration, organizations and public associations that are intended and allocated (involved) for preventing and eliminating emergency situations. Composition of forces and means of the single system is determined by the Government of the Russian Federation.

Included in the composition of forces and means of each level of the single system are forces and means of permanent readiness intended for a prompt response to emergency situations and for carrying out operations on their elimination (hereinafter referred to as forces of permanent readiness).

The base of permanent readiness forces is composed of emergency-rescue services, emergency-rescue units, other services and units equipped with special machinery, equipment, outfits, tools, materials, with consideration for ensuring the implementation of emergency rescue work and other urgent operations in the area of emergency situation during 3 days minimum.

The list of permanent readiness forces of federal level is approved by the Government of the Russian Federation on the presentation of the Ministry for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters of the Russian Federation agreed upon with the executive power federal bodies concerned, bodies of executive power of the subjects of the Russian Federation and organizations.

The list of permanent readiness forces of territorial subsystems is approved by the bodies of executive power of the subjects of the Russian Federation on arrangement with the Ministry for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters of the Russian Federation.

Composition and structure of permanent readiness forces are determined by the federal bodies of executive power which create them, bodies of executive power of the subjects of the Russian Federation, local administration bodies, organizations and public associations proceeding from the tasks on preventing and eliminating emergency situations laid upon them.

Involvement of emergency-rescue services and emergency-rescue units for eliminating emergency situations is realized based on the following:

- in accordance with the plans for prevention and elimination of emergency situations on objects and territories serviced by the said services and units;
- in accordance with the plans of interaction during the elimination of emergency situations on other objects and territories;
- by decisions of federal bodies of executive power, bodies of executive power of Russian Federation subjects, local administration bodies, organizations and public associations realizing management of the said services and units.

Involvement of professional emergency-rescue services and emergency-rescue units to the elimination of emergency situations outside the territory of the Russian Federation is realized

by decisions of the Russian Federation Government in accordance with provisions of international law and on the basis pf international agreements of the RF.

Emergency-rescue units of public associations may participate in the elimination of emergency situations in compliance with the legislation of the Russian Federation and shall act under the guidance of corresponding bodies of the single system.

Along with basic tasks the RSES shall solve a number of auxiliary ones:

development and realization of legal and economic norms on providing protection of the population and territories from emergency situations is realized by the federal bodies of executive power and by a subject of the RF with the observance of a principle of their compliance with the laws of the Russian Federation and norms of international law. Economic regulation in the field of population and territories protection from emergency situations includes the following:

concessional taxation of banks performing soft lending of establishments realizing programs aimed at prevention of emergency situation and protection of population from them;

concessional taxation of expenses of organizations for realizing the programs of prevention of emergency situations and protection from them;

organization of insurance defense of the population and territories from consequences of large-scale industrial accidents and catastrophes;

creating off-budget funds for protecting the population and territories from emergency situations.

Development and realization of target and scientific-engineering programs aimed at preventing emergency situations and rise of stability of organizations functioning, as well as objects of social purpose is carried out with the purpose of decreasing the risk and reducing the consequences of emergency situations;

Financing of program measures is carried out at the expense of the federal budget, budgets of the subjects of the RF and local budgets.

To eliminate emergency situations the following resources are created and used:

- emergency fund of the Government of the Russian Federation on prevention and elimination emergency situations and consequences of natural disasters;
- reserves of inventories for ensuring urgent work on eliminating the consequences of emergency situations, being part of the state material reserve;
- reserves of material resources of the federal bodies of executive power;
- stocks of financial and material resources of the subjects of the Russian Federation, bodies of local administrations and organizations.

Procedure of creating, use and recovery of stocks of financial and material resources is determined by the legislation of the Russian Federation and regulatory legal acts of local administration bodies.

The nomenclature and volume of stocks of material resources for eliminating emergency situations, and also control of their formation, storage, use and recovery are determined by a body creating these stocks.

Main tasks of the RSES in the field of international cooperation are the following:

assistance in developing international relations in the field of prevention and elimination of emergency situations, in rendering mutual international aid at accidents, catastrophes, natural calamities and other kinds of disasters.

provision of interaction and contacts, organization of talks on problems of rendering international humanitarian aid to the population suffered as a result of emergency situations, and also on problems of the evacuation of citizens of the Russian Federation from crisis zones abroad;

provision of preparing documents for taking a political decision on involving RSES forces and means for carrying out emergency-rescue and other urgent operations on the territory of a foreign country if its government has applied with a request for rendering assistance in eliminating the emergency situation;

carrying out control over the implementation of international agreements in the field of preventing and eliminating emergency situations;

seismic notification and forecasting;

scientific research activities;

training specialists in the field of risk science;

joint actions in conditions of emergency situations with the use of advanced technologies and results of military conversion and others.

1.3.Regulatory mechanisms for disaster risk reduction

The set of measures on improving the activity of expert bodies in the interests of preventing emergency situations, including those of natural character, shall be built on the basis of the requirements of the Federal Law "On Protecting the Population and Territories from Emergency Situations of Natural and Anthropogenic Character" No. 68-ФЗ of December 21 1994, and other regulatory acts stipulating the implementation of the state expert examination of projects on constructing new objects and reconstructing the existing objects of various purposes that may be the sources of emergency situations or produce direct influence on guaranteed protection of the population and territories from affecting factors.

Main expert bodies being part of the Ministry are the following: State Expert Commission for the Projects of the Ministry of Emergencies (ME) of Russia and its two branches (in the Southern and North-Western Federal districts), outside expert commissions at regional centers for the affairs of civil defense, emergencies and elimination of consequences of natural disasters, and also expert commissions attached to management bodies on the affairs of civil defense and emergencies of the subjects of the Russian Federation. The activity of said bodies is realized in compliance with the Decree of the Government of the Russian Federation "On Procedure of Conducting a State Expert Examination and Approving the City-Designing, Pre-Design and Design Documentation" No. 1008 of December 27 200, and the "Regulations of the State Expert Examination of Designs of the ME of Russia".

Expert bodies of the ME of Russia provide for control over the observance of requirements on preventing emergency situations, population and territories protection in the city-designing documentation and in construction designs of projects that are potentially risky, and also carry out expert examinations of construction objects designs of the ME of Russia financed from the Federal budget. The State Expert Commission for the Projects of the ME of Russia has conducted state expert examination of the design documents for most complicated and potentially hazardous objects.

Expert bodies of the ME of Russia also cooperate with the territorial organizations of the State independent expert commission of the Russian Federation. Division of authorities, when interacting with the bodies of Glavgosexpertiza (Main State Expert Commission), is carried out on the basis of the Decree of the Government of the Russian Federation No. 1008 dated December 27, 2000, and Regulations of separating the duties on state expert examination and approval of city-designing, pre-design and design documentation between the ME of Russia and State Committee for Construction (Gosstroi) of Russia approved on July 14, 2001. If necessary, the said expert bodies of the ME of Russia interact, as appropriate, with the State expert commission in the field of environment protection, use and protection of water bodies, with expert subdivisions of branch ministries, bodies of executive power of Russian Federation subjects, with corresponding supervising bodies.

In compliance with the Regulations of the State Expert Commission of the ME of Russia one of its duties is to render (at the site) organizational and procedure assistance on the problems of expert examination of design documentation.

In 2003 the state of expert examination activity in the outside expert commissions of Rostovskaya, Astrakhanskaya, Tverskaya, Sakhalinskaya regions, Promorsky and Stavropolsky krais, city of St. Peterssburg, Republics of Udmurtiya and Mary-El was studied with procedure assistance rendered to them.

In 2003 for the absolute majority of designs of potentially hazardous objects and for all designs of objects construction technical meetings were carried out many times with the participation of customer's and design organizations' representatives at which engineering approaches, estimate documents were reviewed, as well as alterations introduced into design documentation according to remarks and proposals set forth in expert opinions.

With the purpose of organizing and realizing the work on preventing fires (including forest fires) and resulting death of people, and also minimizing a damage, a special kind of state supervision activity has been established by the legislation of the Russian Federation which is to be implemented by officials of the State Fire-Fighting Service of the ME of Russia (SFFS).

In compliance with Articles 5 and 6 of the Federal Law "Of Fire Safety" the federal body of SFFS management is invested with the authorities of the federal supervision of Russia in the field of fire safety, and the head of this body is a chief state inspector of the Russian Federation for fire supervision.

At present the development of draft technical regulations in the field of fire safety has been completed that are implemented on principles laid in the Federal Law "Of technical Regulation". The draft technical regulations on fire safety contain minimum necessary requirements of fire safety for protection objects of various purposes at all stages of their life cycle with consideration for individual and social risks resulting from fire, and also their maximum permissible values.

A most important element of the state regulation of the issues of industrial safety assurance, including that in the context of identifying and taking preventive actions aimed at reducing the risks of natural-anthropogenic and anthropogenic-natural risks, is **state supervision for the observance of industrial safety requirements**.

For a long time the supervision in the field of industrial safety was carried out by the Federal Mining and Industrial supervision of Russia (Gosgortekhnadzor) that presently has been transformed into the Federal service for technological supervision. The federal service realizes its activity both directly, and through its territorial bodies carrying out for a long time the management of its territorial bodies of federal subordination.

Basic principles of forming territorial bodies in this field consist in localizing the resources in places of maximum concentration of hazardous objects with consideration for infrastructure and industry development in the regions, for natural hazards, and also creating conditions and optimizing the expenses for reducing the risks from disasters and catastrophes.

With the purpose of realizing the Decree of the Government of the Russian Federation No. 592 "Of Interaction of the Government of the Russian Federation and Federal Bodies of Executive Power with Authorized Representatives of the President of the Russian Federation in Federal Districts and Layout of Territorial Bodies of the Federal Bodies of Executive Power" a distribution scheme has been approved of the territorial bodies of the state supervision body in federal districts, and duties of interacting with authorized representatives of the President of the RF in the federal districts has been laid on territorial bodies that coincide in dislocation with the centers of the federal bodies.

Included in the territorial bodies, depending on specific features and industrial potential of an area, are regional, district, interregional and specialized departments. Personnel of these subdivisions include state inspectors specializing (in consideration of diversified nature and specifics of the state supervision body activity) in various engineering fields of knowledge and practical activity.

When organizing and realizing state supervision, main efforts are presently focused on the following:

improving the procedure problems of supervision activity;

improving the norm-setting regulation in the field of industrial safety with consideration for the necessity of creating a systems of norms complying with the requirements of international standards taking care that these latter are not in conflict with the interests of the Russian Federation;

developing the personnel potential, and also improving the single system of training (increasing competence of workers) and certificating managers and specialists and organizations working in the field of industrial safety assurance;

expanding the field of information technologies utilization.

The existing organizational structure of the state supervision body provides for prompt decision-taking and use of preventive measures, and also observance of the principle of independence on organizations under observation.

Under the diversified nature of activity of the supervision body (for many years) a most favorable model of a single technical policy has been developed in organizing and realizing state supervision, and this makes it possible to realize all general-system functions on the basis of single procedure approaches.

Main principles that are kept to by the state supervision body include the following:

assurance of the observance of the Russian Federation legislation, when realizing state supervision;

system nature and comprehensive approach to the implementation of supervision and permit activity, and also norm-setting regulation;

rational nature of the organizational structure, its flexibility and reliability, clear distribution of rights and duties among all persons employed;

single methodology of supervision, openness of supervision activity, timely circulation of information, its analysis and use at all levels of the supervision system.

It should be noted that for the recent five years after passing the Federal Law “Of Industrial Safety of Hazardous Production Objects” the system of state supervision has developed mechanisms of supervision activity based on creating and functioning of a production monitoring system in organizations operating hazardous production objects. In 2004 fuel-and-energy projects were included into the sphere of the Federal service activity.

Under the diversified nature of activity this approach makes it possible to use general-system functions for supervision bodies adopted in economically developed countries. The said mechanisms also make possible optimizing expenses for supervision activity performance. The same approach may also be used in organizing state control (supervision) in other adjacent directions of supervising and monitoring activity.

In 2003 supervising bodies of Russia carried out 252483 examinations of enterprises which revealed 1868650 violations (and demand of their correction) of the requirements of industrial safety and mineral resources protection. Due to the threat of emergency situations appearance and probable death of people 99910 instructions to suspend the work at hazardous production objects were issued. On issues of industrial safety and mineral resources protection 20924 managers of enterprises under observation reported to the bodies of Gosgortekhnadzor of Russia.

With respect to changes in the technical legislation and issue of Federal Law “On Technical Regulation” a possibility has appeared, along with the solution of a number of other problems, to develop, by way of evolution, principles of supervising the state of industrial safety. Presented for consideration may be the following three basic forms of supervision realization in the field of industrial safety:

1. State supervision (control) is realized directly by the federal bodies of executive power – state inspectors.
2. Inspection realized by self-regulating organizations.

Involvement of non-governmental organizations in individual kinds of supervision activity. Such supervising bodies are organizations complying with certain requirements. It is expedient to use the European Standard EN 45004 which establishes common criteria for bodies carrying out various kinds of inspection as a base for forming corresponding requirements. Creation of the system of accrediting is possible for assessing the implementation of corresponding criteria.

The work on optimizing the functions of state regulation and supervision in the field of industrial safety that is performed on a permanent basis with the purpose of removing and ruling out excessive administrative pressure on business activity in combination with a possibility of applying rigid sanctions to those who violate the requirements of industrial safety, creates necessary conditions for raising the responsibility in solving the issues of industrial safety assurance on the part of managers of enterprises operating hazardous production objects.

Special danger for the environment and population is presented by the realization of natural-anthropogenic and anthropogenic-natural risks connected with hazardous production objects. Such objects should necessarily be declared for industrial safety.

Declaration of industrial safety is a most important, judicially established procedure of regulating industrial safety which makes it possible to consider and evaluate probable environmental risks by way of assessing the risks of accidents.

Declaration is aimed at providing the authorities and population with information on the state of safety of hazardous production objects, and also at improving the efficiency of measures on protecting the population and territories from accidents.

Declaration of industrial safety is represented in the following international documents: UN “Convention on the Transboundary Effects of Industrial Accidents”. Directives No. 82/501/EEC and No. 96/82/EEC (Directives of “Sevezo”). In the Russian Federation the relations in the field of industrial safety declaration are regulated by Federal Law “On Industrial Safety of Hazardous Production Objects”, decrees of the Government of the Russian Federation “On Approving the Rules of Submitting the Industrial Safety Declaration of Hazardous Production Objects” and “On the Periods of the Declaration of Industrial Safety of the Existing Hazardous Production Objects” and by documents of Gosgortekhnadzor of Russia.

Declaration of industrial safety is a document which represents the results of a comprehensive assessment of accident risk, analysis of sufficiency of preventive measures taken including the information of organization preparedness to operating a hazardous production object in compliance with the requirements of norms and rules of industrial safety, and also to the localization and elimination of accident consequences at the hazardous production object.

Federal Law “On Industrial Safety of Hazardous Production Objects” has established the necessity of developing declarations of industrial safety of hazardous production objects at which the quantities of production, use, processing, formation, storage, shipment and disposal of substances are equal to or exceed maximum levels. Bindingness of developing declarations of industrial safety can be established additionally by the Government of the Russian Federation and also, in compliance with its authorities, by Gosgortekhnadzor of Russia.

Declaration of industrial safety is developed as part of the design documentation for construction, expansion, reconstruction, technical re-equipment, preservation and winding-up of a hazardous production object, and also is revised or developed anew in the case of requesting a license for operating a hazardous production object, in the case of changes in the data contained in the declaration or in the case of changes in the industrial safety requirements.

Preparation of a declaration of industrial safety is aimed at:

Improving the efficiency of interaction of bodies of power, local administration and public organizations on the problems of assurance of industrial safety of hazardous production objects;

Creating conditions for organizing and realizing the state supervision in the field of industrial safety of hazardous production objects, and also providing for the activity in the filed

of environment protection and protection of population and territories from emergency situations;

Provision of reporting information to the power bodies, local administration, public associations and citizens concerning the observance of requirements of industrial safety at hazardous industrial establishments.

At present 1158 declarations at 1305 hazardous industrial establishments have been developed.

Declaration of industrial safety resulted in the following:

a new element of safety monitoring has been introduced that complies with the updated methods of management of industrial safety and is harmonized with international documents;

more accurate information has been received concerning the safety of projects at which large-scale accidents are probable;

fundamentals of norm-setting and methodological base in the filed of risk analysis have been developed, and this has given way to conditions for introducing a scientifically substantiated methodology of risk control analysis into the practice of industrial safety assurance;

formation of a market and domestic school of specialized organizations and skilled specialists capable of solving the tasks in the field of accident risk assessment.

1.4. Budget financing of measures for reducing disaster risks

The state function of preventing and eliminating emergency situations is financed in 2003 at the rate of 21 million rubles including the distribution by subsections “Prevention and elimination of consequences of emergency situations” – 11 billion rubles, “Civil Defense” – 67 million rubles, “State Fire-Fighting service” – 10 billion rubles. In accordance with the Federal Law “On protecting the Population and Territories from Emergency Situations of Natural and Anthropogenic Character” the financing within the framework of the Ministry of Emergencies of Russia shall cover the following:

target programs (Federal target program “Children of Russia (2001-2002); Federal target program “Nuclear and Radiation Safety of Russia for years 2000-2006”; Federal target program “Overcoming the Consequences of Radiation Accidents for the Period to 2010”; Federal target program “Decreasing the Risks and Reducing Consequences of Emergency Situations of Natural and Anthropogenic Character in the Russian Federation to 2005”; Federal target program “Dwelling” for 2002-2010);

activity of management bodies specially authorized for solving the tasks in the field of protection of the population and territories from emergency situations (functioning of the executive bodies of state power; monetary allowance for maintaining the central staff);

measures on preventing emergency situation, monitoring and forecasting;

measures on eliminating emergency situations;

creation of stocks of financial and material resources for eliminating emergency situations.

In addition, the whole diversified activity of the Ministry of Emergencies (ME) of Russia is covered by financing including:

carrying out scientific-research work and experimental designing;

capital construction, construction of dwellings;

development, manufacture and purchase of automated control systems, means of communication, exploration, radio-electronic and information counteraction, other radio-electronic and special equipment, means of radiation, chemical, biological, fire-proof protection, engineer support and supplies for the rear;

departmental expenses for health protection;

monetary allowance, food supply, provision with personal equipment and clothing, transport for servicemen, privileges and compensations to servicemen and their families;

combat training and material and equipment supplies for the civil defense troops, maintenance and operation of educational installations of military and physical training;

maintenance, operation and permanent repair of weapons, war materiel and military equipment and materials;

purchases of weapons, war materiel, products of industrial-engineering purposes, property, special equipment and outfits;

social policy, social aid and extraordinary grants in the case of death or damage to health of servicemen, when in line of duty;

measures on many other sections and subsections of the functional classification of financing.

Practically the entire volume of the financing of the ME of Russia activity and activity of structures within its jurisdiction is directed to the economic support of measures for controlling the risks of emergency situations, assessment of their sufficiency and efficiency the work on preventing emergency situations at potentially hazardous installations, localizing and eliminating the occurred emergency situations, minimizing the losses and damage from them.

Main controllable indicators in the system of economic regulation of the issues of emergency situations risk control include a damage, probability of emergency situations, efficiency of measures on their prevention and elimination, assessment of the influence of expenses for emergency situation prevention on social and economic indicators of country's development, assessment of the efficiency of mechanisms included in the system of economic regulation.

Financing of all this diversified activity is realized from the resources of the Federal Budget including those from the reserve Fund of the Government of the Russian Federation for preventing and eliminating emergency situations, from financial resources of executive power bodies of the subjects of the Russian Federation, from the resources of local administration and organizations. However, financing, especially that of the measures for eliminating emergency situations, is implemented in the subjects of the Russian Federation mostly from regional and republican budgets.

Federal target program "Decreasing the Risks and Reducing Consequences of Emergency Situations of Natural and Anthropogenic Character in the Russian Federation to 2005" is approved by the Decree of the Government of the Russian Federation No. 1098 of September 29, 1999. The aim of the Program is to decrease risks and to reduce the consequences of accidents, catastrophes and natural calamities in the Russian Federation for increasing the level of protection of the population and territories from emergence situation of natural and anthropogenic character. Within the Program framework in 2003 a scope of work was implemented on the following lines of activity:

I. Creation and development of the scientific-procedure base of control of emergency situation appearance risks.
II. Formation and development of the norm-setting legal and procedure base for ensuring state control and standardizing the risks of emergency situations appearance.
III. Creation and development of the system of measures on revealing risks, on forecasting and monitoring emergency situations.
IV. Development of the system of providing information for control of emergency situation appearance risks, systems of communication and notification at emergency situations.
V. Development of the system of measures on decreasing the risks, reducing the consequences of emergency situations and protection of the population and territories from them.
VI. Development of the system of measures on preparing the population and training of specialists of the Single Control and Attendance Service for action under emergency situations.

The minutes of the joint meeting of the Russian Federation Security Council and Presidium of the State Council of the Russian Federation No. 4 dated November 13, 2003, approved by the President of the Russian Federation have determined to ensure the correction of the Federal target program (FTP) "Decreasing the Risks and Reducing Consequences of Emergency Situations of Natural and Anthropogenic Character in the Russian Federation to 2005" and its extension to the period to 2010, and the separation in it subprograms of the basic directions of the work including subprograms of systemized studies; ensuring the fire, chemical, biological (including the development and production of special medical means of protection and treatment), anthropogenic and information safety of hazardous objects and population and the guarantee of their protection from adverse natural phenomena (including those presenting seismic danger); ensuring the safety of the housing stock and utilities and transport; improvement of the systems of chemical protection and guarding, monitoring and forecasting emergency situations, centralized notification of the population and communication, civil defense.

Studies and developments on the topic of protecting the population and territories of the Russian Federation from emergency situation of natural and anthropogenic character in 2003 was implemented within the framework of two sets of the Federal Target Scientific-Research Program "Studies and developments on first-priority directions of science and technology development for 2002 – 2006" on section "Ecology and rational nature use" (subsection "Risks and safety in natural-anthropogenic sphere").

The main target of studies on the first set was to establish fundamental laws of formation and development of dangerous and catastrophic processes in the natural and anthropogenic spheres for the analysis and destruction of the systems of protecting the population, economic objects and environment from emergency situations (ES) of natural and anthropogenic character.

The expected final result of this work will be a step-by-step decrease (by 5 to 10% per year) of social-economic, environmental and technological risks and damages from accidents and catastrophes of national, regional, local and one-object scale.

The main target of the development on the second set "Search and applied studies and developments" was the implementation of work in the field of creating new production processes, systems of ensuring safety of dangerous objects, methods of early prevention of natural and anthropogenic catastrophes and development of the state certification system "Personnel – knowledge – education" on problems of safety.

The expected result of this work is the step-by-step transfer of economic objects functioning to a higher level of protection against grave accidents and catastrophes in the natural-anthropogenic sphere (with the use of ecologically safe industrial processes, updated systems of early prevention of emergency situations and new educational processes of personnel professional training).

In 2003 the work was underway on FTP "Provision of Russia's population with drinking water" approved by the Decree of the Government of the Russian Federation No. 292 of March 6, 1998. Periods of realization of the Program are as follows: 1999-2010 (1^{st} stage – 1999-2000; 2^{nd} stage – 2001-2005; 3^{rd} stage – 2006-2010).

First-priority measures of FTP implementation are:

improvement of supply of drinking water of standard quality and in sufficient quantities to the population;

recovery, protection and rational use of the sources of drinking water supply.

In the interests of preventing probable accidents, catastrophes and natural calamities development and realization of target programs on risk decrease and was organized as well as for decreasing risks and reducing the consequences of emergency situations in the subjects of the Russian Federation. At present the realization of a number of departmental and regional programs is underway.

The state of financing of federal and territorial target programs in the subjects of the Russian Federation is shown in Table 1.1.

Scientific-engineering programs in the field of protection of population and territories from emergency situations are realized by way of carrying out scientific research at the federal, territorial and branch levels. Financing of scientific-engineering developments was realized at the expense of the resources of federal, branch and local budgets, and also from off-budget resources.

Table 1.1.

State of financing the federal and territorial target programs
by the subjects of the Russian Federation

Names of subjects of the Russian Federation	Quantity of Federal and territorial target programs developed with the participation of a subject of the Russian Federation	Volume of financing, million rubles	
		planned	actual
1	2	3	4
Aginsko-Buryatskaya autonomous destrict (AD)	2	1.99	1.6
Amurskaya region	10	140.7	116.1
Altaisky krai	6	183.7	221.7
Astrakhaskaya region	8	114.4	69.3
Arkhangelskaya region	1	40.8	-
Bryanskaya region	6	554.2	364.5
Belgorodskaya region	4	81.2	95.8
Vologodskaya region	3	109587.7	31.2
Volgogradskaya region	12	33.51	11.4
Vladimirskaya region	5	292.2	281.1
Voronezhskaya region	2	6.1	2.78
City of Moscow	5	19.4	19.1
City of St. Petersburg	1	2.0	2.0
Jewish autonomous region	6	554.7	459.5
Ivanovskaya region	8	173082.0	-
Irkutskaya region	6	464.2	273.4
Karachayevo-Cherkesskaya Rep.	-	-	-
Kabardino-Balkarskaya Repub.	4	540.3	159.0
Republic of Kareliya	1	33.3	9.5
Kamchatskaya region	9	222.7	115.9
Komi-Permyatsky AD	-	-	-
Krasnoyarsky krai	1	5.7	1.5
Krasnodarsky krai	2	77.3	16.4
Kemerovskaya region	1	3.3	-
Koryaksky AD	-	-	-
Kaluzhskaya region	13	252795	252795
Kostromskaya region	6	648.4	481.8
Kaliningradskaya region	4	8.57	1.7
Kurskay region	9	156.0	87.0
Kirovskaya region	-		-
Kurganskaya region	2	1301.4	1106.4
Lipetskaya region	2	29.7	6.9
Magadanskaya region	8	195.5	131.2

Names of subjects of the Russian Federation	Quantity of Federal and territorial target programs developed with the participation of a subject of the Russian Federation	Volume of financing, million rubles	
		planned	actual
1	2	3	4
Republic of Mary El	3	1.8	0.5
Murmanskaya region	4	827.8	243.
Moskovskaya region	10	3759.0	3741.0
Nenetsky AD	1	2.2	2.2
Novgorodskaya region	6	25.0	24.4
Nizhegorodskaya region	4	88.3	38.6
Novosibirskaya region	2	6.0	0.4
Omskaya region	21	4468.1	3793.2
Orenburgskaya region	27	2180.5	1130.1
Orlovskaya region	3	225.1	225.1
Permskaya region	-	-	-
Penzenskaya region	-	-	-
Pskovskaya region	15	107.7	22.0
Primorsky krai	2	304.3	93.4
Republic of Adygheya	1	-	-
Republic of Altai	4	29.6	27.3
Republic of Khakassiya	6	15.2	14.5
Republic of Tuva	6	392.2	1.1
Republic of Komi	13	59.13	689.4
Republic of Buryatiya	6	248.2	108.0
Republic of Dagestan	2	84.1	71.2
Republic of Ingushetiya	7	34.7	20.5
Republic of Kalmykiya	6	119.2	95.9
Republic of Bashkortostan	4	2232.8	1868.3
Republic of Mordoviya	3	2.05	2.05
Republic of Tatrstan	4	270.7	185.6
Rostovskaya region	1	41.0	39.9
Ryazanskaya region	18	280623	190595
Samarskaya region	4	846.5	696.1
Saratovskaya region	2	4.2	3.8
Sakhalinskaya region	13	1587.0	1397.6
Sverdlovskaya region	2	166.5	116.9
Smolenskaya region	3	377.9	241.5
Stavropolsky krai	10	1153.6	806.0
Taimyrsky AD	1	951.1	879.2
Tambovskaya region	14	968.0	743.7
Tverskaya region	3	240.4	439.7
Tomskaya region	5	112.9	44.9
Tulskaya region	7	420.8	117.4
Tiumenskaya region	1	27.6	18.9
Udmurtskaya Republic	16	245.6	82.7
Ulianovskaya region	3	3828.4	314.9
Ust-Ordynsky Buriatsky AD	1	0.07	0.07
Khabarovsky krai	12	532.3	418.3
Khanty-Mansiysky AD	-	-	-

Names of subjects of the Russian Federation	Quantity of Federal and territorial target programs developed with the participation of a subject of the Russian Federation	Volume of financing, million rubles	
		planned	actual
1	2	3	4
Chitinskaya region	16	245.6	82.7
Chukotsky AD	7	6168.6	6168.6
Chuvashskaya Republic	4	22.1	6168.64.6
Chelyabinskaya region	1	8775	4.6
Evenkiysky AD	-	-	8699.9
Yakutiya Republic of Sakha	12	2978.3	-
Yaroslavskaya region	2	11.9	2419.6
Yamalo-Nenetsky AD	-	-	-

1.5. Participation of non-governmental organizations and public society

More than 1500 nongovernmental and public organizations have been established, and they are successfully developing in Russia. Activity of a number of organizations is directly or indirectly connected with realizing the strategy of decreasing natural and anthropogenic risks. The organizations work on a permanent basis, and also can be established for the period of implementing a certain topical task. A particular example of the latter may be demonstrated by the Public coordination committee for assisting in eliminating the consequences of natural calamities which was founded in summer 2002 in the period of a catastrophic flood in the Southern Federal Region. This committee united more than 10 public organizations and civil initiatives.

An example of a public organization working on a permanent basis may serve a Russian scientific society for risk analysis – an independent scientific organization realizing its activity in the field of development and use of the methodology for risk analysis and control in various fields of scientific and practical work. The society incorporates scientists, specialists, representatives of the industry, bodies of state power and management, organizations and representatives of the public who are interested in studying and using the achievements in the field of risk analysis, risk control and closely-related disciplines with the purpose of taking well-grounded decisions in the field of ensuring the safety of the population, state, natural environment.

The aim of the society is to unite efforts of all persons concerned in preparing and taking well-grounded decisions in the field of ensuring the safety of the population and natural environment. To realize these targets the Society carries out the following kinds of activity:

- scientific and research activity;
- promoting scientific research in the field of risk analysis and control in closely-related disciplines;
- educational activity;
- participation in forming the state policy in the field of ensuring the safety of the population, territories, natural environment;
- participation in law-making activity, independent expert examinations and development of programs, promising ideas, engineering approaches, norm-setting documents and rules in the field of ensuring the safety of the population, territories, natural environment;
- participation in public hearings on the problems of ensuring the safety of the population, regions, natural environment;

- activity on raising the level of knowledge the society, bodies of sate power and management concerned and organization on the problems of risk analysis and control, of risk acceptability.

The Society has a ramified territorial structure (Fig. 1.2), at present branches have been established in 60 subjects of the Russian Federation, the number of Society members exceeds 1000 people, it incorporates world-known scientists, experts of world standard, statesmen. The Society publishes its own official scientific magazine "Problems of Risk Analysis" in which problems of managing natural risks are discussed regularly (Fig. 1.3).

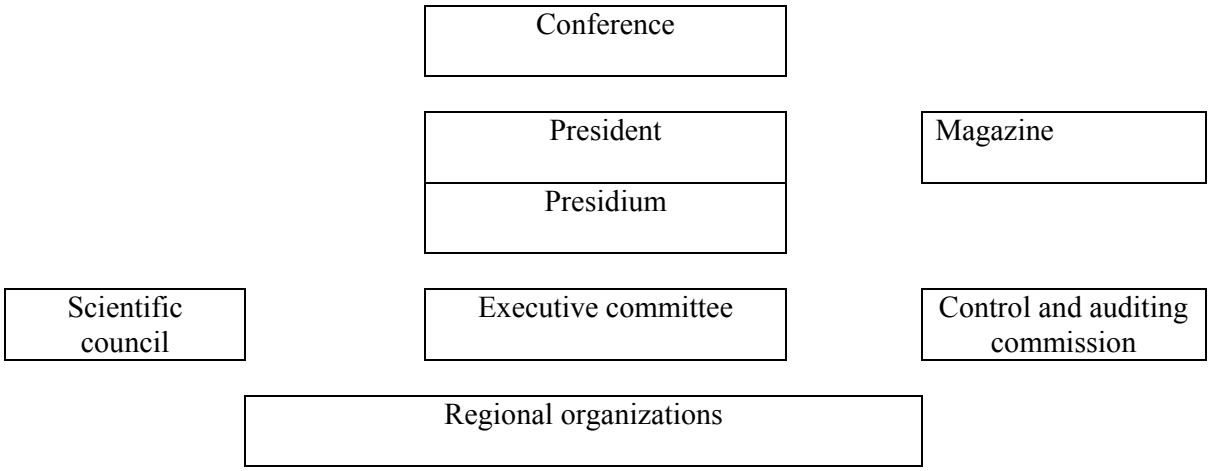
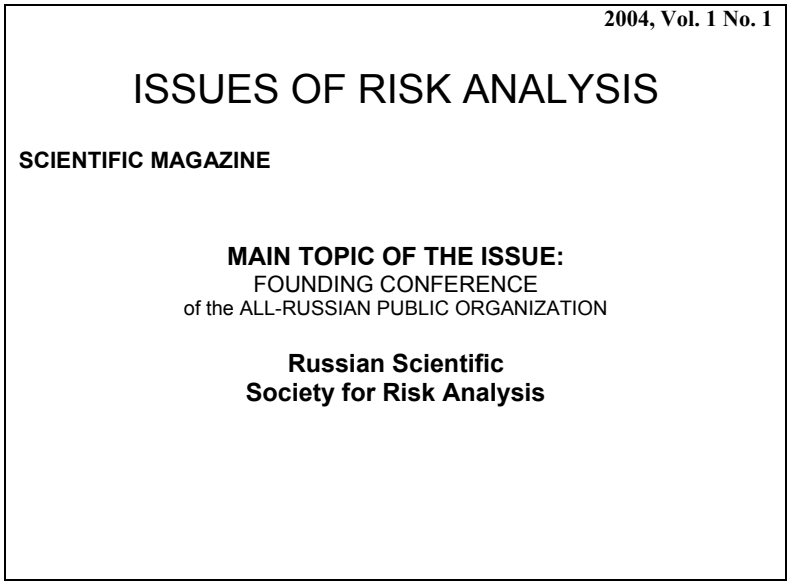


Fig.1.2. Structure of the Russian Society for Risk Analysis



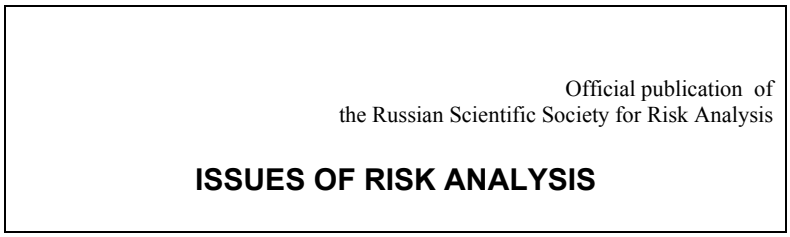


Fig. 1.3. Cover of the official edition of the Russian Society for Risk Analysis

SECTION 2. IDENTIFICATION AND ASSESSMENT OF NATURAL RISKS

2.1. Natural hazards of Russia

The second half of the 20th century was marked by a rapid growth of natural catastrophes and human and economic losses related to them. Compared with 1960s the quantity of natural disasters on the Earth increased by the end of the past century 3 times as much, and economic losses for the same period grew 9 times as much. The growth of the number of catastrophes goes on mostly at the expense of hydrometeorological hazards (floods, hurricanes, storms) with 90 per cent of all the losses, whereas the quantity of earthquakes remains relatively unchanged. Progression of events in the natural sphere being what it is, proceeds from a number of objective reasons: growth of the size of population and accelerated urbanization, degradation of natural environment, global climate changes.

By virtue of the tremendous area and diversity of natural conditions the territory and numerous objects of the Russian economy are subject to destructive impacts of various geophysical, geological, hydrometeorological processes, forest fires, communicable diseases. Out of these impacts the largest area of distribution falls on cryopedological hazards (heaving, thermokarst, thermal erosion, solifluction) related to the zone of permafrost rock development occupying about 65% of the country's territory. Forest fires and other natural fires take place on almost 45% of Russian territory, and on 41.6% of it earthquakes occur with a magnitude of 6 and over (Table 2.1).

A rather significant and permanently increasing (both in time and space) hazard for the social and economic development of Russia is also represented by floods, creeps and cavings, earth flows, partial flooding of territories, destruction of sea shores, banks of reservoirs and rivers, karst-suffosion processes and a number of other hazardous natural and anthropogenic-natural processes (HNAP). The total average annual economic damage of Russia from these hazards according to experts' estimates reaches presently 20 to 26 billion dollars per year.

By media of development various natural hazards and risk resulted from them are divided into geological, hydrological, meteorological, biological, space-related and mixed (geological-hydrological, hydrogeological etc.) ones. Many of them are closely interrelated being either a basic condition or a reason (trigger mechanism) for the rise and development of secondary natural hazards which (by their consequences) may become even more destructive that primary reasons that had caused them.

Given below is a brief characterization of most important peculiarities of manifestation and adverse consequences of most hazardous natural and anthropogenic-natural processes that present a threat to national safety and development of Russia due to tremendous social, economic or environmental injuries inflicted by them.

2.1.1. Geophysical and geological hazards

2.1.1.1.Seismicity and seismic risk

The territory of the Russian Federation as a whole features moderate seismicity. Exceptions are the regions of North Caucasus, south of Siberia and Far East, where the intensity of seismic vibrations reaches magnitudes of 8 to 9 and 9 to 10 by the macroseismic12-point scale MSK-64 (EMS-98). Certain threat is also presented by the zones with magnitudes of 6 to 7 in the densely populated southern part of the country.

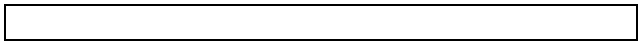


Fig. 2-1

Table 2.1

Susceptibility of the territory and population of Russia to the impacts of hazardous natural processes

Processes	Susceptibility, %				Population density in the zone of impact by a process person/km2
	of territory, areas	of cities and towns		population	
		1986	2002		
Geological:					
earthquakes, slides and	41.6	10(103)*	10(103)	41.8	8.7
cavings	5	27(197)	71(725)	7	14.0
avalanches	9	0.6(8)	0.6(8)	3	3.3
earth flows	5	0.6(13)	0.6(13)	2	4.0
loess sagging	11	-	55(563)	26	23.6
partial flooding of territories	0.5	51(530)	93(960)	69	1291
karst	13	10(101)	30(301)	19	14.6
suffosion	9	-	92(958)	30	29.3
river erosion	0.2	43	43(442)	0.3	13.2
surface and gully erosion	10	-	75(734)	25	21.9
changes of sea and reservoir shores	39**	5	5(53)	5	627.5
Cryopedological:					
heaving	61	-	81(841)	60	8.6
thermokarst, thermal erosion	45	-	7(72)	6	1.2
solifluction	6	-	6(60)	4	6.6
Geological-hydrological:					
tsunamis	0.1	1(14)	1(14)	0.1	8.8
Hydrological:					
floods	2.4	42(432)	70(746)	0.9	3.4
ice-coating	0.08	17(174)	17(174)	0.1	11.0
Meteorological:					
Severe frosts, snowstorms	100	100	100	100	8.6

draughts hurricanes, tornadoes	24 21	8 49(500)	8 49(500)	13 12	2.9 5.0
Biological: natural fires	44.6	-	<1	0.02	3.8
Total:	98	79.7	100	93	8.3

* Given in brackets is the number of cities and towns subject to the process

** Linear affection of shores by the process

Catastrophic earthquakes with a magnitude of 6 and over and with the recurrence of one time in 500 years are periodically observed (according to the set of maps of general seismic zoning of the territory of the Russian Federation (OCP-97) on 41.6% of the territory of Russia with 41.8% of the population (see Table 2.1 and Fig. 2.1). Each year 14 to 15 earthquakes like this take place here (average multi-year values). In this case their centers of origin in the majority of cases (76%) are located within the lithosphere at the depth up to 30 km.

The total number of strong earthquakes that affected the territory of Russia in the 20th century exceeds 1400. However, in the past century only 40 of them caused social and economic losses, and this was due to low economic development of significant areas of seismic territories located in the Asiatic part of Russia.

Scenarios of the development of the majority of catastrophic seismic events on the territory of Russia are similar enough. Apart from generating various-frequency vibrations that directly result in the destruction of buildings and structures, they often cause ruptures, subsidences, upheavals and horizontal shifts of long sections of the earth surface. Such deformations sometimes reach tens and hundreds kilometers in length and 8 to 10 and over meters in amplitude. Rather frequent are the cases of dynamic thinning of disperse rocks, these latter are predominantly of sandy composition, their evacuation to the surface in the areas of dislocations with a break in continuity and bulging from under buildings and structures. For example, the said effects manifested themselves during Neftegrosk earthquake.

Within the boundaries of severely rugged territories earthquakes, as a rule, initiate the formation of slides, cavings and snow avalanches which is particularly typical for fold-mountain structures of North Caucasus, Altai, Sayans and Far East. These and some other seismosynergistic dangerous processes usually intensify destructive consequences of earthquakes several times as much, and in some cases – cause basic social and economic losses.

The territory of Russia belongs to Northern Eurasia whose seismicity is stipulated by intensive geodynamic effect of several large lithosphere plates – Eurasian, African, Arabian, Indo-Australian, Chinese, Pacific, North-American and of the Sea of Okhotsk (Fig. 2.2).

Fig. 2-2

In European part of Russia high seismicity is inherent in Northern Caucasus, in Siberia – in Altai, Sayans, Baikal and Transbaikal region, in the Far East – Kurilo-Kamchatsky region and isle of Sakhalin. Less active in terms of sesmicity is Berkhoyano-Kolymsky region, regions of Amur river, the Seaside, Koryakiya and Chukotka, although rather powerful earthquakes occur there as well. Relatively low seismicity is observed on plains of East-European, Skif, West-Siberian and East-Siberian platforms. Along with the local seismicity strong earthquakes on Russia's territory are also felt on adjacent foreign regions (East Carpathian mountains, Crimea, Caucasus, Centrl Asia, Scandinavia and others).

The dominating quantity of earthquake centers can be conveniently considered by regions located in three main sectors – in European part of the country, in Siberia and in the Far East.

European part of Russia. Northern Caucasus being part of extended Crimea-Caucasus-Kopetdag zone of Iran-Caucasus-Anatolian seismic region features the highest seismicity in the European part of the country. In this region there are known earthquakes with a magnitude about M=7.0 and with seismic effect in the area of epicenter reaching 10=9 and higher in intensity. East-European plain and Ural are featured with relatively poor seismicity and rarely occurring local earthquakes with a magnitude M≤5.5 and intensity up to 10=6-7. On a wide area, including Moscow and St. Petersburg, seismic vibrations were observed repeatedly with the intensity to 3-4 from deep-seated centers of large earthquakes occurring in Eastern Carpathians. Frequently enough seismic activity is aggravated by anthropogenic action of the lithosphere shell of the earth (oil and gas production, extraction of other mineral resources, pumping-in fluids into fractures and so on).

Siberia. Altai with its Mongolian part and Sayans – are one of most seismic areas of intracontinental regions of the world. The region of East Sayans features rather violent earthquakes on the territory of Russia, where earthquakes are known with a magnitude M≈ 7.0 and 10 ≈ 9 and where ancient geological traces (paleoseismodislocation) of such and larger seismic events are found. Largest seismic catastrophes in the beginning of the last century took place in Mongolian Altai. Magnitude and seismic effect of these earthquakes are close to limit values of M = 8.7, 10 = 12 points. Baikal rift zone is a unique seismodynamic region of the world. The hollow of the lake is represented by three seismically active kettleholes – southern, middle and northern. Similar zoning is also characteristic of the earthquake manifestation east of the lake, up to Olekma river. In the east of Olekmo-Stanovaya the seismic zone traces the boundary between Eurasian and Chinese lithosphere plats (some scientists also separate an intermediate plate: Amurskaya one, which is less in area. On the joint of Baikal zone and East Sayans there are traces of ancient earthquakes with a magnitude M = 7.7 and over (10 = 0-11 points). Verkhoyano-Kolymsky region belongs to Chersky zone extending south-east of the mouth of Lena river to the coast of the Sea of Okhotsk, North Kamchatka and Komandorskie islands. The strongest of earthquakes ever known in Yakutiya with a magnitude M=6.8-7.1 took place in the lower course of Lena river and at the border of Yakutiya with Magadan region. Less significant seismic events: with a magnitude to M=5.5 and intensity 10≤7 points were observed on the territory of West-Siberian platform. Arctic rift zone is a north-western extension of the seismic structure of Verkhne_Kolymsky region that moves away in the form of a narrow strip to the Arctic Ocean and connecting in the west with a similar rift zone of the Middle Atlantic Crest. On the shelf of the Laptev Sea there are earthquakes with a magnitude M=6.8.

Far East. Kurilo-Kamchatskaya zone is a classic example of Pacific lithosphere zone subduction to under the continent. It extends along the eastern coast of Kamchatka, Kuriles and isle of Khokkaido. This is the place where largest in Northern Eurasia earthquakes appear with a magnitude M≥8.0 and seismic effect of 10 ≥10 points. The zone structure is clearly traced by the location of centers in plan and in depth. Its length along the arc is approximately 250 km, in depth – over 650 km, thickness – about 70 km, slope to horizon – to 50 deg. Seismic effect on the earth surface from deep centers is relatively small. Certain seismic hazard may be presented by earthquakes related to the activity of Kamchatka volcanoes. Strongest earthquakes (M=8.0-8.5, 10=10-11 points) appear at the depth to 80 km in a relatively narrow strip between the oceanic trench, Kamchatka and Kurile islands. The most of them were accompanied by powerful tsunamis of 10 to 15 m and over in height. Sakhalin is essentially a northern extension of Sakhalin-Japanese basic arc which traces the boundary of the Sea of Okhotsk and Eurasian plates. Before the catastrophic Neftegorsk earthquake (1995; M=7.5, 10=9-10 points) seismicity of the island seemed moderate and, prior to creating in 1991-1997 a new set of maps of the general seismic zoning of the territory of Russia (GSZ-97), earthquakes that were expected in this area did not exceed the intensity over 10 = 6-7 points. Regions of Amur river and the Seaside feature moderate seismicity. From earthquakes known here only one in the north of Amurskaya region reached the magnitude M=7.0 (10 =9 points). In the future the magnitudes of potential earthquakes in the south of Khabarovsk krai also may happen to become not less than

M=7.0 and in the north of the Amurskaya region earthquakes of M=7.5 and over are not ruled out. Along with intracrustal earthquakes in the Seaside deep-focus earthquakes are perceived in the Southwest part of Kurilo-Kamchatskaya subduction zone. Earthquakes on the shelf are often accompanied with tsunamis to 34 m in height. Chukotka and Koryakskoye upland are studied not well enough with respect to seismicity due to the absence of sufficient number of seismic stations here. At the eastern coast of Chukotka earthquakes took place with magnitudes M=6.2-6.9, on Koryakskoye upland – with M=7.0 (10=8-9 points).

2.1.1.2 Tsunamis

Maximum hazard is presented by tsunami for the sea coasts of Kamchatka and Sakhalin regions bordering with waters of Pacific Ocean, Sea of Okhotsk, Sea of Japan and Bering Sea.

The speed of tsunami waves spread from an earthquake epicenter amounts to 400-500 to 700 km/h on deep water. In the shallow-water coastal part their speed gradually decreases to 70-100 km/h, however at the same time the height is increasing that reaches on the eastern coast of Kamchatka and Kuriles 30 to 60 m.

On 5.11.1952 the most destructive tsunami for the whole history of the country took place here whose magnitude was 8.25 and which extended to more than 750 km of the Pacific coast from the isle of Onekotan to Kronotsky Peninsula on Kamchatka (Savarensky and others, 1958). The tsunami caused a series of waves up to 14-20 m in height which reached the coast in 20-25 minutes after the earthquake. As a result of it the largest part of the town of Severo-Kurilsk on the isle of Paramushir was destroyed that was located at elevations of 10-15 m from the ocean level. According to different sources the number of victims was 10 to 14 thousand people.

The impact of destructive waves of Kamchatka tsunami was preceded by a short-time withdrawal of sea waves from the coast. This effect is typical for a situation under review, and it often becomes the reason of large-scale deaths of people who were not timely informed and just wanted to have look at the sea that was growing shallow.

A tsunami similar in power came down upon Kamchatka and Kuriles seacoast in 1737. Less catastrophic events were registered in the years 1780, 1893, 1918, 1923, 1958, 1959, 1963, 1969 and 1994.

Since the time of earthquake and tsunami of 1952 about 60 tsunamis were registered in the area under consideration with the wave height more than 1-2 m. Three of them resulted in the death of people and economic losses (1958, 1963, 1994). Thus the recurrence of destructive tsunamis in Kurilo-Kamchatka region amounts to about one time in 10 years, and their most catastrophic manifestations – one time in 100-30 years.

2.1.1.3 Slides.

On the territory of Russia slides originate, as a rule, on steep slopes with the height more than 5 to 10 m in whose sections argillaceous rocks of various degree of lithification are present. Such conditions exist on approximately 5% of the country's total area (see Table 2.1). The volumes of simultaneous displacement of slide masses on the said territory may reach 1-10 million m^3 on high slopes (more than 100-200 m) and the speed of the first meters per second.

The frequency of the said catastrophic events related to mass activation of slides is 1 time in 8-12 years practically in all slide-hazardous regions of Russia. Such activation of a slide process is especially typical for severely rugged areas of North Caucasus, Volga region, South Siberia, Far East and slide-hazardous coasts of the Black and Azov seas. Elevated danger of activation of the existing catastrophic slides as well as the of formation of new ones is characteristic of many regions in the north-west, central and Volga regions of the country.

Maximum vulnerability to slides in the aforesaid regions is featured by the following towns: Sochi, Taganrog, Stavropol, Mineralnye Vody, Cherkessk, Goryachi Kliuch,

Makhachkala, Buinaksk, Nizhny Novgorod, Cheboksary, Volsk, Ulianovsk, Saratov, Volgograd, Barnaul, Krasnoyarsk, Omsk, Tomsk, Achinsk, Irkutsk, Khabarovsk. Petropavlovsk-Kamchatsky. The dominating quantity of slides appear as a result of artificial slope-cutting, water leakage from service lines and partial flooding of territories, of vibration effect of operating mechanisms and many other anthropogenic factors. In such natural-anthropogenic conditions the activity of slide formation increases significantly both in time and in space.
And rather often slides affect territories within which (in undestroyed natural conditions) slide formation was practically impossible earlier, and this makes the forecast of hazards under review especially difficult.

North-Caucasian region features a particularly great slide hazard. An example of this catastrophic situation is a large-scale slide descent in spring 1989 in mountainous regions of Chechnya and Ingushetiya. At that time the area affected by slides was about 2.5 thousand sq. km. As a result 85 settlements were fully or significantly destroyed including the town of Malgobek, 2157 houses, more than 80 objects of social and domestic purpose (schools, kindergartens, shops, hospitals etc.), 60 agricultural buildings, about 100 km of motor roads, 102 km of power lines and others. 6025 families (about 27 thousand people) remained homeless. The total direct economic damage from this slide-induced catastrophe was estimated at 390 million dollars. Town of Malgobek located on a narrow crest-like hill which was "eaten" by the slide from both sides, was transferred to a plain, and this required allocation of more than 100 million dollars (Fig. 2.3).

Fig. 2-3

A difficult slide situation was repeated on the territory of Chechnya and Ingushetiya in 1998. About 12 thousand people remained homeless, and economic losses exceeded (by expert assessments) 140 million dollars.

2.1.1.4. Earth flows

In the 20th century destructive earth flows affected towns Tyrnyauz, Baksan, Novorossisk, Tuapse, Kirovsk, Kyakhta, Ulan-Ude, Khilok, Nerchinsk, Petropavlovsk-Zabaikalsky, Chita, Vladivostok, Nakhodka, and also many other smaller settlements located mostly in North-Caucasian region. For example, in September 1992, rain-induced mudflows destroyed more than 700 dwelling and public buildings with the total cost exceeding 2.3 million dollars. Two persons died.

On July 18 – 25, 2000, along river Terkhozhansu in Kabardino-Balkariya five earth flows occurred (with short intervals); their total volume was more than 10 million sq.m^3. Two thirds of Tyrnyauz turned out to be in the affection zone. As a result 8 persons died, direct economic damage amounted to more than 17.8 million dollars.

On August 6-10, 2002, a powerful cyclone with heavy rainfalls caused mudflows in the area of the city of Novorossisk. As a result 60 people died and more than 30 thousand were injured. 447 dwellings were destroyed and about 5 thousand houses – damaged. In addition 20 bridges, 5.5 km of motor roads, about 1 km of railways, 5 water-intake stations and 55 municipal objects were destroyed. Direct economic loss amounted to more than 71 million dollars.

A glacial mud-and-stone flow, which is rare for Russia, occurred on 20.09.2002 after the descent of glacier Kolka to the valley of river Genaldon in Karmadon canyon in Northern Osetia. At first glacial masses of about 21 million m^3 closed the river valley over 5-km length having formed a sort of a natural dam about 100 m high and 200 m wide, and behind it water started to accumulate. When the critical volume of water was achieved, glacier masses started fast moving in the form of ice-and-stone flow of 10-12 million m^3 in volume. The latter moved down the

valley to a distance to 16.5 km (Fig. 2.4). As a result of this disaster about 140 people died including the filming team of S. Bodrov the junior. The three-storey building of sanatorium "Karmadon" and two recreation camps were destroyed.

Referred to other slide-hazardous regions of Russia are mountain territories of the Khibins, Middle and Polar Ural, Siberia and Far East. These places feature the probability of simultaneous occurrence of slides, cavings, avalanches and earthquakes. However, economic damage from mudflows is not big in these regions, and cases of death of population are relatively rare (once in 5-10 years). They usually result from a careless choice of places for passing the night or arranging temporary settlements in slide-hazardous valleys. In June 1991 for this reason in the vicinity of the town of Pevek (Magadan region) 20 houses were destroyed in a geologists' settlement, 8 persons died.

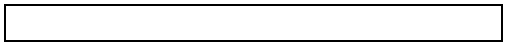


Fig. 2-4

2.1.1.5. Karst processes

The processes are actively developing on about 13% of Russia's territory whose near-surface parts are composed of soluble carbonate, sulfate and haloid rocks. Basic adverse manifestations of these processes are connected with fast (seconds, minutes and first days) settlements and sinks of the earth surface with the diameter ranging from 1-5 to 200-300 m caused by the gravity caving of the roof of underground karst spaces (karst deformations) and (or) suffosion evacuation into these spaces of covering water-saturated disperse rocks (karst-suffosion deformations). The depth of sinks usually varies in the limits of 1-3 to 10-15 m. However, in individual cases it may be much greater. For example, in 1984 in the outskirts of Bereznyaki town a tremendous anthropogenic karst sink (which came to the surface from the depth of 400 m) occurred as a result of the underground development of potassium salts.

Most active and dangerous karst manifestations for the population and economic objects are typical for the areas of development of sulfate and haloid rocks in the Ural region and region of territory along Middle Volga (Bashkiriya, Tatartstan, Permskaya, Nizhegorodskaya and Samarskay regions). In the area of karst hazard large towns are located like Perm, Ufa, Kazan, Nizhny Novgorod, Samara, Almetievsk, Dzerzhinsk, Sterlitamak, Salavat, Solikamsk. The danger of karst sinks of the earth surface also exists in Kirovskaya region and in Siberia (Irkutskaya region, Yakutiya, area of the city of Norilsk).

Much less active (in time and space), however, more spread (about 10% of the country territory) is karst that develops in carbonate rocks (limestones, chalks). It is inherent in the European part of Russia (Arkhangelskaya, Leningradskaya, Moskovskaya, Tulskaya, Voronezhskaya, Ulianovskaya and Saratovskaya regions, Northern Caucasus) and also East Siberia and Far East.

In these regions karst deformations are most frequently demonstrated on urbanized territories as a result of uncontrolled pumping-out of underground water and leaks from water-supplying lines. Thus on the territory of Moscow for the recent 30 years 42 sinks were registered. In 1969 and 1977 in the north-western part of the city karst sinks destroyed three residential buildings. The summarized direct economic damage from these catastrophes amounted (in current process) to no less than 10 million dollars.

Catastrophic sinks that caused the destruction of buildings and structures were observed in the 20th century in many other towns and settlements of Russia (Ufa, Kazan, Kungur, Perm, Polazna and others). In two cases they resulted in the death of people. Because of karst sinks railway traffic was interrupted many times, particularly along section Samara-Zlatoust, where they occur actually every year.

As a whole, on the territory of Russia, the frequency of destructive karst sinks occurrence that cause social and economic losses, amounts to about 2-5 cases per year. Maximum dangerous such sinks are for urbanized territories with a high population density. By a lucky chance only a tragedy of such scale this did not occur on 15.07.1992 in the town of Dzerzhinsk*. A large karst sink of 30 m in diameter and 20 m deep destroyed here one of the blocks of enterprise "Dzerzhinskkhimmazh" which was built in early seventies without studying karst hazard and creating counterkarst protection. Direct economic damage from this sink amounted to 1.7 million dollars. It should be specially noted that the said sum is almost 10 times as much as the cost of necessary counterkarst measures on the entire territory of the enterprise which might prevent the losses.

* the sink occurred at down time, at 5 o'clock a.m. near the storage facility of hazardous chemical materials.

2.1.1.6 Changes of sea and water storage shores.

There are 2260 man-made water storages whose volume of water totals about 1 million m^2. Together with sea shores the total length of the shore line amounts to about 125 thousand km. Approximately 39% (48.4 thousand km) of shores are subjected to active destruction which annually leads to the irreversible withdrawal from the land use of a territory up to 6.7 thousand hectares of near-shore areas of various purposes.

The rate of linear retreat of shores on water storages under review changes from 1-5 to 10-30 m/year depending on shore-forming rock composition, stage of process development and hydrometeorological conditions.

In individual years these rates of shore changes may be considerably higher. Thus the rate of shore washout in Bratsk water storage near Artumei settlement in the first years of its filling and operation (1962-1967) amounted to 139.5 m/year. For two profiles the rate of shore change on this water storage reached 100 m and 127 m for 12 hours. Artumei settlement was transposed inland.

Recession of shores (with the rate of 70 to 100 m/year) composed of easily softened and washed out loess soils was observed in the first years of filling and operation on Tsimlyansk water storage, Krasnoyarsk water storage and many others located mostly in southern regions of Russia.

Shore destruction, often accompanied by the death of people, was observed on the territory of 53 towns and hundreds of smaller settlements practically in all regions of Russia (see Table 2.1). For the recent 10 years alone such situations occurred on individual sections of the coasts of Caspian, Azov, Black and Baltic seas and on the shores of Rybinsk, Kuibyshev, Saratov, Volgograd and other water storages (towns Makhachkala, Kaspiisk, Derbent, Lagan, Taganrog, B.Sochi, Svetlogorsk, Rybinsk, Volsk, and so on).

Particularly catastrophic was a situation which was formed in 1978-1995 on the Russian coast of the Caspian Sea of more than 1 thousand km in length as a result of sea level fast rise by 245 cm. The rise of the sea level caused not only the flooding of vast territories, but also to a significant (to 5-10 m/year) activation of shore-destruction processes practically on the entire Dagestan coast of the Caspian Sea (Fig. 2.5). The rise of the sea level was accompanied by the increase in the intensity and recurrence of catastrophic water pile-ups, and also partial flooding of vast areas. The later in its turn has stipulated the increase (by 1-2 points) of seismic hazard of many urbanized territories which were developed with no regard to such changes.

Fig. 2-5

As a result of the rise of Caspian Sea level and shore destruction connected with this rise, and also other hazardous processes that were described above, the zone of affection covered 5 towns and more than 70 settlements with the population of about 100 thousand people. As a result of flooding and partial flooding more than 400 thousand hectares of near-shore territories were withdrawn from the land use, hundreds of houses and industrial buildings were destroyed, as well as tens of kilometers of railway and motor roads, power lines, and also many other objects of infrastructure. Direct economic losses as of the end of 1996 amounted to more than 6 billion dollars and they are still increasing. And the total average damage for many years resulting from shore destruction at all seas and water storages of Russia amounted in 1976-2000 according experts' estimates to a sum ranging from 2 to 2.5 billion dollars per year.

2.1.2. Hydrological and Meteorological Hazards

2.1.2.1. Floods

These processes reveal themselves in temporary inundation of floodplains and first terraces of rivers during snow melting and/or heavy rainfalls that cause quick groundwater rise and increase of water flow velocities. Floods also include periodical inundation of flat and low coastal areas of seas during surge events (marine-type inundations).

In addition to fires, inundations had been deemed most destructive natural hazards practically through the whole history of Russia up to the mid-XXth century. In the 1950s-1970s after wide-scale works on construction of reservoirs for regulation of river flows, leveeing of banks, movement of settlements from zones of likely inundation the risk of flooding has reduced essentially, especially in European Russia. At present the risks of flooding are high again because preventive works on engineering protection of coastal areas are not so active now and also because of environment degradation and global climate warming.

A risk of flooding of various kinds exists approximately on 2.4% of the territory of Russia. Every year about 5 mln ha of lands or 0.3% of the territory of Russia are affected by flooding. Approximately 50% of floods are observed in spring during snow melting. In mountain and northern areas a flooding period usually begins in later spring and ends in summer.

On big rivers floods usually last for 2 to 3 months, while on smaller rivers – for no more than 15 to 20 days. Here the water level reaches its maximum in 20–30 days and 3–5 days, respectively, after snow starts melting. In this period a water level may rise at a rate of 2 to 3 m/day.

Most disastrous floods affect basins of several big rivers and are usually observed when two or three relatively independent factors meet: 1) considerable accumulation of snow on watersheds exceeding many-year average data; 2) deposition of snow on wet and already deeply frozen ground; 3) quick snow melting that sometimes is aggravated by intensive rainfalls.

Such floods, covering extensive areas, were recorded in 1908, 1926, 1970 and 1979 in the European part of Russia, while in 1959 – in the lower reaches of the Yenisei River. During inundation of 1979 only in Bashkiria and Sverdlovsk Region there were flooded approximately 400 settlements. A disastrous inundation caused by heavy rains in the period of quick snow melting returned to Bashkiria in April–May 1990 when the water level in the Belaya River rose by more than 10 m, which led to inundation of 130 settlements, destruction of 90 bridges, 100

animal husbandry farms and death of 12 people. The economic damage was evaluated at more than US$ 250 million. In 2000 in Orenburg during a flood period there were inundated 1911 dwelling houses, evacuated 1184 people. In Sverdlovsk and Kurgan Regions 3198 houses were inundated and 3204 people were evacuated.

During spring floods ice jams cause most grave impacts, which is most typical of all Russian rivers flowing northwards and also of the upper reaches of the Volga, Vyatka, Kama and Ural Rivers. In 1991 as a result of enormous snow accumulation and intensive snow melting the inflow into a cascade of reservoirs on the Volga and Kama Rivers was 1.8- to 2.2-fold more than the norm. Floods affected Volgograd, Astrakhan, Ulianovsk, Saratov and Nizhegorodsky Regions, Republics of Mordovia, Mary and Tatarstan. The total damage was evaluated at US$ 318 million.

During great ice jams a water level in Siberian rivers may rise by 35–40 meters. The floods of such scale were observed on the Lena River in 1998 and 2001. The first flood led to partial destruction of Lensk City, while the second flood destroyed this city practically completely. Flooding of Lensk started on May 13, 2001 when an enormous ice jam more than 15 m high formed near the Batamai Lake locating 40 km downstream the river. There were many attempts to break this jam. It was even bombarded from military helicopters and attack aircraft SU-24, but all in vain. On May 17 the water level in Lensk rose by 19 m. The city was practically flooded and destroyed, and 25 thousand people living in it were evacuated (Fig. 2.6).

In short time Lensk was built anew at higher elevations and defended with dykes. The direct economic damage from jam-caused floods on the territory of the Republic of Saha (Yakutia) in May 2001 that also affected great areas in the valleys of Nyuya, Vitim, Olekma, Aldan, Volyui and Kolyma was estimated at US$ 240 million. Seven people died and more than 50 thousand suffered (Table 2.2).

Considerable social and economic damage on the territory of Russia is also incurred by more rare during a spring snow melting season, but no less hazardous inundations caused by copious rainfalls in summer and autumn. Such inundations often occur due to occurrence of water-saturated Pacific cyclones (typhoons) on the Far Eastern coast and their movement inside a territory as far as upper reaches of the Amur River and Eastern Circum-Baikal area.

In August 1996 such typhoon that brought with it heavy rains led to disastrous flooding in the Maritime Territory attended with breaking of banks and multiple landsliding phenomena. About 180 settlements on an area of 1.5 mln ha were under water. There were damaged 347 bridges and 2014 km of roads. Four people died. The direct economic damage exceeded US$ 170 million. Typhoon “Robin” that swept over the Maritime Territory in 1990 brought still greater losses (evaluated at more than US$ 472 million). There were more than 800 buildings in a disaster zone, more than 4 thousand families were evacuated. In the recent decade disastrous floods occurred in the Maritime Territory practically every year, most disastrous ones – once in 3 to 10 years. The total damage from floods in the Maritime Territory only for 1991 exceeded US$ 600 million.

The Chita Region regularly faces disastrous floods caused in most cases by cyclones. Thus, in July-August 1990 during the greatest flood ever witnessed in the Chita Region there were flooded 36 settlements (10 of them twice), evacuated 7322 people, underscoured 2774 houses. The damage was evaluated at US$ 746 million.

Heavy floods periodically occur in other regions of the country as well. The most disastrous of them in the whole history of Russia took place in southern regions in June-July 2002. This flood

originated from a powerful cyclone that returns once in 50 years. It was attended with heavy rainfalls, mudflows, landslides and scouring of banks of rivers, canals and dykes. After dykes were broken village Barsukovskaya where there were 44 deaths and also low-lying parts of Adygeya were flooded. In this catastrophe 114 people died. All in all 389,752 people were affected; the direct economic damage was equal more than US$ 484 million.

Periodical flooding of Saint-Petersburg is the most well-known cases of surge floods. Prior to construction of a dam in the Neva River mouth such floods when the water level rose by 1.5–2 meters and more occurred here nearly every year (300 events for 270 years), the most disastrous of which (with a water rise by 4 meters and more) were observed in 1777, 1824 and 1924, i.e., approximately once in 50 years.

Surge floods often occur on flat coasts of the Azov and Caspian Seas. They threaten most the northeastern part of the Caspian Sea. In 1995 a disastrous surge wave up to 4.2 m high rolled here reaching Lagan Town that is at a distance of 15 km from the sea. A flooded area was equal

Table 2.2

Major natural hazards on the territory of Russia in 1978–2003

Date	Type and place of hazards	Direct damage		
		Economic, US$ mln	Social, persons	
			died	affected
18.06–05.07.2002	Flood in the south of Russia	484	114	389,752
12-24.05.2001	Ice jam-related floods in the Republic of Saha (Yakutia) on Lena, Nyuya, Vitim and other rivers	240	7	Over 50,000
1998	Activization of landslides on the territory of Chechnya and Ingushetia	140		Over 12,000
08.1996	Typhoon in the Maritime Territory	Over 170	4	Over 100,000
25.05.1995	Neftegorsk earthquake	240	Over 2,000	Over 240
09.1994	Typhoon with floods in the Maritime Territory	140	13	18
1991	Floods downstream Volga-Kama cascade	318		
1990	Flood in the Maritime Territory caused by typhoon “Robin”	472.8		
07–08.1990	Largest flood in the history of the Chita Region	746.4		
04.1990	Flood in the Republic of Bashkortostan	250	12	
02–04.1989	Activization of landslides on the territory of Chechnya and Ingushetia	490	1	27,000
07–08.1988	Flood in the Chita Region	172.1		
1978–1995	Water level rise in the Caspian Sea by 245 cm	6,000	2	100,000

to 224.1 thou ha; 424 living houses accommodating 1300 people were destroyed; 24 km of railways, 26 km of power transmission lines, 10 km of protection dykes, etc. were broken. Two people died. The direct damage to the economy was US$ 90 million worth.

2.1.2.2. Snow Avalanches

Snow avalanches cause trouble on 9% of the heavily rugged territory of Russia, especially in Western Caucasus, Khibiny, Northern Urals, Altai, Trans-Baikal area and Sakhalin. Avalanches are formed as a rule on slopes more than 14^{o} sparsely overgrown and covered with snow. The snowshed areas vary from the first dozens of square meters to 2–3 sq. km. A thickness of a moving snow cover that has sustained some changes should make no less than 0.3 to 0.5 m.

Snow avalanches are seasonal hazards. An avalanche-risk period on the territory of Russia usually begins in December and ends in March. The greatest hazards of avalanche are deaths of people, destruction of automobile roads and railways, transport means and power transmission lines. Quite often snow avalanches lead to breaking of power supply of Greater Sochi for many days, arresting of transport movement on the roads of Sakhalin, Trans-Baikal area and Northern Caucasus. Most vulnerable in terms of snow avalanches is the area of the Roksky mountain pass of the Trans-Caucasian automobile road connecting Russia and Georgia. In January 1993 an avalanche has thrown down a bus into a gorge here, as a result 47 people died. At present an avalanche threat to the road in the Roksky pass area becomes less due to construction in 2002 of an avalanche-control gallery 1.6 km long.

Average many-year death rate of the population due to avalanche impacts on the territory of Russia is about 7 to 10 people a year. In some years with a great number of snow days mass snow avalanches may be observed affecting up to 100 people. A probability of such disastrous events on the whole territory of Russia is approximately once in 7 to 10 years.

2.1.2.3. Heavy Frosts, Snowstorms

Frosts, snowstorms and also some other meteorological hazards connected with changes of air temperatures and snowfalls (icing, snow drifts, frosts, etc.) in the recent 5–10 years have become a serious hazard for the population and economics of Russia. This is connected with the increased number of major accidents on heat- and power-supply facilities that often leads to freezing of heat-supply networks in the wintertime, particularly in small settlements of Siberia and Far East and to evacuation of the population from these settlements.

At present we witness more often deaths of people from overcooling in streets and also in unheated houses, because of this we loose every year several thousands of people. Ordinary snowfalls in winter are now perceived everywhere as natural hazards that stop for long the transport traffic and working activities even in big cities.

2.1.2.4. Hurricanes, Tornadoes, Windstorms

Windstorms are suddenly emerging short-time (for several minutes) strong winds blowing up to 31 m/s, inclusive, that often uproot old trees and destroy light buildings.

Tornadoes are a local vortex movement of air at a speed from 18–32 to 93 m/s and more (tornadoes with a magnitude 4 to 6 points in the Fudjita-Pearson scale) developing from a thunderstorm cloud towards the Earth's surface. An average speed of tornado movement over a terrain is 50 to 60 km/hour, while an affected area on the territory of Russia does not usually exceed 1 to 4 sq. km. In some rare cases the tornado speed may be as great as 100 to

120 km./hour, while an affected area – from 60 to 80 sq. km with a total length of a destruction belt up to 150–160 km.

Stormy winds blow with a speed of 32 m/s and more. Such speeds are often recorded during typhoons in the Maritime Territory accompanied by torrents of rains. The disastrous convective meteorological events studied here may occur practically on the whole territory of Russia, but they are most hazardous approximately on 21% of the territory (see Table 2.1).

Stormy winds are most typical of open coastal areas of seas and large reservoirs in the country, flat and piedmont territories near mountains. On the territory of Russia tornadoes most often appear in the Central and Central-Chernozem Regions and also on the coast of the Black Sea. Every year the European part of Russia witnesses 8 to 10 tornadoes and windstorms, but not all of them cause destruction. Probability of disastrous hurricanes, tornadoes and windstorms over the whole territory of Russia, leading to deaths of people and direct economic damage more than US$ 2.5 million worth, is about 4 or 5 times a year.

In rare cases the economic damage may exceed US$ 30 million, as, for instance, was recorded on 09.06.1984 after rolling of disastrous tornadoes and windstorms over the territories of the Ivanovo, Kostroma, Yaroslavl, Tver and Moscow Regions. The “Ivanovo” tornado swept for about 150 km and caused destruction on an area of 60–70 sq. km with a width of a destruction belt being 300 to 800 m.

Disastrous was also stormy wind that rushed on Moscow at night of the 20th – 21st of June 1998. In the period from the 13th to the 20th of June the air in the city was heated to 30-32^{o}. At this time the air mass, which temperature was approximately 10 degrees less, approached Moscow from the west. At the interface of these air masses with different temperatures and pressure powerful cumulonimbus clouds were formed the upper border of which, according to the Hydrometeorological Center (“Gidrometcentr”), reached 13–14 km. As a result, approximately by 23:00 on the 20th of June strong wind started blowing bringing with it a thunderstorm and copious rainfalls (up to 36 mm during 2.5 hours). In this disastrous event in Moscow 9 people died and about 200 got different injuries; 2.5 thousand living houses were damaged to various extent, lighting in 193 streets was damaged, more than 110 thousand trees were felled (Fig. 2.7). The direct economic damage was evaluated at approximately US$ 160 million.

2.1.3. Biological and Space Hazards

Biological (by a development environment) hazards include natural fires and also invasions of allochthonous insects (locusts, Colorado beetles and others) and various diseases of animals and plants (epizootia, epiphytotia, etc.). Most biological hazards on the territory of Russia are under permanent control and their consequences are liquidated rather promptly. An average many-year damage from these hazards is not very significant in view of the country’s scales and is in reverse dependence on the funds allotted from the budget to respective services for detection and prevention of these hazards. This dependence is typical also of many natural hazards, including natural fires.

2.1.3.1. Natural Fires

Natural fires are usually divided by prevailing landscapes where they develop and by burning products into forest, steppe, tundra, shrub, peat and others. They are most dangerous on 44.6% of the territory of Russia that is covered with forests (see Table 2.1). According to the RF State Committee for Statistics (Goskomstat RF), in 1971–2002 in forested areas and on nearby lands without forests 11.7 (in 1985) to 36.6 (in 1999) thousand natural fires were registered. They

affected 0.2 to 5.4 million ha of forests (an average many-year figure - 1.1 million ha). Here from 50 to 90% of natural fires acquiring a non-controllable disastrous nature occurred every year in Eastern Siberia and Far East on sparsely populated territories and in not easily accessible areas that were not adequately controlled by fire services

The total area of fires and respective losses caused by them vary (by an order) on a year-to-year basis depending on dryness of a non-winter period in a particular year and also on efforts and money spent on their liquidation. But notwithstanding actions aimed at preventing natural fires, their total quantity and affected area in the recent three decades have been increasing with every passing year even on well-protected territories by 4.9 to 7.2%, respectively (Table 2.3). Economic losses have also grown in proportion to fire-affected areas.

Table 2.3. Dynamics of losses caused by natural fires on the territory of Russia In 1971–2000 (by data of Goskomstat RF)

Index*	Years			Average annual increase in 1971–2000, %
	1971–1980	1981–1990	1991–2000	
Number of fires, thou pcs.	12.3–33.7 18.767	11.7–22.5 16.491	17.9–36.6 27.634	4.9
Fire-affected area, thou ha	232.7–2013 719.0	233.8–2056 969.0	463.0–5340 1545	7.2
Economic damage to forestry, US$ mln	20.2–175.1 54.5	20.3–178.9 79.5	34.7–529.2 117.2	7.2
Expenditures on fire extinguishing, US$ mln	- 8.9**	- 11.8**	8.4–54.2 18.9	7.1
Total economic damage, US$ mln	- 63.4	- 85.3	43.1–583.4 138.1	7.2

* Limits of index variations (above a line) and its average many-year value (under a line).
** Expert estimate.

At present these losses make, on the average, US$ 136.1 million a year. In some years this figure may be exceeded 4- or 5-fold. For instance, this was observed in 1999 when the total economic damage from natural fires including losses of the forestry and expenditures on fire fighting, reached US$ 583.4 million. Judging by available statistics, a probability of such extreme events is once in 20–30 years.

2.1.3.2. Space Hazards

Space hazards are related largely to annual falls on the Earth of about 19,000 meteorites weighing up to 10 kg and also to the Earth colliding with larger space objects (asteroids, comets, etc.), which may cause death to all living on our planet. The considered hazards seems to be the only of all natural events that at present are not forecasted in advance and, consequently, are not warned about.

But in the nearest two or three decades it seems that these hazards will become strategic for Russia because of a meager probability of their realization. Thus, on the territory of Russia the

individual risk for the people to die from small meteorites is no more than $6 \cdot 10^{-6}$ a year. It's not surprising that until now in our country and worldwide no such event was reliable registered.

A risk (probability) of hitting of urban territories in Russia with a large meteorite like the Tunguss one, that exploded in air on 30.06.1903 in the basin of the Podkamennaya Tunguska River and felled forest on an area approximately 2,000 sq. km, may be evaluated, at maximum, at $(1–2) \cdot 10^{-4}$ a year (i.e., no more than twice in 10,000 years), although an order less value of this risk seems more truthful. Still less probable (once in 10–1000 million years by the available geological and astronomical data) is collision of the Earth with a large asteroid or comet with a diameter more than one kilometer, which is fraught with a global catastrophe. The last such event that led to disappearance of dinosaurs occurred supposedly in the Mesozoic period, i.e. about 65 million years.

2.1.4. Mapping of Natural Hazards

2.1.4.1. Mapping of Seismic Hazards

The first data about strong earthquakes on the territory of Russia were found in historical documents of the XVIIth–XVIIIth centuries. Regular investigations of geographical distribution and geophysical nature of earthquakes in Russia were initiated in the late XIXth – early XXth centuries. They are connected with the names of I.V. Mushketov and A.N. Orlov, who were the first to prepare a catalog of earthquakes on the territory of Russia and who studied the links between seismic events and geological structures, and with the name of Academician Duke Golitsyn who created the world's first highly sensitive seismographs and who laid the basis of the modern seismological and seismometric science. These investigations were continued by the Seismological Institute of the USSR Academy of Sciences established in 1928 and being a predecessor of the present O.Yu. Schmidt Institute of the Earth's Physics of the Russian Academy of Sciences. The world's first standard map of seismic zoning of the whole territory of the former USSR was prepared in 1936 by G.P. Gorshkov, and from that time such documents were used as a basis for support of seismic-resistant construction. Investigations of S.V. Medvedev and I.Ye. Gubin and later on of B.A. Petrushevsky, G.A. Gamburtsev, Yu.V. Riznichenko, V.I. Keilis-Boroka and other scientists enabled development of more advanced "seismogenetic" and probabilistic methods for evaluation of seismic hazards and seismic risks. In fact, all makers of subsequent standard maps of seismic zoning in 1957, 1968 and 1978 used new concepts on seismogenesis and evaluation of seismic hazard.

In 1997, applying new methodology, seismogeodynamic and probabilistic approaches to evaluation of seismic hazards, the RAS Institute of the Earth's Physics prepared the Set of Maps on General Seismic Zoning of Northern Eurasia – OSR-97 which in 2000 were included, as concerns the territory of Russia, into Construction Norms and Rules "Construction in Seismic Regions". For the first time seismic zoning covered all vast territory of Northern Eurasia, including platform regions and shelf areas of marginal and landlocked seas. The Set comprises three maps – OSR-97-A, OSR-97-B and OSR-97-C showing 90%- (Map A), 95%- (B) and 99%- (C) probability of non-exceeding (or 10%, 5% and 1% of likely exceeding) of the design seismic intensity during 50 years, that corresponds to a return of a seismic effect on the Earth surface once in 500, 1000 and 5000 years, on the average. Differentiated appraisals of seismic hazards enable application of the Set OSP-97 in design and construction of seismic-proof projects of various categories of importance and service life. For very important structures, such as nuclear power plants, radioactive burial facilities and others, Map OSP-97-D was prepared that corresponds to an average return of seismic impacts once in 10,000 years. Map OSR-97-A, showing acceleration of ground oscillations, was included into the First Map of Global Seismic Hazard published in 1999 in the U.S.A. under the UN auspices.

2.1.4.2. Mapping of Exogenous Hazards

A greater part of the Russian territory, except for some not easily accessible and practically non-developed regions found mostly in Eastern Siberia and Far East, is covered by state geological survey at scale 1:200 000. On the basis of these works in the 1970s–1980s maps of most hazardous exogenous geological processes – landslides, avalanches, mudflows, karst phenomena, suffusion, bank transformation of reservoirs and seas, gully formation, etc. – were additionally prepared showing a degree of vulnerability to them of some large regions having, as a rule, an area over 25 sq. km. More detailed maps of these hazards at scales 1:200 000 – 1:50 000 and larger were prepared for 15% of the country's most developed territory.

In 1991–1996 under the guidance of V.I. Osipov, A.L. Ragozin and V.M. Kutepov (RAS Institute of Geoecology), using the above as a basis, there were prepared, applying the same methodology, thirteen maps of individual natural hazards (tsunami, landslides, karst phenomena, bank transformation, submergence of territories, geocryological processes, etc.). As an example Figure 2.8 presents maps of karst hazard and hazard of bank transformation of reservoirs and seas of Russia. In 2000 using the same base a map of exogenous geological processes in Russia was prepared at scale 1:2 500 000.

2.1.4.3. Mapping of Hydrometeorological Hazards

Under the Federal Program "Safety of Population and Economic Projects Regarding a Risk of Natural and Anthropogenic Disasters" maps of flood and strong wind hazards were prepared at scale 1:5 000 000 for the territory of Russia. Other special mapping of hydrometeorological hazards for whole Russia was not, in fact, conducted. But large zones of likely inundation during floods of various probability are identified and marked on topographic maps at scale 1:25 000 practically of all developed territories. There is also information about separate manifestations and regions affected by tornadoes, hurricanes and other strong-wind hazards.

2.2. Assessment of a Level of Population and Economic Object Vulnerability to Natural Hazards

2.2.1. Kinds of Vulnerability and Their Assessment

Assessments of damageability and vulnerability of buildings and structures to the impacts of earthquakes, floods, landslides, mudflows, ground subsidence of various origin are included in routine analyses of negative impacts of natural hazards and evaluation of incurred damage. Regarding an area of fixation of likely losses there are distinguished four basic types of vulnerability of risk-affected objects: physical, economic, social and environmental.

Physical vulnerability is a reaction of abiotic objects to a hazard of certain genesis, intensity and duration that may be identified as a ratio of a number of affected with various outcomes (complete destruction, deformation, etc.) elements to their total quantity in an object prior to a hazard. Such vulnerability is a constant value (Fig. 2.9).

Figure 2.9.
1 – Vulnerability; 2 – Life cycle of an object, years

Economic vulnerability characterizes relative (specific) losses of an object value as a result of negative impacts of any genesis. It may be determined for buildings and structures being designed and under construction in a risk zone by certain OPTP in two ways:

- by the results of evaluation of actual (realized) economic vulnerability of similar constructions in projects after disastrous impacts of similar intensity;
- by estimation of likely deformations in an evaluated construction object caused by impacts of certain intensity and exceeding the maximum admissible values set in a project documentation for construction.

In all these cases the economic vulnerability of concrete objects for certain OPTP is evaluated on the basis of their likely losses or respective indices of physical vulnerability.

In view of considerable (sometimes by an order of magnitude) regional and local differences in cost of one and the same construction and other objects the values of economic vulnerability for OPTP on the territory of Russia vary within wide ranges (Table 2.4).

Social vulnerability of the population for OPTP reflects relative damage to health or life of separate groups of people. It is dependent, to a great extent, on daily and seasonal (object-to-object and territorial) migration of the population, a degree of protection of buildings and structures where people stay for the most of their time, organizational and psychological preparedness for danger, etc.

Vulnerability of the population in time to some hazard H should be evaluated by the actual data on a duration of staying of people related to different age groups and having different professions in a risk-affected object or in an object-analog.

In assessments of vulnerability of the population to quick onset natural hazards that cause quick (within minutes, hours and first days) destruction of economic objects it is recommended now to use data on physical, economic and social losses incurred by destructive impacts of natural and anthropogenic hazards of other genesis on objects similar by their design and attendance. If there are no such data the social vulnerability of the people in buildings and structures may be roughly evaluated with the help of Table 2.5 prepared by the data on population losses in buildings and structures in emergency situations of various genesis.

Table 2.5

Correlation between economic vulnerability of quickly destroyed buildings, structures and people in them due to geological and other natural and anthropogenic hazards and vulnerability of people in these objects

Vulnerability of buildings and structures	Vulnerability of people in buildings and structures with different number of floors		
	1–4	5–10	More than 10
0.005	0.000006-0.0001	0.000006-0.0001	0.000006-0.0001
0.05	0.00006-0.001	0.00006-0.001	0.00006-0.001
0.1	0.0003-0.017	0.0003-0.018	0.00030-0.09
0.2	0.0006-0.15	0.0006-0.16	0.0007-0.17
0.3	0.003-0.25	0.003-0.27	0.004-0.28
0.4	0.0052-0.35	0.0052-0.38	0.0061-0.39
0.5	0.015-0.45	0.015-0.48	0.018-0.49
0.6	0.031-0.55	0.031-0.58	0.038-0.59
0.7	0.047-0.65	0.05-0.68	0.059-0.69
0.8	0.064-0.75	0.07-78	0.08-0.79
0.9	0.42-0.85	0.5-88	0.54-0.89
1.0	0.7-0.91	0.8-0.96	0.9-0.99

Table 2.4

Comparative characteristics of average values of economic vulnerability of buildings to various natural and anthropogenic processes

Building type	Foundation (seismic resistance type by MMSK-86)	Submergence of territories*	Wind-water surges**	Earthquakes (points)		
				7	8	9
Many-storey buildings of quarry stone, adobe, clay	Strip ($А_1$)	0.75	0.482	0.512	0.818	0.990
	Slab ($А_2$)	0.65	0.259			
	Pile, columnar ($А_2$)	0.3	0.094	0.215	0.685	0.848
Standard buildings of burnt brick on mortar М-10	Slab ($Б_г$, $Б_{кч}$)	0.4	0.165			
	Pile, columnar ($Б_г$, $Б_{кч}$)	0.2	0.047	0.103	0.353	0.74
Standard buildings with reinforced concrete or steel framework without anti-seismic reinforcement	Strip ($Б_{кс}$)	0.3	0.165			
	Slab ($Б_{кс}$)	0.2	0.071	0.066	0.274	0.618
	Pile, columnar ($Б_{кс}$)	0.1	0.002			
Buildings of brick and sawn stone with design seismic proofness of 7 points	Strip ($7_{кч}$)	0.3	0.165			
	Slab ($7_{кч}$)	0.2	0.071	0.058	0.246	0.583
	Pile, columnar ($7_{кч}$)	0.1	0.002			
Buildings of frameworks and large panels with design seismic proofness of 7 points	Strip ($7_{кс}$, $7_{кп}$)	0.3	0.165			
	Slab ($7_{кс}$, $7_{кп}$)	0.2	0.071	0.037	0.144	0.42
	Pile, columnar ($7_{кс}$, $7_{кп}$)	0.1	0.002			
Buildings of brick and sawn stone with design seismic proofness of 8 points	Strip ($8_{кч}$)	0.3	0.165			
	Slab ($8_{кч}$)	0.2	0.071	0.04	0.152	0.439
	Pile, columnar ($8_{кч}$)	0.1	0.002			
Buildings of frameworks and large panels with design seismic proofness of 8 points	Strip ($8_{кс}$, $8_{кп}$)	0.3	0.165			
	Slab ($8_{кс}$, $8_{кп}$)	0.2	0.071	0.026	0.085	0.278
	Pile, columnar ($8_{кс}$, $8_{кп}$)	0.1	0.002			

Environmental vulnerability is understood as a property of biotic objects to loose their capacity to perform their functions as a result of hazardous impacts of different genesis, intensity and duration. Recently in foreign publications a term "sensitivity" to adverse impacts usually of a anthropogenic origin is often applied now for description of such property.

Environmental vulnerability of some representatives of fauna and flora to abiotic OPTP may be evaluated if there are available respective initial data, such as a ratio of affected (died, infested, inhibited, genetically changed, etc.) species in an affected zone to their total quantity in this zone prior to a negative impact of OPTP. The second way is related to territorial evaluation of occurred or likely cases of damage of the natural environment.

2.2.2. Methods of Vulnerability Assessment

Assessment of vulnerability (resistance) of various buildings and structures to OPTP is conducted applying the following methods:

experimental – by the data on a degree of destruction of assessed objects after actually occurred natural hazards of known intensity;
estimation-experimental – by the results of investigation of building response to test impacts of low strength;
estimation – with the help of theoretical models taking into account design specific features of building and structures as regards their capacity to resist to destruction caused by extreme natural hazards.

A protection level of objects, ensured by timely taking of actions on engineering protection of the population and territories, also influences a scale of destruction. A degree of protection is characterized by a coefficient of reduction, K_{red} (0.1) of loads from extreme natural hazards acting on objects.

2.2.3. Forecast of Disastrous Earthquake Consequences

The Federal Center for Science and Hi Tech of the Research Institute on Emergency Situations of the Ministry for Emergencies of Russia has developed a technology for creation of "Extremum", a global (world) geoinformation system for forecasting the consequences of disastrous earthquakes, that makes it possible to predict round-the-clock the consequences of disastrous earthquakes in the world.

In general, a technological structure of GIS "Extremum" incorporates the following main blocks presented in Fig. 2.10

A database block comprises structured massifs of digital cartographic and subject-oriented (semantic) information.

A database block of GIS "Extremum" represents massifs of digital cartographic and semantic information. Massifs of digital cartographic information include mapping materials ("electronic maps") with four levels of detailing:

- overview – for the whole world (M 1:5 000 000; M 1:1 000 000);
- regional (M 1:200 000);
- of cities showing their structures and quarters (M 1:100 000);
- of objects showing separate buildings (M 1:10 000 and M 1:2 000);

- of tectonic faults and engineering-geological conditions.

Figure 2.10
Layout of a program for assessment of heavy earthquake consequences

A – Geoinformation system; 1. Database block; 2. Mathematical models block;
3. Block of selection and optimization of actions on risk reduction;
4. Block of output data and documents; 5. Block of information services for urgent warnings;
6. Block of selective object in a hazard zone

A structure of cartographic information is shown in Fig. 2.11. An example of a map of faults is presented in Fig. 2.12.

A block of mathematical models includes procedures that can be divided into five groups: impact models; models describing resistance of objects to impacts; forecast models; optimization and operations models. Each model enables solution of certain types of problems both prior to and after actual occurrence of an event.

Figure 2.12.
Example of cartographic image

With the help of mathematical models included into the Geoinformation System "Extremum" it becomes possible to estimate risks of the population from floods, flooded zones and damage that may be expected as a result of territory flooding (Fig. 2.13).

GIS "Extremum" makes it possible to justify places where facilities for emergency-rescue works can be dislocated with sufficient lead time. The same places can be used for acceptance of humanitarian air on the first stages of rescue works after an earthquake.

Figure 2.13
Objects in a flooded zone

GIS "Extremum" enables modeling of oil spills in most important areas of the territory (Fig. 2.14). In this case the modeling outputs include quantity of spilled oil, quantity of oil that has got into water and is beyond a modeled territory, an area of a polluted zone.

MODELING OF EMERGENCY OIL SPILL OVER
THE TERRITORY ADJOINING AN OIL PIPELINE

Figure 2.14
Modeling of oil spill in a crossing of an oil pipeline with
the motor road Krasnodar – Anapa

GIS software helps to estimate zones of likely damage in case of explosions and other accidents on oil pipeline systems and on the basis of such estimates to assess individual risks to the personnel engaged in oil pipeline maintenance.

The final output of emergency oil spill modeling includes zoning of territories along pipelines by pollution hazards at maximum oil spills.

A subsystem of fire situation forecasting ensures: visual presentation on a vector map of GIS "Extremum" of the results of interpretation of space photos (Fig. 2.15) coming from a subsystem

of space information receiving, including if a fire source is in a controlled zone; forecasting of fire situation development in a controlled zone, visual presentation of forecasting results on a vector map of GIS "Extremum". Forecasting results take into account a direction and speed of natural fire front propagation.

Therefore, application of GIS "Extremum" enables minimization of a time for decision-making on the use of efforts and means, if emergency situation does really occur, thus, diminishing risks of losses for the population that needs various kinds of aid.

Figure 2.15

2.3. Monitoring of Natural Hazards and Risks

The first observatory for hydrometeorological and geophysical observations over weather and some OPTP was established in Russia 170 years ago (in 1834) in Saint-Petersburg. At present, three main state services are engaged in monitoring of the considered hazards, they are, "Rosgidromet" (hydrometeorological hazards), the Ministry of Natural Resources of Russia (geological hazards) and the Russian Academy of Sciences (seismic hazards).

In addition, there are several departmental systems for OPTP monitoring belonging to the Ministry of Agriculture (agricultural lands), the State Sanitary-Epidemiological Supervising Service or "Gossanepidnadzor" (biological hazards) and also RJSC "Gazprom", OJSC "Lukoil", JSC "Transneft" and some other ministries, departments, joint stock companies and corporations which supervise conditions of their construction objects and of the natural environment.

2.3.1. Monitoring of Seismic Processes

The Russian Academy of Sciences (RAS) has elaborated, created and operates a national seismic network ensuring stationary monitoring of earthquakes. A special service, RAS Geological Service, was set up to supervise performance of this network.

Figure 2.16

This network has a three-level structure: teleseismic, regional and local.

A teleseismic network undertakes observations over the whole territory of Russia from a magnitude level of 4.0 and higher and ensures integration of the country into global seismic observations over the whole Earth.

Regional networks locate in seismically active regions of Kamchatka, Sakhalin, Northern Caucasus, Baikal and others. They cover a territory of approximately million square kilometers and record earthquakes with a magnitude of 2.5–3.0 and more.

Local observations are carried out on territories making 100 x 100 sq. km covering prognostic testing grounds and ensure studies of seismic intensity from a magnitude over 1.0.

Networks of all three levels are closely linked, supplement each other and interact using modern channels of information communication.

This network is made up of digital seismic stations provided with digital and analog devices and computer technologies of collection, processing and dissemination of seismic information

realized in information-processing centers. More than 70% of stations are adjusted to a digital registration regime.
On the basis of a computer technology there was organized a service of the federal and regional levels for urgent issuance of warnings on heavy and disastrous earthquakes occurring on the territory of Russia, CIS countries and in the world. The information contains data of parameters of earthquakes, their likely consequences and is transmitted practically in a real-time format (with a time lag up to 30 minutes) to interested ministries, including the Ministry for Emergencies of Russia (ME of Russia), departments and other organizations of the Russian Federation and CIS countries. This information is used by ME of Russia for decision-making on rendering assistance to affected regions for saving the lives of people and liquidation of consequences of natural hazards. Thus, only in the recent five years on the territory of Russia there were processed in an urgent mode about 1.5 thousand earthquakes, including 30% that were felt by people. Out of this number approximately 100 earthquakes had very dangerous manifestations on the Earth's surface.

Seismological bulletins and catalogs of teleseismic and regional levels containing data on several thousand earthquakes a year are published regularly.

Every year a collection of scientific papers "Earthquakes in Northern Eurasia" is published; it incorporates results of seismic investigations conducted in Russia and CIS countries and also results of studies of most hazardous earthquakes in these countries. These data are used as inputs in fundamental investigations in the field of Earth sciences, including studies of a seismic regime, assessment of seismic hazards on the territory of Russia, elaboration of methods for earthquake forecasting, regulatory requirements to seismic-proof construction, etc.

RAS seismic network participates in the global seismic monitoring for which purpose RAS develops interaction with international organizations and national seismic centers in some countries. Such interaction serves to essentially improve the monitoring efficiency on the territory of Russia, including accuracy in locating earthquakes and prompt data processing.

Scientific-technical cooperation with the USA in observation seismology and geodynamics is developing. An input of the RAS network into progress of the European system of seismic observations has increased considerably. Exchange of information is organized with the Mediterranean Seismic Center in France, the International Seismic Center in Britain, the European Consortium ORFEUS in the Netherlands.

A comparative analysis of the RAS seismic network with foreign global and national systems of seismic observations has shown that the Russian seismic network is integrated technologically into the world system of seismic observations and develops following the general tendency to unification and improvement.

2.3.2. Monitoring of Hydrometeorological Processes

A system for monitoring of hazardous hydrometeorological processes conducted by "Rosgidromet" comprises approximately 2800 stationary observation posts covering the whole territory of the country, including in 219 cities and on 1140 water bodies (rivers, seas, lakes and reservoirs). The main events under observation are floods, surge waves, strong winds, cyclones, typhoons as well as tsunamis, snow avalanches and mudslides. This system not only records separate OPTP and their development in time and space, but also factors characterizing these processes (a thickness and condition of a snow cover, a depth of ground freezing, an air temperature, precipitations, ice jams and others).

An integral part of the system is forecast of development of the mentioned processes with a warning lead-time from several days to one and more years.

2.3.3. Monitoring of Exogenous Geological Processes

A network for observations over development of hazardous exogenous geological processes is managed by the Ministry of Natural Resources of Russia. It incorporates more than 1240 observation sites and is divided (by sources of financing) into state basic and territorial, departmental, municipal and object-related networks. Observations conducted on the state basic monitoring network are financed from the federal budget, on the territorial observation network – from budgets of the regions entering the Russian Federation.

Most developed is a network for observations over hazardous geological processes in the Circum-Volga and Southern Federal Districts. Smaller scale observations are carried out in the Central, Siberian and Far-Eastern Federal Districts. On the territory of the Northwestern and Ural Federal Districts a network for observations over hazardous geological processes needs further improvement.

Greatest attention in the monitoring process is drawn to the most damage-causing processes, such as mudflows, landslides and other slope processes the development of which is controlled by more than 40% of observation stations of the network. The share of observations over erosion processes (24% of observation stations in the network) and bank transformation of seas and reservoirs (23% of observation stations) is also significant.

2.4. Analysis and Mapping of Natural Risks

2.4.1. Methodology of Risk Analysis

A modern methodology of quantitative analysis of natural risks is based on determination of probabilistic indices of likely social, economic and environmental losses from OPTP, determination of the admissible level of a natural risk and taking on this basis of management decisions and practical steps aimed at diminishment of the risk and its impacts.

A procedure on risk assessment includes a sequence of operations (Table 2.6) as follows:

- study of the factors of a risk, including frequency and intensity of natural hazard realization in time and space and also vulnerability of various economic objects, population and natural environment to them;
- risk assessment;
- assessment of an admissible risk;
- taking actions on risk management.

Regarding various combinations of analyzed sources of hazards and a composition of recipients there are distinguished 8 types and names of risk maps (Table 2.7).

2.4.2. Hierarchy of Hazards and Risks Maps

During studies of risks and taking management decisions by power authorities of various levels there is a need to take into account maps and documents of various degree of detailness and informativeness: at the general federal level overview maps and smaller-scale maps may be used for these purposes, while at the municipal level and at decision-making on separate objects the medium- and large-scale maps are needed.

Table 2.6

Stages of natural risk analysis

<table>
<tr><td rowspan="4">Risk analysis</td><td colspan="2">Study of risk factors</td><td rowspan="3">Risk assessment</td></tr>
<tr><td>Natural hazards
- Kinds of hazards
- Geographical extension
- Intensity and return</td><td>Vulnerability of people, technosphere objects, natural components
- Vulnerability of people
- Vulnerability of technosphere objects
- Vulnerability (sensitivity) of ecosystems</td></tr>
<tr><td colspan="2">Risk assessment</td></tr>
<tr><td colspan="2">Determination of acceptable risk</td></tr>
<tr><td colspan="3">Risk management
• Management of hazardous natural processes
• Optimization of economic activities
• Organizational measures (creation of warning systems, education of people and others)</td><td>Risk management</td></tr>
</table>

Table 2.7

Types of natural risk maps regarding a hazard source and recipients

Quantity of sources (kinds) of hazards	Recipients			
	Individual (man)	Group of people	Technosphere objects	Biosphere objects
One	*Individual* (seismic, landslide, karst, etc.) *risk*	*Social* (seismic, landslide, karst, etc.) *risk*	*Economic* (seismic, landslide, karst, etc.) *risk*	*Environmental* (by kinds of flora and fauna, health condition of people, separate indices of ecosystems) *risk*
Several	*Individual integral* (complex) *risk*	*Social integral* (complex) *risk*	*Economic integral* (complex) *risk*	*Environmental integral* (complex) *risk*

Applied are also maps of several scale levels: global, federal, regional and territorial. Certain map scales correspond to each of the above levels (Table 2.8).

Maps of a global level present an overview and are prepared for the whole world most often for study or education purposes. The scales of such maps are usually 1:10 000 000 and smaller.

Maps of a federal level are prepared for Russia in general and have mostly scales from 1:10 000 000 to 1:2 500 000. They are meant for governmental structures of a federal level. As an example of a risk map of a federal level we may take a map of seismic individual risk prepared by the Research Institute for Civil Defense and Emergency Situations of the ME of Russia, the Center for Emergency Situation Studies (CESS) and the RAS Institute of Geoecology. It contains information on probabilistic death of one man out of a group of people

found themselves in an affected zones during one year for settlements with the population no less than 50 thousand and for large cities with the population more than 50 thousand (all in all for

Table 2.8

Hierarchy of maps of natural hazards and risks by their scales and purposes

Scale level		Scale	Mapping objects
Global		1:10 000 000 and smaller	Earth as a whole
Federal		1:10 000 000 to 1:2 500 000	The whole territory of Russia
Regional	Regional	1:1 000 000 to 1:500 000	District or several subjects of the Federation
	Subregional	1:500 000 to 1:50 000	Separate subjects of the Federation
Territorial	Municipal	1:50 000 to 1:5 000	Separate cities and industrial centers
	Local	1:2 000 to 1:500	Separate settlements, regions and microregions of cities
	Object-related	1:500 to 1:50	Separate objects

366 cities). The obtained evaluations vary from negligibly small values to rather high values equaling $5 \cdot 10^{-4}$ man/man a year and more.

As an example of quantitative evaluation of natural integral economic risk may be a risk map of construction development in Russia prepared by A.L. Ragozin, O.V. Slinko, V.A. Pyrchenko (Fig. 2.17). Evaluation of an economic damage from natural hazards conducted in 1990 on the basis of this map gave damage US$ 15.5–19.0 billion worth.

Figure 2.17
Modeling of oil spills nearby Beregovoy structures of the KTK oil pipeline system applying GIS technology

Maps of a regional level are prepared for the territories of separate subjects of the Federation or a group of subjects. The scale of these maps may vary considerably from 1:50 000 to 1:1 000 000. A content of a regional map of natural risks may be illustrated on the example of a map of seismic individual risk in the Krasnodar Territory prepared by CESS on an order from ME of Russia at scale 1:1 000 000 (Natural Hazards …, 2003). This map contains characteristics of a risk for people living in cities and settlements in this Territory the value of which varies from $0.5 \cdot 10^{-5}$ to $2 \cdot 10^{-4}$ man/man a year and more (Fig. 2.18).

Figure 2.18
Seismic microzoning (SMZ) of the territory of Kislovodsk City
1 – Seismic resistance 7 points; 2 – Seismic resistance 8 points; 3 – Seismic resistance 9 points

Maps of natural risks of a territorial level are intended for decision-making on risk management by municipal and local authorities and also on planning of economic development of territories and design of concrete objects. The scale of such maps varies from 1:50 000 to 1:50. In Russia such maps are prepared for some cities in the south of the country. As an example we may take a map of seismic individual risk in Kislovodsk prepared by CESS. This map shows 7 types of city

areas characterized by different individual risks varying from 10^{-4} to $5 \cdot 10^{-4}$ man/man a year (Fig. 2.19).

Figure 2.19
Zoning of the Kislovosk territory by an individual seismic risk
Map detailness corresponds to scale 1:100 000

On the basis of these developments it seems possible to prepare maps of natural risks for the territories of regions and subjects of the Federation using finance, scientific potential and banks of the regions proper.

2.5. Diagnostics of Buildings and Structures in the Early Warning System

For verification and extension of a database of a geoinformation system "Extremum" related to buildup of settlements it is possible to use a technology designed for evaluation of real seismic proofness and stability of buildings (structures) with the help of a mobile diagnostic complex "Struna–2".

A mobile diagnostic complex (MDC) is designed for evaluation of seismic proofness and engineering safety of buildings, structures and technological systems with a view to forecast damages from likely emergency situations involving breakup of buildings (structures) and to mitigate their impacts.

The tasks that this mobile diagnostic complex is called to realize may be conventionally divided into three blocks:

1) evaluation of real seismic proofness of buildings (structures) in the zones of higher seismic risk and issuing of recommendations on improvement of their seismic proofness;
2) evaluation of physical stability and operating suitability of living and public buildings, including those which lifetime is completed in the course of their operation or after disastrous impacts of emergency situations, with a view to prevent their breakup in emergency situations.

By the results of complex analysis of data on evaluation of building stability and seismic characteristics of ground near foundations of buildings in a construction site a passport of building safety is prepared that gives seismic proofness of a building in points, a residual lifetime of a building, places of latent defects in constructions, a conclusion on a degree of building damage by an international scale MMSK–86.

SECTION 3. EDUCATION OF THE PUBLIC HOW TO DEFEND FROM EMERGENCY SITUATIONS

3.1. Scientific-Technical Policy

The Russian Federation pursues a targeted scientific-technical policy the constituent element of which is organization of communication of research and design organizations with management authorities of different levels responsible for disaster control.

The goal of the state scientific-technical policy in relation to protection of the public and territories from emergency situations caused by natural and man-made hazards is a scientific support of activities of ME of Russia, other federal authorities of executive power and organizations involved in protection of the public and territories from emergency situations caused by natural and man-made hazards and from their risks.

The principal scientific issues that need to be resolved for successful realization of the strategy of disasters risk diminishment are:

- development of a single theoretical socio-economic and scientific-technical basis for shaping of the state policy in relation to protection of the population and territories from emergency situations caused by natural and man-made hazards;
- development of a theory on management of risks of emergency situations;
- development of the theoretical foundations of population safety;
- development of scientific foundations of prevention of emergency situations, integrated protection of the population and taking of emergency-rescue and other urgent actions;
- development of a legislative and regulatory legal base in relation to protection of the population and territories from emergency situations caused by natural and man-made hazards;
- validation of basic lines of improvement and further development of RSES and civil defense;
- development and improvement of facilities used by emergency-rescue teams;
- protection of objects that are essential for normal functioning of the economics and survival of the population in emergency situations of various nature;
- development and improvement of management, communication and warning systems.

Shaping its scientific-technical policy in relation to protection of the population and territories, Russia is seeking to provide stimuli for scientific and scientific-technical activities of regional and territorial authorities, integration of their scientific-technical potential, draws attention to development of international cooperation in science and technology in this field.

A scientific-technical policy in relation to protection of the population and territories from emergency situations caused by natural and man-made hazards is pursued through scientific and scientific-technical activities of structural subdivisions of ME of Russia and its subordinated establishments carried out together with other federal bodies of executive power.

Realization of a scientific-technical policy is organized by elaboration and realization of state scientific-technical programs, federal target-oriented programs, medium-term programs of scientific-technical activities and also annual plans of research and design works (NIOKR) of ME of Russia.

For coping with the mentioned issues in the early 1990s the State Scientific-Technical Program "Safety of the Population and Economic Objects with Regard to Risks of Natural and Man-Made Disasters" (SSTP "Safety") was elaborated and adopted.

As a result of implementation of this program it is expected to diminish losses from accidents and disasters, to elaborate new ways for realization of the national policy on ensuring safety and protection of the public, objects and territories from natural and man-made disasters.

SSTP "Safety" will be realized in three stages:

1991–1995 – development of a scientific-technical policy of the state on management, control and securing of safety on the basis of known theories and regularities in formation and development of natural and anthropogenic disasters as well as legislative, economic and regulatory technical documents, legal acts, state norms and standards;

1996–2000 – development of a three-level system (object-related, regional and national) for securing safety with regard to the general concept of sustainable development and results of the first stage;

2001–2010 – development of ways and transition of Russia to creation and functioning of objects and territories applying a single state and international system of laws, norms, rules and standards on safety improvement, diminishment of a risk of natural and man-made disasters of global, national, regional, local and object-related scales.

The Program was elaborated with regard to the acting and being developed state, interdepartmental, departmental, regional, foreign and international projects and is to be financed from the federal budget.

In 1991–1995 works under this Program were conducted in 100 projects grouped by eight subjects, including:

safety of complex technical systems;
diminishment of damage from natural and man-made disasters;
safety of functioning and development of economic objects and transport systems;
warning and protection of the public, emergency-rescue works;
legal and economic regulation of safety issues;
regional safety issues in the Russian Federation with regard to a risk of natural and man-made disasters;
interstate management of safety of the population and economic objects with regard to a risk of natural and man-made disaster occurrence;
medicine of disasters and rehabilitation.

In 1996–2000 on the second stage of implementation of SSTP "Safety" the following works were carried out: scientific support of safety issues; safety norms; protection in higher risk conditions; federal and regional safety management.

ME of Russia adopted and fulfils the "Medium-Term Program of ME of Russia Scientific-Technical Activities for the Period 2001–2005 and Till 2010". This program covers a wide range of possible lines of investigations on mitigation of disaster threat and envisages elaboration of the scientific-technical foundations for RSES development, prevention of emergency situations, protection of the population and territories from ES and liquidation of their consequences. It also provide s basis for annual planning of NIOKR.

The medium-term program of scientific-technical activities is implemented through annual single thematic plans NIOKR elaborated by ME of Russia for academic and departmental research institutions coping with the issues of population and territories protection from hazards and disasters. ME of Russia acts as a state customer taking together proposals and recommendations of practically all interested federal bodies of executive power and organizations of the Russian Federation.

With a view to ensure efficient spending of finance allotted to researches the orders for NIOKR are awarded as a result of bids organized in accordance with Resolution of the Government of the Russian Federation of May 7, 1997, No. 513 "On urgent actions to improve sates support of science in the Russian Federation". The basic principles of organization and holding of bids are securing of equal bidding conditions for participants, transparency, sameness of requirements and objective assessments.

A qualification selection of bidders competing for NIOKR is carried out by a specially established Bidding Commission of ME of Russia.

Introduced is a contract system in relation to research and trial-design works based on a system of public bids. A contract system facilitates solution of the problems using the research results in the interests of the society, protection of the intellectual property, improvement of a mechanism for attraction of non-budget money for financing of NIOKR on a share basis.

ME of Russia undertakes its scientific-technical activities in close interaction and cooperation with the Ministry of Education and Science of Russia.

One of the most important means for more active interaction among representatives of academic, departmental science, representatives of state power and specialists is convening of usable science conferences.

All-Russia and international conferences discussing the issues on mitigation of hazards of natural and man-made disasters are convened regularly. From 1993 the all-Russia conferences attended by foreign participants have been held on the theme "Natural risk assessment and management". These conferences discuss problems of identification, assessment and forecast of natural hazards, methods for evaluation of natural hazard impacts, a theory and practice of quantitative evaluation of risks and also management of natural risks.

In 2003 there was held the third Usable Science Conference "Problems of emergency situation forecasts" which discussed organizational, regulatory and methodological issues of monitoring and forecasting of natural and man-made ES, the results of studies of a relationship between global changes of the climate and natural hazards as well as studies of the causes of different ES occurrence.

The all-Russia Usable Science Conferences on Protection of the Population and Territories from Emergency Situations have been carried out beginning from 1996. By now there were held 9 meetings. The subjects of the conferences cover various aspects of management of man-made and natural risks from a national to a municipal level.

3.2. Improvement of the Population Awareness on Protection from Emergency Situations

An important factor influencing the results of a strategy aimed at diminishment of a risk of disasters and activities of RSES on protection of the population and territories from emergency

natural and man-made situations is a level of preparedness of the population to take actions against emergency situations.

Improvement of the public awareness on protection of the population and territories from emergency natural and man-made situations is a target-oriented activity of federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies, administrations of economic and infrastructure projects and also public associations aimed at helping all categories of the population to acquire knowledge and learn practical skills needed for successful coping with emergency situations.

The Russian Federation has not simply educational programs on mitigation of hazards of disasters for all levels of educational institutions, but a whole state system for training of all categories of the population for better awareness of natural and anthropogenic safety that has been functioning for long. This system appeared in the 1920s as a means to oppose a military threat to the civil population, and for many years it was spearheaded to educating the public to civil defense issues. From 1986 the natural and anthropogenic disasters became the key issues in this training.

The legal foundations of the population education about protection in emergency situations were set forth in the Federal Law “On protection of the public and territories from natural and anthropogenic emergency situations”. In compliance with this law the government of the Russian Federation approved in 1995 within the framework of the Federal Target-Oriented Program the following theme “Education of the population, training of specialists of management bodies on liquidation of emergency situations”. Its main goal was to improve a state system for education of the population and specialists based on application of new study programs, computer technique and intensive education methods.

The next step in development of a system of population education was Resolution of the Government of the Russian Federation of July 24 1995, No. 738 that approved a procedure of population education about protection from emergency situations and assigned to ME of Russia to undertake a methodological guidance and control of the population education process. In addition, the above resolution of the government of the Russian Federation outlined general for all Russia organizational-legal norms of a state system for population education, the goals, forms and methods of education.

The resolution assigned to the Ministry of Education of the Russian Federation and ME of Russia to envisage obligatory education about population protection from emergency situation during elaboration of state educational standards and educational programs. The resolution obliged the Committee of the Russian Federation for Publishing, the Federal Service of Russia on TV and Radio, ME of Russia and other federal bodies of executive power, executive power bodies in the subjects of the Russian Federation, local self-government bodies and organizations to ensure wide promotion of knowledge on protection of the population from emergency situations, including via mass media.

This new system of population education about natural and anthropogenic emergency situations started functioning from 1996 at all levels of RSES. At present the education process is organized by age or social groups and is conducted at enterprises, establishments (including educational) and organizations irrespective of their legal form of organization and also at living places.

Methodological guidance, coordination and control of the population education in this field are assigned to ME of Russia, are conducted in all subsystems and links of RSES. The Ministry for

Emergencies of Russia also determines a scope of programs and periodicity of studies at the Ministry's Academy of Civil Defense, study-methodological centers on civil defense and emergency situations in subjects of the Russian Federation and at courses on civil defense in cities and regions.

The basic goals of education about protection from emergency situations are the following:

education of all groups of the population about how to behave in emergency situations and about principal methods of protection from emergency situations, rendering of first aid to affected people, rules of application of collective and individual protective means;

education and re-education of managers of all levels how to protect the public from emergency situations;

development in top officials and specialists from federal bodies of executive power, executive power bodies in the subjects of the Russian Federation, local self-government bodies, enterprises, establishments and organizations of skills on preparation and management of personnel and means of the single state system on prevention and liquidation of emergency situations;

practical mastering by workers of RSES of their duties and proper behavior in emergency situations.

The following groups of the population shall be educated how to protect from emergency situations:

the public engaged in production and servicing, students of general educational establishments and secondary-vocational and higher educational institutions;

top officials of federal bodies of executive power, executive power bodies in the subjects of the Russian Federation, local self-government bodies, enterprises, establishments and organizations irrespective of their legal form of organization and specialists in protection from emergency situations;

workers of federal bodies of executive power, executive power bodies in the subjects of the Russian Federation, local self-government bodies, enterprises, establishments and organizations entering the single state system of prevention and liquidation of emergency situations;

the general public not involved in production and servicing.

The population engaged in production and servicing, but not being members of RSES forces should be educated by attending courses that last for 12 hours on a workplace and by independent study of behavior in emergency situations in accordance with recommended programs with subsequent practical training.

Taking into account that this category of educated people is the most numerous and active part of the country's population, a high quality of their education is of state significance. Responsibility for quality education of the population engaged in production and servicing and its preparedness to behave in a proper way in emergency situations is entrusted to top officials of respective organizations.

Praising high the importance of this kind of activities, ME of Russia draws special attention to rendering assistance to bodies of executive power directly in their places – in subjects of the Russian Federation, in municipal formations, in economic projects. In cooperation with ME of Russia there was elaborated a new educational program, re-equipment of study classes was carried out following a single methodology. ME of Russia and management bodies of RSES

constantly provides methodological assistance on elaboration of planning documentations, organization of theoretical and practical studies.

With a view to improve quality of population education about protection from emergency situations the regulatory-legal base in this field is constantly improved, the legislative and regulatory documents stipulate higher responsibility of the officials for an education process.

3.3. Educational Programs on Mitigation of Disaster Hazards

Education of students of general educational establishments and establishment of primary, secondary and higher professional education is organized during a study time by educational programs on protection from emergency situations. These educational programs are approved by the Ministry of Education of Russia upon coordination with ME of Russia.

Many millions of Russian pupils and students studying at general educational schools, gymnasiums, lyceums and colleges, vocational-technical colleges, higher educational institutions and non-school educational establishments make the basic human capacity for the future of our country. As a result most close attention is drawn to their education about protection from emergency situations.

The initial military training course that existed till 1991 did not contain the required scope of knowledge on behavior of young students and pupils in emergency situations, thus, by Resolution of the RSFSR Council of Ministers of May 14, 1991, No. 253, a new course "Foundations of life protection science" (LPS) is introduced in state general educational establishments from the 1st to the 11th forms. The course of LPS is designed for 400 study hours that are distributed as follows:

theory and practice of man protection from harmful and hazardous factors in emergency situations – 270 hours;
basics of medical knowledge and protection of children's health – 53 hours;
basics of military training – 77 hours.

Beginning from 1994 the LPS course was also introduced in curricular of non-state general educational establishments.

The pupils of primary and secondary vocational educational establishments study the LPS course for 140 and 90 study hours, respectively.

The main goal of this course is to teach students and pupils the knowledge and skills how to protect the life and health of people in emergency situations, to render help to himself and others, to participate in liquidation of these situations. Study of this course serves shaping of a considerate and responsible attitude to the problems of personal safety and safety of those people around you, identification and proper assessment of harmful and hazardous factors of the natural environment, finding methods to hedge them. In most subjects of the Russian Federation this course is already included into regional basic study plans.

At pre-school educational establishment there are organized studies with children on the program "Foundations of life safety for pre-school children". This program is targeted to teach children the rules of behavior in dangerous situations in a street, public transport, when they come in contact with unknown people, dangerous articles, animals and poisonous plants. This course is designed to give children the basic knowledge on environmental culture, healthy and safe way of life.

3.4. Programs of Higher Education

Since 1991 the program of the course "Life Security" (LS) meant for 136 study hours was introduced in higher educational establishments. About 50 study hours of this program are devoted to the issues of the life and territory protection from emergency situations.

Students at higher educational institutes study:

theoretical foundations of life security in the system "man – environment – machine";
legal, regulatory, technical and organizational aspects of life security, including of civil defense;
basics of man's physiology and rational working conditions;
anatomical and physiological consequences of the impact of harmful, hazardous and destructive factors in emergency situations;
ways and means to improve security of technique and technological processes;
methods for study of stable performance of production objects and technical systems in emergency situations;
methods of forecasting of emergency situations and their impacts;
organization of civil defense.

Students learn how to elaborate actions on protection of the population and personnel of enterprises from emergency situations, to take measures to improve stable operation of economic objects, systems and branches, to master methods of management of a modern enterprise in emergency situations.

In general, a positive dynamics is observed in education of young people. While in the mid-1990s the course "Foundations of Life Protection Science" passed 950 thousand pupils of general educational establishments and more than 880 thousand pupils of primary and secondary vocational educational establishments, then at present these figures have increased to 12.5 million and 1.5 million pupils, respectively. Approximately 2.5 million students of higher educational institutions in the Russian Federation passed the course "Life Security" having received necessary knowledge on behavior in emergency situations.

From 1993 the specialists who already have their higher education diplomas should also pass the LS course. In 158 higher educational institutions in Russia the LS faculties exist and in 2003 this faculty admitted 6,000 students.

To satisfy the growing need of RSES in professionals some state higher educational institutes, such as the State Academy of Management, the Moscow State Technical University, the Moscow State Technological University, the State Academy of Oil and Gas, the Moscow State University of Railway Engineers, the Saint-Petersburg Forestry Academy, the Ural Polytechnical University, the Moscow Institute of Steels and Alloys, educate now bachelors on specialities connected with life security and also on speciality "Teacher-Organizer of Safe Life Foundations".

3.5. Public Programs and Campaigns on Hazards Mitigation

Taking into account the need of education of patriotism, professional orientation of the young people and with a view to improve popularity of the LPS course ME of Russia together with the Ministry of Education of Russia adopted a proposal from the Tula Combined Study-Methodological Center on Civil Defense and Emergency Situations, Radiation and Environmental Security about an experiment on establishment of the Children-Youth

Association “School of Security” and Children-Youth Township “Island of Security” in Tula. The basic target here is to educate environmental culture by realizing the program “Global study of ecology and practical observations with a view to preserve natural environment” and teaching to appropriate behavior in emergency situations. This initiative has found wide support and will be further developed.

Beginning from 1995 in Tula, Pskov and some other cities there were organized All-Russia Meetings-Competitions “School of Security” for pupils of general educational schools. More than 50 commands representing cities and subjects of the Russian Federation took part in them.

In May 1996 Tula welcomed the Foundation Conference of the Youth General Russia Public-State Association “School of Security” that discussed and approved the Statute of the Association and elected its President. From 1997 within the framework of this Association every year during winter school holidays special All-Russia Children-Youth Camps “Young Rescuer” were organized. Hobby groups “Young Rescuer” are organized in many places, cadet schools and classes “Rescuer” have appeared. All the above facilitated improvement of the youth bringing-up and education.

3.6. Education of Officials and Specialists

Education of top officials and specialists about protection from emergency situations is organized as follows:

officials of federal bodies of executive power and executive power bodies in subjects of the Russian Federation – at annual meetings, studies and trainings;

officials and specialists federal bodies of executive power and executive power bodies in subjects of the Russian Federation – at the Academy of Civil Defense of ME of Russia by a special program once in 5 years;

officials, commanding-leading staff of formations and specialists of local self-government bodies – at study-methodological centers on civil defense and emergency situations in the subjects of the Russian Federation by a special program once in 5 years and in the course of studies and trainings;

officials, commanding-leading staff of formations and workers of enterprises, establishments and organizations at civil defense courses in cities and regions by a special program (primary – 70 study hours, repeated – 35 study hours) once in three years and also in the course of studies and trainings;

workers of enterprises, establishments and organizations entering emergency-rescue, militarized and special on-alert formations – at establishments for professional improvement and re-education of the personnel, study-training centers, training centers of ministries and departments of the Russian Federation by special programs and also in the course of studies and trainings;

workers of enterprises, establishments and organizations entering other formations – directly at a workplace by a special program for formations and also in the course of studies and trainings.

In addition, all categories of officials and specialists should pass every year training at their workplaces by individual programs: for officials and commanding-leading staff – 15 study hours, for workers involved in production – 12 study hours.

According to available data every year these training courses are passed by approximately 20 thousand officials and specialists from federal bodies of executive power, executive power bodies in the subjects of the Russian Federation and local self-government bodies, about 70

thousand officials and specialists of enterprises, organizations and establishments, more than 150 thousand people from commanding-leading staff of formations, 4.0 million workers at enterprises, organizations and establishments entering these formations.

No less than important and complicated is the problem of education of the population not involved in production and servicing. The main goal of education of these category of the population is to teach them to basic elementary methods of protection from emergency situations, methods of rendering help to himself and people around you, rules of application of collective and individual protective means, rules of behavior and responsive actions to warnings, etc. This program is meant for 12 study hours and it is realized in the form of lectures, discussions, demonstration of study films, invitation to studies and trainings by a residing place. In addition, the population is recommended to study personally booklets, leaflets, to listen to radio broadcasts and to watch TV programs concerning behavior in emergency situations.

In terms of organization and convening the education of this category of the population presents most difficulties. At present, when the people, in conditions of the established socio-economic situation, demonstrate a passive attitude to many public affairs the organization of education of the population not involved in production and servicing becomes still more difficult.

In view of the above the coverage of people by education and efficiency of this education in this category of the population are very low. But notwithstanding the mentioned difficulties, thanks to persistence and initiative of territorial management authorities and education establishments of RSES they succeeded to attract to training more than 16 million people from this category. Some effect is attained by dissemination among the population of booklets showing how to behave in emergency situations.

An important role in this work is played by regular travels to different regions of motor clubs with teachers from study-methodological centers and civil defense courses; a certain contribution is made by mass media: radio broadcasts and TV shows, publications in press devoted to the issues of protection from emergency situations.

3.7. Organization of Exercises and Trainings

The main forms of training and check of preparedness of all categories of the public for protection from emergency situations are command and staff, tactical-specific, integrated exercises and trainings.

Command and staff exercises that last up to three days are organized in federal bodies of executive powers, executive power bodies in the subjects of the Russian Federation once in two years, while in local self-government bodies – once in three years. Command and staff (staff) exercises are carried out once a year, they last up to one day.

The main goal of such command and staff exercises (staff trainings) is to develop in officials and specialists of RSES of all levels the skills of management of the forces and means during liquidation of the consequences of natural hazards, accidents, natural and man-made disasters.

Tactical-specific exercises that last up to eight hours are conducted with formations at enterprises, establishments and organizations once in three years, while with higher-alert formations – once a year.

The basic goal of tactical-specific exercises is to develop in the staff of formations the practical skills of emergency-rescue and other urgent works, rendering first aid to the affected persons, use of the assigned technical means, rescue equipment and tools and also protective means.

Integrated exercises that last up to two days and are organized once in three years are conducted at local self-government bodies, at enterprises, establishments and organizations with personnel number more than 300 people, and at treatment-preventive establishments – if they have more than 660 beds.

In other organizations trainings that last up to eight hours are conducted once in three years.

At objects with the personnel number of 20 thousand and more such integrated trainings are carried out in production areas, workshops and groups of workshops.

At objects the integrated exercises (trainings) are usually preceded by command and staff exercises.

In the course of integrated exercises (trainings) the following is trained:

on the territories prone to natural hazards – the problems of warning, rescue, evacuation and life support of the people;

at nuclear power plants and objects locating within a 30-kilometer zones of NPP – problems of warning, radiation exploration, dosimetry control, introduction of radiation protection regimes, undertaking actions on radiation protection and evacuation of the population and also desactivation of a terrain, buildings and machinery, sanitary treatment;

at chemical hazardous objects – the problems of warning, chemical exploration, protection of the production personnel and population from harmful chemical substances in case of accidents with them, evacuation of the population, liquidation of impacts of chemical contamination.

Trainings and exercises are conducted by the staff of management bodies of RSES, study-methodological centers and civil defense courses.

Training of students of general educational establishments and establishments of primary, secondary and higher vocational education is conducted every year during one study day.

The main goal of practical exercises and trainings of students is better knowledge of the theoretical material taught in accordance with a training program, mastering of practical skills as regard life security in extreme conditions, fulfillment of the set norms, etc.

In general, in the course of practical exercises and trainings conducted in conditions that are close as much as possible to that situation that can be established during natural hazards, accidents, natural and anthropogenic disasters the young people, apart from mastering some practical skills, develop moral strength, self-control and required psychological traits. In the course of such trainings the staff of formations passes the required norms.

All people that are invited to take part in exercises and training courses have the right:

to be warned about the risk that they may suffer in the course of exercises and trainings;
to compensations for the damage incurred to their health during exercises and trainings;

to retain their salaries for the period of their participation in exercises and trainings at the expense of finance of an organization that is engaged in planning and conducting of such exercises and trainings.

3.8. Improvement of the Study and Material Base of Education and Training

Efficient performance of a system for population education about protection from natural and anthropogenic emergency situations and its further improvement are impossible without an appropriate study-material base. That is why simultaneous with formation of a system for education of the population about protection in emergency situations close attention is paid to development and improvement of its study-material base by means of construction of new study objects, additional equipment and rehabilitation of the existing study townships, test grounds, study centers. For the period of evolvement of a system for education of the population about protection from emergency situations considerable efforts were aimed at creation and improvement of its study-material base, development of study establishments of RSES:

there was created the Academy of Civil Defense of ME of Russia as a a head study-methodological and scientific-pedagogical center in the special educational system for training of RSES specialists, civil defense and also for carrying out fundamental exploration and applied researches in the interests of civil defense and RSES improvement; the Academy is a state establishment of higher vocational education;

there was organized the Russian Center for Rescuer Training of ME of Russia designed for training of qualified specialists for emergency-rescue detachments, carrying out of on-field tests of technical facilities, mastering of new technologies of emergency-rescue works;

on the basis of regional and republican courses of civil defense there were established study-methodological centers on civil defense and emergency situations (CDES) in the subjects of the Russian Federation;

in all study-methodological centers of CDES and civil defense courses, applying a single methodology, special study classes were equipped and provided with visual study aids, works are underway to create video-computer classes;

there were built new and additionally equipped existing study townships and test grounds in territorial subsystems of RSES;

on the basis of the Tula Combined Study-Methodological Center on Civil Defense and Emergency Situations, Radiation and Environmental Security there was organized a faculty for education of teaches of “Foundations of Life Security Science” for general educational establishments and establishments of primary, secondary and higher vocational education;

RSES study structures were licensed;

there was developed a whole complex of programs for training and education of all categories of the population, prepared and published textbooks on LPS course. These textbooks for pupils of 1–11 forms of general educational establishments are included into a federal complex of study literature.

Educational aids for students of higher educational institutions on “Life Security: Security in Emergency Situations”, “Life Security: Economic Mechanisms of Risk Management in Emergency Situations”, “Warning on and Liquidation of Emergency Situations”, “Foundations of Risk Analysis and Management in Natural and Anthropogenic Spheres” and some others were prepared and published.

Extension of knowledge on protection of the people and territories from emergency situations play an important role in improvement of the population preparedness.

In accordance with the Federal Law "On protection of the people and territories from natural and anthropogenic emergency situations", extension of knowledge in this field should be carried out by management bodies of RSES together with public associations engaged in protection and rescue of people, federal bodies of state power, bodies of state power in the subjects of the Russian Federation, local self-government bodies, organizations. Mass media should play an important role in extension of knowledge on protection of the people and territories from natural and anthropogenic emergency situations.

The main goals of extension of knowledge on protection of the people and territories from natural and anthropogenic emergency situations are:

clarification of the state policy as regards prevention and liquidation of emergency situations, protection of the life and health of people, material and cultural valuables of the country, the natural environment;

drawing of attention of the public to the issues of the population and territory protection from natural and anthropogenic emergency situations, shaping of appropriate awareness by all state structures, the public and each person of importance of activities aimed at prevention and liquidation of emergency situations;

making the public aware of socio-economic and humanitarian significance and role of RSES in a system of country security;

popularization among the public the purposes and tasks of RSES, promotion of its development and improvement, attainment of higher efficiency;

promotion of high preparedness of management bodies, RSES forces and means to liquidation of emergency situations, rendering aid to the affected population, protection of material and cultural valuables;

informing the public on a level of population and territory protection from emergency situations and on the actions taken to ensure their security, on forecasted and occurred emergency situations, ways and methods of protection from them;

clarification of rights and liabilities of the population as regards protection from emergency situations, including persons directly involved in liquidation of emergency situations;

development in the people of responsibility for observation of legal norms and rules as concerns natural, anthropogenic and environmental security, development in them of high moral and psychological traits for proper behavior in extreme conditions;

mobilization of the population for participation in hedging of emergency situations;

dissemination of knowledge, practical experience and achievements in protection of the population and territories from natural and anthropogenic emergency situations, related international experience;

wide dissemination and advertising of advanced methods and material-technical means applied in prevention and liquidation of emergency situations, of required services and also of best organizations in this field.

Coping with the mentioned issues, the dissemination of knowledge on protection from emergency situation also undertakes organizational, educational, study and informative functions. It contributes to higher efficiency of education of the population about protection from emergency situations, better moral and psychological preparedness of the population, dissemination of advanced experience in this field and plays an important role in bringing up and education of the youth.

The organizational and legal basis of propaganda is the acting legislation, regulatory legal acts of the government of the Russian Federation, subjects of the Russian Federation, local self-government bodies and directive documents of ME of Russia.

This propaganda uses both traditional and new forms and, first of all, electronic means of mass information.

Speaking about the present state of the population preparedness to protection from natural and anthropogenic emergency situations, it can be stated that a system of education is shaped completely and its organizational, methodological and material level fully complies with the present-day requirements. Among the priorities of its further development are improvement of the study-material, legislative and regulatory legal base and improvement of the efficiency of RSES propaganda, education of teachers for this field.

SECTION 4. RISK MANAGEMENT

4.1. Observation and Control of the Condition of the Natural Environment and Potentially Hazardous Objects

"Rosgidromet" is responsible for taking actions with a view to prevent pollution of the natural environment over the whole territory of the country. It has a system for observation and control of hazardous hydrometeorological and heliogeophysical events and pollution of the natural environment (a functional subsystem "STORM"). This system is designed to detect and forecast hazardous hydrogemeteorological events and also to issue prompt warnings to management bodies of RSES of all levels, enterprises, organizations and the population. The structure of this system of observation and control includes the following elements: a land-based subsystem for receiving data (4922 hydrometeorological stations and posts); a space-based subsystem (satellites "Meteor", "Okean", "Resurs"); a subsystem for collection and dissemination of information; a subsystem for information processing and preparation of hydrometeorological forecasts; an avalanche-control service of "Rosgidromet".

FP RSES-STORM receives information and forecasting support from: 22 regional and territorial departments on hydrometeorology and monitoring of the natural environment (DHME), 72 centers on hydrometeorology and monitoring of the natural environment (CHME) locating in administrative centers of the subjects of the Russian Federation, the Hydrometeorological Research Center of the Russian Federation ("Gidrometcentr" of Russia).

Russia has a state observation network that includes hydrometeorological stations and posts. For smooth passage of spring-summer floods in 2003 there were restored 766 hydrological posts, including 16 permanent and 120 temporary posts. During a flooding period 160 on-land and 66 air-borne surveys of rivers were carried out.

The militarized services of "Rosgidromet" provide forecasts and issue prompt warnings on sliding down of snow avalanches. On the territory of the Russian Federation the Avalanche-Control Service provides meteorological forecasts to 61 points (large settlements, objects of federal significance) and 41 territories (railways and motor roads, nature reserves).

ME of Russia, pursuant to Resolution of the President of the Russian Federation of March 23, 2000, No. 86-rp, organized works on creation of a system for monitoring and forecasting of emergency situations of the natural and man-made origin.

Order No. 483 of November 12, 2002 of ME of Russia approved the Regulations on a System of Monitoring, Laboratory Control and Forecasting of Natural and Anthropogenic ES (SMF ES). This system incorporates federal bodies of executive power, organizations subordinated to various departments engaged in monitoring of the natural environment and anthropogenic sphere

("Rosgidromet" Ministry of Natural Resources of Russia, Ministry of Public Health of Russia, Ministry of Agriculture of Russia, Ministry of Defense of Russia, state supervising agencies).

All regional centers have centers for ES monitoring and forecasting that today are operating with a permanent staff. All subjects of the Russian Federation (except for the Nenets and Komi-Permyatsky Autonomous Area) have centers for ES monitoring and forecasting, 43 of which are also operating today with a permanent staff (Fig. 4.1).

Figure 4.1
1) Number of regular and non-regular TCMP
2) Dynamics of regular TCMP creation

A network of observation and laboratory control of the Russian Federation is a component of the RSES system of observation and control. It incorporates approximately 9,000 establishments of various ministries, departments and territories (Fig. 4.2).

Figure 4.2
Number of SOLC establishments by RF ministries – 2003

1) Minzdrav; 2) Minselkhoz, 3) "Gidromet", 4) MNR; 5) MS; 6) Others,

An observation and control system of the Russian Ministry of Agriculture comprises 3389 establishments, including 7 establishments of a federal level, 599 – of territorial and 2783 – of a local level.

In order to organize and carry out observations over the condition of the natural environment and potentially hazardous objects ME of Russia undertakes its activities through 185 centers of state sanitary-epidemiological supervision; 53 production environmental laboratories, including 4 trailer-laboratories and one vehicle-mounted laboratory with a complex of analytical equipment.

Specialists from the All-Russia Center for Monitoring and Forecasting of Natural and Anthropogenic Emergency Situations ("Antistihia" Center) of ME of Russia together with specialists from other ministries and departments regularly check preparedness of the system for observation and laboratory control (SOLC) for performance in emergency situations. In 2003 checks were conducted in four subjects of the Russian Federation, i.e., in the Astrakhan and Bryansk Regions, the Republic of Komi and the Republic of Mary El. There were checked 64 establishments, out of which 21 – subordinated to the Russian Ministry of Public Health; 18 – to the Russian Ministry of Agriculture; 13 – to "Rosgidromet"; 12 – to other ministries, departments and joint stock companies. For assessment of preparedness of SOLC establishments to functioning there were prepared and analyzed 704 control specimens for radioactive substances (RS), poisonous substances (PS), chemically hazardous substances during accidents (CHSA) and imitators of biological substances containing agents of dangerous infectious diseases.

Observations and control of the condition of potentially hazardous objects of FPC of the Russian Ministry of Power Generation are conducted with the help of respective systems and laboratories which are described in Table 4.1.

Table 4.1

Condition of systems for observation and laboratory control

Systems for observation and laboratory control	Quantity of establishments (stations, posts)		Area of an observation territory		Provision of systems, %	
	Total	Change for a year, %	Total, sq. km	Change for a year, %	With specialists	With equipment and devices
1. Oil and oil refining industry						
Radiation safety system	13	-	Object-related	-	100	100
Environmental safety system	70	-	262286	+ 7	100	85
Gas safety system	6	+ 40	Object-related	-	100	95
System for observation over emissions into the atmosphere	15	-	Object-related	-	100	100
Laboratories for control of atmosphere, soil and water	54	-	35244	+ 21	100	80
Production laboratories (posts)	322	-	19503	-	100	85
2. Gas industry						
Automatic systems for pollution control of atmosphere in terrestrial layers in settlements	140	-	306	-	100	100
Systems for control of the maximum admissible concentrations of H_2S	6	-	3950	- 0.6	100	85
Systems for engineering-geocryological monitoring	23	-	> 5	-	100	90
Systems for geochemical monitoring of landscapes	43	-	250	- 3.5	100	95
Systems for monitoring of quarry development	974	-	20	- 19	100	85
3. Coal industry						
Units for control of air parameters in mines	218	-	Object-related	-	100	95
4. Power engineering						
Systems for supervising safety of hydraulic structures and chemical laboratories	339	-	1625000	-	100	100

FPC branches have more than 1100 various systems and laboratories that make it possible to carry observations over more than 2.0 million sq. km of the territory. Stuffing with specialists is 100%, provision of equipment and devices – from 80% to 100%. OJSC “Gazprom” creates a geoinformation system of ES monitoring and forecasting (GISMF “Gaz ES”).

Special works are carried out for organization of monitoring of underwater potentially hazardous objects (UPHO). For fulfillment of the mentioned works ME of Russia created a System for keeping a register of underwater potentially hazardous objects that ensures: development of the required regulatory and legal base in this field; collection, processing, analysis and registration of the information; declaration of UPHO safety; examination of UPHO included into the register without declaration of their safety; additional investigation of UPHO and operative control of their condition; information support in decision-making; carrying out of specific underwater works.

4.2. Non-Budget Mechanisms for Protection of the People and Territories from Natural and Anthropogenic Emergency Situations

The economic condition of the country is affected significantly by considerable expenditures related to liquidation of the impacts of natural hazards, accidents and disasters. They are covered from the budget, money of the people and legal persons. Due to insufficiency of finance the losses are often compensated selectively as a result of which property interests of private and legal persons become affected. In order to attract additional money for financing preventive actions and repayment of costs related to liquidation of ES impacts different non-budget mechanisms are being elaborated in Russia.

Great role is played here by insurance companies. The main purpose of insurance development in this field is elaboration and realization of actions to satisfy the needs of the population, organizations and the state in insurance protection that are a stimulus for expansion of business activities and accumulation of long-term investment resources for development of the country's economy.

In Russia the insurance market is being formed for slightly more than ten years. A number of insurance companies is more than 1,000. At present the share of insurance services in GNP of the country makes only 4%, which is several times less than in developed countries. This is indicative of a great potential for development of this mechanism for management of regional risks and safety of municipal formations.

At present the insurance business in Russia in relation to hazards and disasters should resolve the following problems:

formation of a legislative base for the insurance service market;
development of obligatory and voluntary insurance;
elaboration of an effective mechanism for state regulation of insurance business.

Formation of a legislative base for the insurance service market, development of obligatory and voluntary insurance are carried out in cooperation with MS and the Ministry of Finance of Russia and other interested departments.

The basic lines for development of obligatory insurance are the following:

increased control of an obligatory insurance process;
introduction of new kinds of obligatory insurance of objects, subject to considerable risks and losses, belonging to private and legal persons to whom considerable damage can be incurred as a result of natural hazards, accidents and disasters.

ME of Russia coordinates elaboration of programs on development of insurance of risks from natural and anthropogenic emergency situations on a regional level in the subjects of the Russian Federation.

At present the insurance protection programs (IPP) are approved in 21 subjects of the Russian Federation; in many subjects of the Russian Federation such programs are on a stage of development or approval. A state of insurance protection in the Russian Federation is presented in Table 4.2.

Some major Russian insurance companies propose a voluntary form of insurance coverage of the population and territories from natural hazards. Within the framework of the federal program

Table 4.2

State of insurance protection in the Russian Federation

	NWRC	CRC	SRC	PURC	SibRC	FERC	Kalinin-grad region
Number of subjects in which IPP are prepared	10	17	13	21	16	10	1
Not started IPP preparation	-	-	1	12	3	3	1
IPP on the stage of elaboration	4	2	6	5	2	2	-
IPP on the stage of agreeing and expertise	3	10	2	-	12	1	-
IPP are approved and realized	3	5	4	4	1	4	-

OJSC "Rosgosstrakh" undertakes insurance of federal roads, bridges, tunnels, protective structures on roads, overpasses, galleries and various objects of road infrastructure. Among insured accidents there is one of the following natural hazards – storm, tornado, earthquake, flood, rainstorm, inundation as well as ground subsidence, landslide, avalanche, groundwater impact, illegal actions of third parties (intentional damage or breakup of insurance objects, terrorism), explosion of any origin and road-transport accident.

One more example is activity of the Insurance Company "SOGAZ" that invested into rehabilitation of the gas supply infrastructure damaged as a result of flood in the south of Russia in 2000. As a result of flooding in the Stavropol, Kradnodar Territories, in the Kabardino-Balkarsky Republic and Daghestan separate sections of gas pipelines were destroyed. The gas supply infrastructure in these regions was insured with OJSC "SOGAZ". The usual practice of losses settlement in such cases is as follows: affected enterprises at their expense restore the damaged equipment and then an insurance company repays their actual expenditures on rehabilitation. In view of a large-scale damage incurred by a natural event the application of the described procedure of financing may delay considerably the rehabilitation works, that is why payments were made in advance, not waiting for final restoration of damaged infrastructure. This made it possible to reduce the terms needed for restoration of gas supply to affected territories.

In general, a share of insurance companies in repayment of damage caused by natural hazards is not large. The total repayments of insurers at present are not more than 2 or 3% of the total damage.

During two years (2000–2001) Russia undertakes a scientific-practical experiment on search for non-budget sources of financing of actions on prevention and liquidation of emergency situations. Thirty-four subjects of the Russian Federation participate in this experiment pursuant to the Agreement of Intentions concluded by ME of Russia and bodies of executive power of the subjects of the Russian Federation.

The main outcomes of this experiment are creation of opportunities and conditions for accumulation of finance of insurance companies from a reserve set for preventive actions of enterprises and organizations, organization of innovation activities and realization of commercial

projects with a view to receive non-budget money for financing actions on prevention and liquidation of emergency situations in the subjects of the Russian Federation.

As a result of this scientific-technical experiment there were attained some practical results on creation of institutes for realization of the state socio-economic strategy, policy and economic mechanisms for prevention of emergency situations:

- a non-budget Fund for Prevention of Emergency Situations was established in the Far-Eastern Federal Area and also non-budget Funds for Prevention and Liquidation of Emergency Situations in the Moscow, Sakhalin, Kamchatka, Magadan, Amur, Leningrad, Smolensk, Nizhni-Novgorod, Kursk, Tambov, Saratov and Kirov Regions, in the Khabarovsk and Maritimes Territories, in the Jewish Autonomous Area, in the Republic of Saha (Yakutia), Chuvashia and Tatarstan, in the Koryak and Chukotka Autonomous Areas. In the Murmansk, Kurgan, Volgograd, Tyumen and Novgorod Regions, in the Republics of Daghestan, Altai and Bashkortostan such funds for prevention and liquidation of emergency situations are being formed;
- the Interregional Insurance Group "Mostins" is created and operating; it incorporates seven insurance companies for interaction with the subjects of the Russian Federation in insurance of anthropogenic and natural risks and ensuring non-budget financing of innovation technologies on prevention of disasters.

The scientific attendance of works carried out in the course of this scientific-practical experiment and also analysis and generalization of the obtained results were secured by the All-Russia Research Institute on Civil Defense and Emergency Situations.

4.3. Measures to Reduce the Impact of Disasters

4.3.1. Protection from Floods

To protect from floods there are two groups of measures implemented in Russia, including engineering and non-engineering methods. *Engineering measures* have the most radical effect on reduction of risk of high-floods. Traditional engineering methods of protection from floods in Russian Federation are as follows:

- Redistribution of maximum drainage by water storage lakes.
- Enclosure of territories with embankments.
- Increase of a passage capacity of the river-bed.
- Elevation of marks of the protected territory.
- Drainage transfer.
- Some special techniques of reduction of impact of floods.

A powerful water economy complex is set up in Russia, which plays a basic role in flood risk management. Its basis consists of 65 thousand objects of a hydraulic engineering purpose - 36 thousand of water intake and drain structures, about 10 thousand km of protective embankments and water guarding banks, 29 thousand of water reservoirs, ponds, accumulators of liquid wastes with pressure hydraulic engineering structures. Only 1 % (388) of pressure hydraulic engineering structures belong to the federal property (Ministry of Natural Resources of Russia, Minenergo of Russia, Gosgortekhnadzor of Russia, Mintrans of Russia etc.). More than half of structures belong to joint stock companies and 8 % of hydraulic engineering structures have no owner at all.

For protection of populated areas, economy objects and agricultural areas there are about 10 thousand km of protective engineering structures in the country - water embankments and banks with drainage systems, pumping stations, emergency water drainage. In compliance with

the effective laws provision of safety of hydraulic engineering structures is placed upon owners of hydraulic engineering structures and organizations operating the hydraulic engineering structures.

Experience of previous years shows, that maximum economic effect and technical reliability of systems of protection from floods can be reached with combination of regulation of drainage by water storage lakes and embankment of protected territories. Example of such combination is experience of protection from floods in Kuban river basin. Winter-spring high floods and summer high floods are frequently observed in this area in connection with snow and glaciers melting in mountains and heavy rain falling. Only during 50 last years the Kuban river flood lands were flooded 46 times. In connection with the exclusive value of Kuban lands great volumes of works were fulfilled on embankment at the flood land during more than a hundred-year period. Total length of embankments reaches 900 km. A territory with an area of 6.5 thousand km^2 with a population exceeding 300 thousand people is protected with embankments.

The sections of river basins, where development of embankment systems is not expedient due to economic specific features of the territory use local embankment of lands with mechanical water removal in compliance with the polder principle for protection of potentially fertile lands from floods.

The necessity and economic expedience of construction of polders is determined by a value of agricultural lands, flooding conditions of the river flood lands, volumes of required financial investments and operating expenses. Construction of separate polder systems, the area of which is from several tens to several thousand hectares has gained wide-spread acceptance.

Depending on altitude and plan location of the river flood lands of planned agricultural use, conditions of floods the not flooded and flooded (summer) polder systems are arranged. A height of embankments of not flooded polder systems is determined on account of water levels of 1 % of provision. Pumping stations at such polders start operating from the first thaws, pumping the water drain set up directly at the embankment territory, because such water cannon be removed by drainage. Such polders are used usually for glowing of vegetables, grain, cultivated crops, as well as annual and perennial grass crops. Such a method of lands use requires deeper reduction of levels of ground waters.

Used at comparatively small rivers as one of a method of protection from flood of adjacent river flood land territories is a method of increase of a passage capacity of the river bed by its regulation (cleaning, deepening, widening, straightening). This method is widely used in reclamation for regulation of rivers - water intakes to remove surface and ground waters from reclamation territories.

Ground build-up to elevate the territory surface marks as a method of protection from floods is used exclusively in case of necessity of arrangement of separate objects, which should be arranged due to settled circumstances. This method is widely used in widening and building on new town territories.

All anti high-flood measures depending on protected objects are designed for hydrologic conditions of a certain estimated provision. In addition, provision is made for special measures of protection and localization of emergency situations in implementation of situations beyond the design.

In case of use of the banking-up system localization of emergency situations is reached at the expense of separation of embanked territory by lateral embankments, which guard against flooding of big areas of protected territories in case of local break of the protection front.

Important elements of measures providing trouble-free operation of the banking-up system are reserve emergency flood land reservoirs at the banked up territory. The indicated reservoirs are banked up sections of the flood land, which are to be flooded in case of appearance of an emergency situation caused by a threat of water flow over crests of embankments at important sections of banking-up. Provision is made for use as reserve anti-flood reservoirs of less value banked up territories with regard to the economic point of view. Water release to these reserve reservoirs at a critical moment makes it possible to cut a level in

the inter-embankment space at controlled territories and thus to guard against breakage of banking-up at undesirable places.

Dams, embankments, locks, water drainage make up so called head front, which makes it possible to hold water in a cap of water reservoirs both in the regime of normal functioning and during natural calamities. In case of their breakage water starts flowing to the downstream, breaking the dam body and quickly spreading over territories adjacent to the river bed. Large zones of catastrophic flood are developed, which considerably differ from high-flood waters by the nature of effect. During flood water comes comparatively slowly, while with breakage of hydraulic engineering structures a break wave is developed, which can destroy different buildings at a huge territory located down the river stream.

From 1997 to 2002 the Ministry of natural resources carried out inventory of Russian hydraulic engineering structures (HES), the safety supervision of which is exercised by it. There are four levels of safety estimation of a structure.

«Normal» condition is accepted for 40 % of hydraulic engineering structures, «reduced safety» is accepted for 15 % of objects, «unsatisfactory» condition is accepted for 8 %, «hazardous» condition is accepted for 2 % (approximately 600 objects). Estimation «hazardous» is meant that a dam is in the emergency condition and it can be broken. «Unsatisfactory» condition is meant that there is no threat of immediate breakage but with a certain circumstances (in other words during natural calamity) the object will not withstand the water head. Hydraulic engineering structures belonging to the power engineering industry or located at water reservoirs of the federal status are in the normal condition.

The greatest part of territories subjected periodically to flooding, practically cannot be provided with engineering protection systems. In these conditions for not protected territories the most important are *non-engineering* preventive methods of protection from floods.. Such protection directions are as follows:

Development of a flood insurance program.

Control of economy use of hazardous zones.

Organization of operational warning and informing of management bodies and population of a flood hazard.

Development and operational implementation of evacuation plans of people and material values from threatened regions.

Organization of regular hydrometeorological observation.

Monitoring and prediction of development of high-flood processes.

Removal of objects from zones of periodic flooding.

Organization of coordination and efficient control of protection from floods in the river basin.

Detailed economic and ecological researches are carried out in economy developing of flood-hazardous territories, both in river valleys and at sea coasts. Their purpose is revealing the ways of getting a maximum possible economic effect from development of these territories and thus reduction to minimum possible losses from floods.

Regulating state authorities have a right to limit or completely prohibit such types of economic activities, as a result of which it is possible to increase the floods (forest exploitation and others), as well as widening of measures directed at setting up conditions leading to reduction of drainage. In addition at high-flood territories it is recommended to exercise such types of economic activities, which will be subjected to minimum damage in case of flooding.

At the present time the maps of regions are being prepared with plotting of boundaries of different type high-floods. With account made for a type of economic use of the territory it is recommended to set up zones with 20 % flood provision (for agricultural lands), 5 % provision (for buildings in villages), 1 % provision for town territories and 0.3 % provision for railways.

Effective tool for regulation of land use at high-flood hazardous territories can be a flexible program of flood insurance developed at the present time combining both compulsory and voluntary insurance. The basic principle of this program consists in the following: in case of

acceptance a type of territory use with regard to anti-flood protection the insured gets significantly greater extent of cover than in case of his ignoring respective recommendations and norms.

4.3.2. Protection from Forest Fires

Basic tasks of protection of forests from fires are as follows: prevention of forest fires, their detection, limitation of spreading and extinguishing. Organization of development and fulfillment of measures on protection of forests is provided by the Russian Federation Government, state authorities bodies of subjects of Russian Federation, federal body of management of forestry and its territorial bodies. Practical implementation of measures on prevention, detection and extinguishing of fires in forests is placed upon forestry farms and state forest guard.

Basic components of the existing system of protection of forests of Russia providing implementation of measures on prevention, detection and extinguishing of forest fires are: special service of aviation guard of forests, forest fire brigades, personnel and technical facilities of forestry farms (ground forest guard); personnel and technical facilities of other enterprises and organizations used for fire fighting in conditions of high and extreme combustibility of forests.

At the present time the system of aviation guard of forests comprises 24 aviation bases, 1 independent aviation enterprise, 4 aviation enterprises and 2 aviation units as components of aviation bases. A park of aircraft of the forest aviation consists of 102 aircraft, including АН-2 - 69 aircraft, АН-26 - 5 aircraft, АН-24 - 2 aircraft, МИ-8Т - 18 helicopters, МИ-8ТВ - 1 helicopter, Ми-2 - 3 helicopters, Бе-12 - 3 helicopters. In addition about 150 flying vehicles are attracted for aviation guard against rental agreements. Number of regular staff of the parachute landing service is 3.8 thousand people.

From total actively guarded area of 760 million hectares a territory serviced by the aviation covers about 725 million hectares and about 110 million hectares of deer pastures.

About 550 million hectares of forests located in the taiga zone with rare network of roads are related to areas of primary use of aviation forces and facilities of fire extinguishing and other 175 million hectares - to areas of primary use of ground forces and facilities of fire extinguishing with aviation patrol.

The aviation detects up to 70 % of all fires appearing at the whole serviced forest territory and to 95 % of fires in areas of primary use of aviation forces and facilities of fire extinguishing. With the use of aviation it was liquidated to 45 % of fires appeared at the whole territory serviced by the aviation and to 95 % of fires in areas of primary use of aviation forces and facilities of fire extinguishing.

Aviation guard is a component of the total complex of measures on protection of the forest fund and forests not included in the forest funds from fires, carried out by the federal management body of the forestry and its territorial bodies in the Russian Federation subjects. Inclusion of territories of the forest fund and forests not included in the forest fund to the aviation guard zone is established by the Federal Forestry Service of Russia.

Aviation guard of forests is carried out by special organizations - bases of aviation guard of forests (aviation bases) or aviation units having the rights of aviation bases of the Federal forestry management body of Russia. Management of work of aviation bases is carried out by the Central Base of aviation guard of forests «Aviation Forest Guard» (Central Base) of the Federal Forestry Service of Russia. It is permissible to carry out aviation guarding of forests by other natural and juridical persons having a license for fulfillment of this type of works. The license is issued by the Federal Forestry Service of Russia in compliance with the established procedure.

The areas of aviation guard include territories, at which timely detection and liquidation of forest fires cannot be provided by available ground forces and facilities of fire extinguishing.

In the ground guard areas the aviation bases can provide detection of forest fires, warning of the ground forest guard on their appearance, spreading and required measures on fire fighting.

Aviation bases fulfill the following types of works:

Aviation patrol of the forest fund and forests not included in the forest fund and other natural landscapes to detect forest and other fires.

Forest fire extinguishing by forces and facilities of the parachute landing service and from flying vehicles in areas of aviation guard of forests, deer pastures and hunting areas, as well as rendering assistance to management bodies of the forestry and forest users in detection and extinguishing of forest fires.

Transportation by flying vehicles to places of forest fires for their extinguishing and back of the personnel, technical and other facilities for forest fire fighting.

Organization of development and introduction of technical and other facilities and technologies of detection and extinguishing of forest fires with the use of aviation.

Carrying out fire prevention propaganda and other prevention measures by aviation and usual methods and means.

Carrying out simultaneously with aviation forest guarding works of the state fire inspection to control observation of fire safety rules in forests, revealing and taking legal steps against those violating the rules.

Fulfillment of other aviation and other works on servicing of the forestry management bodies.

Participation in provision of measures on prevention of emergency situations connected with the forest and tundra fires and carrying out primary aviation rescue works.

Aviation works are carried out with the use of aircraft and helicopters of aviation enterprises of the Russian Forest Resource of the Ministry of Natural Resources and leased in other aviation enterprises of the civil aviation, including the Russian Defense Sporting Technical Organization.

Direct fulfillment of works on aviation protection of forests from fires at the territory serviced by the aviation base is carried out by aviation sections. The aviation sections may comprise mechanized teams equipped with bulldozers, automobile tanks and fire fighting equipment. Heavy helicopters may be used for transportation of mechanized teams to the places of fires. Parachute and landing fire-fighting services are set up in the aviation base to fight the forest fires.

Aviation bases together with the forestry management bodies in subjects of Russian Federation and their territorial bodies work out for periods of increased fire hazard in forests the measures of operational cooperation with the state authorities in organization of forest fires fighting.

Aviation guard of forests is carried out in close cooperation with work of the ground forest guard, which provides the most efficient use of aviation forces and facilities.

To provide aviation patrol at the territory serviced by the aviation base and to take timely and sufficient measures on extinguishing of forest on the day of their detection provision is made for organization of dispatcher control of all forest fire services at the guarded territory. The dispatcher control point functions as the inter-departmental control center with involvement for work in it of all authorized representatives of the forestry management bodies and other forest using departments. The following information is accumulated every day at the dispatcher control point: meteorological situation and weather forecast; readiness for flight of flying vehicles, time of departure and flight purpose; availability in aviation section of ready for departure of personnel of parachute and landing fire-fighting service, as well as other resources; number and area of effective and localized fires at the guarded territory; number of personnel of parachute and landing fire-fighting service, ground forest guard, involved workers and availability of technical facilities of fire extinguishing; number of people and equipment, field equipment planned for transportation to fires and removal from fires by aviation facilities on the next day; assistance required for the aviation section.

Depending on a class of fire hazard the following regimes of aviation patrol are carried out: with fire hazard of class 1 aviation patrol as a rule is not carried out or episodic flight are carried out for monitoring the condition of effective fires and rendering assistance to teams carrying out fire extinguishing. With coming in of fire hazard in the forest due to weather conditions and as it increases the intensity of aviation patrol is increased too. With small fire hazard (class II) the patrol is carried out in 1 - 2 days before the beginning of burning. The ground for assignment of everyday single patrol is coming in of a period of medium fire hazard (class III) or availability of fires in days with class II. The ground for assignment of two-time patrol is coming in of a period of high fire hazard (class IV) or availability of fires in days with class III. The ground for assignment of triple patrol is coming in of a period of high fire hazard (class V) or availability of fires in days with class IV.

Availability of own park of flying vehicles makes it possible to provide air training and fulfillment of aviation forest protection works with small or partially medium combustibility. During the fire hazard season inter-base manoeuvring of helicopters Ми-8 and aircraft Ан-2 is carried out over the whole territory of Russia, operation transportation by aircraft Ан-26 and Ан-24 of personnel of the parachute and landing fire-fighting service, is carried out, as well as fire extinguishing facilities and field equipment. By making investments in development of units of forest aviation the Central Base assigns a mission of provision of works on aviation guard of forests in areas with insufficiency of flying vehicles.

Ground guard of forests has been mostly developed in the country regions with the developed infrastructure. It is carried out by forces and facilities of forestry farms consisting of up to 2.6 thousand fire chemical stations and to 2.2 thousand fire observation towers. The areas of ground guard include about 210 million hectares, including 35 million hectares of areas of ground guard without aviation patrol.

Fire chemical stations are special units of owners of the forest fund (forestry farms, reserves, national nature parks, training, forest and experimental forest farms, collective farms, state farms and other agricultural enterprises engaged in forestry) and organized with a purpose of timely liquidation of forest fires.

According to their purpose, level of equipment, structure, procedure of completing three types of fire chemical stations are set up.

Fire chemical station 1 (type 1). It is organized basically at forestry farms having forests with high natural fire hazard. It provides liquidation of two simultaneous fires a day, as well as participates together with other units in extinguishing of spread of forest fires at the serviced territory. The team is formed as a rule for a fire hazardous season (season formation).

Fire chemical station 2 (type 2). It is organized basically at central forestry farmsteads having forests with high natural fire hazard. It provides liquidation to four simultaneous fires a day, as well as participates together with other units in extinguishing of spread of forest fires at the serviced territory. Carrying out preventive measures, agitation explanation work among population are also placed on it. The team is organized as a permanent or season unit.

Fire chemical station 3 (type 3). It is organized in areas, having forests with very high natural fire hazard, durable fire hazardous season (more than 5 months) and most combustible forests. It is formed for liquidation of big forest fires developing emergency situations, as a special inter-region forest fire-fighting service for a forest department or forestry located in the center of the fire hazardous region. It is organized as a round-year formation.

Fire chemical stations are equipped with special forest fire-fighting equipment, fire extinguishing facilities, transport, communication, tools.

Having a reserve of fire-fighting equipment for extinguishing of various fires are ground services of different state and commercial organizations (specialists of oil, gas, power, communication industry, owners of automobile and rail roads), whose structures pass through forests. The railway structure has distances of protective afforestation, which should provide all set of protective and guarding measures with regard to protective forest belts and large tracts of forest located in the railway strip.

The railway service has its departmental fire brigade equipped with fire trains with arranged tanks with water, engine-driven pumps and other fire-fighting equipment. In case of necessity the railway service in cooperation with the state forest guard organizes works on liquidation of forest fires which can spread to the forest fund.

One of promising directions of detection of forest fires adding the ground and aviation detection is the use of information received from modern satellite systems.

Modern methods of operational monitoring of forest fires widely use meteorological satellites of USA of the NOAA series, rotating in polar sun-synchronous orbits with an altitude about 850 km, with inclination of 98.8 ° and orbital period of the order of 100 min. Simultaneously no less than two satellites are in the orbit and the orbit of one of them crosses the equator at local time in the morning at 6 - 10 h at a descending node, and the other - after afternoon (14 - 18 h) at the ascending node. Every satellite has a measuring complex aboard, consisting of a set of scanning radiometers of different purpose and resolution.

Information from NOAA satellites is intended for solving the following tasks:

Operation estimation of current moisture content of forest combustible materials by computer analysis of information in the nearest and far infrared spectrum ranges.

Mapping of dynamics of spots of large fires, determination of energy properties of the fire edge.

Space estimation of optic physical parameters of the smoke covering zone in conditions of mass fires.

Inventory of fire burnt places and diagnostics of post-fire condition of slashes.

Space-time dynamics of a boundary of snow cover as a criterion of coming in and end of the fire hazardous season.

Already many regions of Russia use the data of space monitoring of forest fires at their territory. Thus the state forest service of the Department of natural resources and environment protection of the Ministry of natural resources of Russia for Republic of Tiva uses the system of remote probing of the territory bases upon analysis of space still pictures made from NOAA satellites since 2001. From 2002 with its aid it was detected 76 % of forest fires in the republic.

The new control system considerably reduced the mechanism of monitoring and liquidation of forest fires in Tiva Republic. Scanning of places of fires appearance and directions of their spread were simplified. This problem is specially actual in regions adjacent to Mongolia, where sometimes mutual claims appear on a fact of fires transfer from the territory of one country to another one.

In 2001 57 % (363 cases) of all forest fires in the republic and practically all fires at remote territories were detected by the satellite system. In 2002 powerful fires devastated about 6 % of the Tiva territory (more than 1 million hectares). 424 forest fires (76 %) were detected with the use of the space monitoring system.

Example of use of modern satellite systems in monitoring of forest fires in the aviation forest protection system is the activity of Irkutsk Center of Space Monitoring (Institute of sun-earth physics of the Russian Academy of Sciences). The system of operational detection of forest fires is developed in the Center, which for the first time in Russian Federation showed a possibility of use of the data of meteorological satellites of the NOAA series for operational detection of fires in boreal forests of Siberia. regular reception from the satellite started from 1994. Reception of information starts above the territory of China and continues during 17 minutes, when the satellite leaves the visibility zone in the area of Norilsk. The received information makes it possible to obtain pictures of surface of the whole Siberia and Far East, including Sakhalin in the visible and infrared ranges.

Space and aviation components of monitoring of forest fires excellently complement each other. For convenience of users actual space image is put on the cartography base with a coordinate net, with names of populated areas and other geographic objects. For regions of Siberia and Far East such information is supplied in the automatic mode. More detailed

information is presented to territories and enterprises having contract relations with the center up to indication of numbers of forest blocks, where a fire is fixed, its area and spreading speed.

To increase efficiency of fire prevention measures the owners of the forest fund are obliged to carry out measures directed at protection of forests. *Preventive inspection* in forests provides carrying out a set of measures directed at prevention of appearance of forest fires, limitation of their spreading and setting up conditions to provide successful fire fighting. Measures on fire prevention management of forests are carried out on the basis of plans prepared in forest management or special plans of fire prevention management of the region forest territory. During preparation of indicated plans types of fire prevention measures and volumes of fulfilled works on every forestry should be based upon the data on a level of development of the region economy, degree of economic cultivation of forests, intensity of the forest economy, actual combustibility of forests. On the basis of these materials all the owners of the forest fund work out annual operation plans of current fire prevention measures. Provision should be made for accounting of changes taking place in the forest fund, reasons of appearance of forest fires, social demographic composition of people guilty in their appearance and it is necessary to correct the work in compliance with dynamics of weather conditions.

Practical fulfillment of measures on protection of forests from fires, including fire prevention inspection, prevention and suppression of violations is placed on the state forest guard and its units, as well as departmental guard.

Measures on fire prevention inspection in forests are subdivided into three main groups: prevention of appearance of forest fires, limitation of spread of forest fires and organizational technical and other measures providing fire stability of the forest fund.

Organizational technical and other measures improving fire stability of the forest fund consist in attachment of forest sections to settlements, organizations, enterprises, preparation of local population for works on prevention, detection, extinguishing of forest fires, construction and repair of fire-prevention objects, work with authorities, lease holders etc.

Taking into consideration that in most cases forest fires appear because of careless fire handling during recreation or fulfillment of works, the state forestry management bodies provide the following:

Wide carrying out forest fire prevention propaganda among population at settlements, public transport, places of fulfillment of works and mass recreation of people on observation of fire safety rules.

Organization of forest recreation to reduce not organized arrival of people, provision of fire safety at recreation places.

Control of observation of fire safety requirements in forests, establishment of reasons of appearance of forest fires, revealing of infringers and people guilty of appearance of forest fires.

Prevention and limitation of spread of fires in forests is reached by carrying out *measures on improvement of fire stability of forests* by regulation of their composition, sanitary cutting and cleaning them, as well as by setting up at the territory of the forest fund the fire-prevention barriers, limiting spread of possible fires, arrangement of a road network and reservoirs providing their quick localization.

Special attention is paid to setting up a system of fire-prevention barriers, which should separate fire hazardous large tracts of coniferous forest into isolated from each other blocks of different values.

Forestry and fire-prevention forest roads are arranged depending on a purpose. Forestry roads are arranged basically in cultivated forests with intensive forest economy at sections, where these roads are required not only for forest fire fighting, but for other needs of the forestry too and will be widely used. Fire-prevention roads are arranged in addition to the available network of forest roads to provide passage of automobile transport to fire hazardous sections and reservoirs.

For efficient use of water extinguishing facilities in fighting the forest fires provision is made for respective preparation of natural water sources (rivers, lakes etc.) and construction of

special artificial water reservoirs. Preparation of natural water sources for fire extinguishing purposes consists in arrangement of approach roads to them, equipping special sites for water intake by fire tanks and engine-driven pumps and in necessary cases also in deepening of water reservoirs or making dams.

4.3.3. Measures on Engineering Protection of Territories from Hazardous Geological Processes

Measures of engineering protection are regulated by a number of normative documents, the main of which are SNiP 2.01.15-90 «Engineering protection of territories, buildings and structures from hazardous geological processes. Basic provisions of designing» and SNiP 2.01.51-90 «Engineering technical measures of civil defense».

Engineering measures on protection from earthquakes consist in determination of seismicity of the site on the basis of seismic micro-zoning and observation of norms of designing and construction of buildings and structures in seismic regions. measures should be taken on exclusion of arrangement in seismic hazardous regions of hazardous enterprises, carrying out construction and reconstruction of potentially hazardous objects with account made for seismic stability of earlier erected buildings and structures made without seismic consideration, reduction of hazard of appearance of secondary injure factors during the earthquake.

Measures guarding against soil flow and earth fall include the following:

- Change of the terrain of slopes for the purpose of planning of slopes, reduction of steepness of slopes, improvement of their stability, regulation of drainage of surface waters, artificial reduction of a level of underground waters, their interception with the aid of drainage systems.
- Construction of holding structures (banquettes, terraces, retaining and supporting walls, girdles, anchor fasteners, tunnels, covered fences, course of piles), especially at places where the slopes are cut by the roads.
- Arrangement of guidance walls to change the movement of the falling rocks.
- Carrying out of explosions to provide controlled slide of soil flow and earth falls.

Protection from mudflow provides the following:

- Monitoring and prediction of development of mud flows, timely warning of population of a threat of mud flows.
- Arrangement of mud flow holding dams, mud flow passage channels, mud flow drainage, bridges, mud flow guides and guarding dams and lugs, stabilizing structures (cascades, dams, drainage, retaining walls).
- Preventive flow of mud flow lakes and mud flow preventive structures (dams regulating high flood, water drainage).

Anti-avalanche engineering measures and structures are as follows:

- Monitoring and prediction of descent of snow avalanches, warning of population of a threat of their descent.
- Preventive avalanche descent.
- Structures guarding against avalanche (snow holding and snow retarding fences, walls etc.).
- Avalanche protection structures (guidance walls, beds, avalanche cutters, breaking blocks, trenches, dams, passing galleries, sheds, trestles).

Anti-karst engineering measures are carried out by way of:

- Filling the karst cavities.
- Water reduction and regulation of the underground waters regime.
- Organization of the surface drainage.

Engineering protection of banks of seas, water reservoirs, lakes and rivers provides the following:

- Construction of embankments and sheet piling.

- Coating of banks (monolith and assembles from plates and blocks).
- Construction of penetrable structures along the shores.
- Arrangement of slope structures (spilled or laid).
- Erection of guide banks.

SECTION 5. EMERGENCY PLANNING

5.1. Plans of Actions on Prevention and Liquidation of Emergency Situations

In compliance with the Provision on The United State System of prevention and liquidation of emergency situations (P. 23) planning of actions on prevention and liquidation of emergency situations within the frames of the RSES is carried out at all levels of the system in the form of : Federal plan of actions, regional plans of actions (cooperation), plans of actions of federal executive bodies (functional subsystems), plans of actions of executive bodies of subjects of Russian Federation (territorial subsystems), as well as plans of actions of local self-management authorities and plans of actions of organizations (objects).

Development of plans of actions on prevention and liquidation of emergency situations in organizations (at objects) is specified also by Chapter 14 of the Federal Law «On protection of population and territories from emergency situations of natural and technogeneous nature», Chapter 10 of the Federal Law «On industrial safety of hazardous industrial objects: and a number of other federal laws, as well as «Requirements for prevention of emergency situations at potentially hazardous objects and life support objects» (P. 68) approved by order No. 105 of the Ministry for Emergency Situations of Russia dated 28.02.2003.

According to its purpose the Plan of actions establishes a sequence of carrying out concrete actions of operational duty services, management bodies, operational staff of these bodies, forces and means of a respective level of RSES in case of a threat and in case of appearance of emergency situations.

With appearance of emergency situations and direct organization of actions the measures and procedure of actions of forces and means assigned by the Plan of actions are refined with account made for set up situation and actual conditions.

In compliance with the effective normative legislation acts the executive authorities of subjects of Russian Federation provide development of special plans of actions on separate types of emergency situations. They include the following:

Plans of prevention and liquidation of spillage of oil and petroleum products.

Operational plans of fighting the forest fires **approved annually** by state authority bodies of subjects of Russian Federation.

Plans of protection of the personnel and population in case of emergency at a nuclear station (nuclear power station, thermal nuclear power station).

Plans of actions on prevention of appearance of emergency situations in fulfillment of works on storage, transportation and liquidation of chemical weapons and liquidation of their aftereffects.

Plans of primary life-support and survival of population suffered in emergency situations.

Plan of actions at the federal level, as well as at the level of a subject of Russian Federation, large city or region **determines a common algorithm of actions of the operational duty services, management bodies of SDES and committees on emergency situations and provision of fire safety** with setup of a real threat and with appearance of emergency situations at a territory within the jurisdiction, as well as contains a set of additional documents in a form of separate sections of the plan and required appendices determining a procedure of quick concentration in the emergency situation zone of forces and facilities required for fulfillment of emergency rescue and other urgent works and for their comprehensive support.

The plan of actions includes a special section determining a list of measures on prevention of emergency situations. Prevention of emergency situations includes a big set of organizational, scientific technical and social measures on monitoring and prediction of emergency situations, improvement of technological and operation reliability of production processes, engineering protection of territories and populated areas, preparation of objects of economy and life-support and survival systems of population for work in conditions of emergency situations etc.

The work on fulfillment of all indicated measures has a **permanent nature and is specified in respective general or special plans**.

At the federal level such plans are as follows: FCP «Reduction of risks and softening of aftereffects of emergency situations of natural and technogeneous nature in Russian Federation to 2005»; Plan of basic measures in the field of civil defense, prevention and liquidation of emergency situations and provision of fire safety in Russian Federation for the coming year, coordinated with interested executive authorities and approved by the Russian Federation Government; annual, quarterly and target plans of the Ministry for Emergency Situations of Russia, as well as plans of federal executive authorities containing measures on prevention of emergency situations at objects within the jurisdiction and on provision of readiness of functional subsystem of RSES formed by these authorities.

Plan of actions practically is a **document of preliminary operational planning**. In connection with this in the Federal Plan of actions the section on prevention of emergency situations is limited by a list of target programs, containing measures on prevention of emergency situations, the fulfillment of which is subjected to permanent control, as well as a list of basic measures on prevention of emergency situations of a season (cyclic) nature and organization of control of their fulfillment.

They are:

- Preparation for spring high-floods.
- Preparation for spring-summer fire hazardous season in forests.
- Control of timely preparation of living and public service facilities and respective power systems for the winter period.
- Carrying out season measures on provision of protection of people life at places of mass recreation of population at water places and provision of state technical supervision with the use of small ships.
- Control of carrying out measures on preparation of summer country recreation of children, schools and other children educational institutions for a new training year.

Section on prevention of emergency situations reflects basic measures on organization of monitoring and prediction of emergency situations with account made for specific features of each period of a year, as well as specific features of monitoring in case of appearance of emergency situations of territorial and regional scales and prediction of a potentiality of their further development.

The effective Provision on the united system and other normative legislative acts of the Russian Federation Government establish a united general procedure of functioning of the RSES, its subsystems and links in case of a threat and appearance of emergency situations. In connection with this all levels of the RSES have a united structure of plans of actions (cooperation) on prevention and liquidation of emergency situations, consisting of basic sections and appendices.

Section 1. Total estimation of probable situation with appearance of emergency situations

1. Probable emergency situations of federal and transbordering scales:

Natural emergency situations.

Emergency situations of a technogeneous nature (including fires).

Emergency situations of a social-biological nature.

Section 2. Basic measures on prevention of emergency situations

1. List of basic measures on prevention of emergency situations characteristic for the territory of Russian Federation, normative legislative documents, regulating implementation of these measures (federal laws, decisions of the Russian Federation Government, federal target and scientific technical program on prevention and liquidation of emergency situations and provision of fire safety etc.)

2. Basic measures on prevention of emergency situations of a season (cyclic) nature, organization of control of their fulfillment:

Spring high-floods.

Forest fires.

Preparation of living and public service facilities for the heating season.

Readiness of buildings of summer country recreation of children, schools and other children educational institutions for a new training year.

Other season measures on prevention of emergency situations with account made for specific features of regions of Russian Federation.

3. Organization of monitoring and prediction of emergency situations and exchange of prediction information.

Section 3. Provision of readiness for liquidation of probable emergency situations

1. Organization of activity on provision of readiness for liquidation of emergency situations at all levels of management of the RSES.

2. Organization of the communication and warning system of control bodies of the RSES.

3. Composition and readiness of forces and facilities of the RSES, their deployment (echelonment).

4. Organization and condition of readiness of individual protection aids and protective structures for protection of population in accidents and catastrophes with emission (threat of emission) of chemically hazardous agents, radioactive agents, other hazardous agents.

5. Organization of evacuation measures in emergency situations.

6. Availability and procedure of use of reserves of financial and material resources for prevention and liquidation of emergency situations.

Section 4. Actions in case of threat and appearance of federal transborder emergency situations

1. Procedure of transfer of the central staff of the Ministry for Emergency Situations to readiness for actions in case of a threat and appearance of emergency situations, organization of cooperation with federal executive authorities and organizations of Russian Federation in cas eof threat and appearance of federal and transborder emergency situations, formation of operational teams and deployment of the operational headquarters on liquidation of the emergency situation (regulated by the decision of the Russian Federation Government, the draft of which is a component of the Federal Plan of Actions).

2. Actions in case of appearance of the emergency situation (regime of higher readiness).

Organization of communication and warning of management bodies of the Ministry for Emergency Situations of Russia, forces and facilities of permanent readiness and interested services of a threat of appearance of the emergency situation, informing the population in regions of probable appearance of a federal or transborder emergency situation.

Procedure of introduction and declaration of the higher readiness regime in the area of probable appearance of a federal or transborder emergency situation, increase of observation and control of the environment condition, situation at the potentially hazardous objects and territories adjacent to them, carrying out emergency prevention measures.

Procedure of making decisions on sending of additional forces and facilities of the RSES to the proposed area of the emergency situation, as well as on protection of population, including

problems of shelter in protective structures, anti-chemical, medical, anti-epidemic, radiation protection, as well as its possible evacuation (transfer) from the hazardous zone.

Procedure of collection and organization of work of the Government Committee on prevention and liquidation of emergency situations and provision of fire safety.

Procedure of organization of control of fulfillment of measures of higher readiness.

3. Actions in case of appearance and during liquidation of emergency situations (emergency regime):

Organization of communication and warning of management bodies of the RSES, collection of members of operational teams and operational headquarters on liquidation of an emergency situation, deployment of permanent readiness forces of the federal level and operational teams to the area (zone) of the emergency situation, establishment of permanent communication with them and provision of control of sufficiency of taken at the place measures on liquidation of the emergency situation including announcing of the «emergency situation regime».

Determination of the emergency situation zone, organization of reconnaissance and prediction of probable variants of development of the emergency situation, warning of population living in the emergency situation zone and carrying out urgent measures on its protection.

Organization of execution of a required set of emergency rescue and other urgent works in the emergency situation zone, rendering assistance to victims, evacuation of suffered people and other population from the hazardous zone and its primary life support and survival.

Provision of cooperation of forces and facilities of different specialization and subordination, involving for liquidation of the emergency situation of forces and facilities of the second echelon, setting up at the place of works of forces and facilities and required material resources.

Organization of information on a situation in the emergency situation zone.

Organization of comprehensive support of actions of forces and facilities on liquidation of the emergency situation, provision of public order and regulation of road traffic.

Organization of financing of measures on liquidation of the emergency situation.

Preparation of the draft Decision on liquidation of the emergency situation and its approval by the Government Committee on prevention and liquidation of emergency situations and provision of fire safety.

Section 5. Provision of readiness of management system in crisis situations

1. Basic tasks solved by the management system.

2. Condition of readiness of automatic facilities in crisis situations at the RSES. Availability of formalized algorithms of reaction, software, united reporting documents of RSES and Ministry for Emergency Situations of Russia.

3. Organization and condition of readiness of forces and facilities of the Ministry for Emergency Situations of Russia for management in federal and transbordering emergency situations.

4. Measures on buildup of software and hardware facilities, algorithms, scenarios and methods of management, interdepartmental cooperation and training of specialists.

Plan of actions contains a number of obligatory appendices.

1. Map of a probable situation in case of appearance of emergency situations at the territory of Russian Federation (with the explanatory note and attachment of a list of forces and facilities).

2. Calendar plan of basic measures of the RSES in case of a threat and appearance of federal and transbordering emergency situations.

3. Plan of organization of management in case of a threat and appearance of federal and transbordering emergency situations.

4. Plan of communication and warning in case of a threat and appearance of federal and transbordering emergency situations.

5. Plan of radiation and chemical protection (on a map with an explanatory note).

6. Plan of engineering supply of liquidation of emergency situations and engineering protection of population (on a map with an explanatory note).

7. Plan of medical support (on a map with an explanatory note).

8. Plan of material technical support of forces of the Ministry for Emergency Situations of Russia taking part in liquidation of the emergency situation (on a map with an explanatory note).

9. Plan of primary life support and survival of population suffered as a result of the emergency situation (on a map with an explanatory note).

10. Draft Decision of the Government Committee on prevention and liquidation of emergency situations and provision of fire safety for liquidation of the emergency situation (with an explanatory note).

11. Other documents.

a) Plans of actions on prevention and liquidation of emergency situations of federal executive authorities.

b) Calculation and reference materials on probable scenarios of appearance and development of federal and transbordering emergency situations.

c) Plans of actions on prevention and liquidation of emergency situations at potentially hazardous objects of class I in compliance with classification established by order No. 105 of the Ministry for Emergency Situations of Russia dated 28.02.2002.

5.2. Budget Reserves of Material and Financial Resources for Response to Hazards

Within the framework of the Federal Target-Oriented Program "Reduction of Risks and Alleviation of the Impacts of Natural and Anthropogenic Emergency Situations in the Russian Federation Till 2005" the budget material and financial reserves were created.

The Russian Agency on State Reserves and bodies of executive power in the subjects of the Russian Federation are involved in creation and attending of the reserves of material valuables for liquidation of ES impacts and rendering of humanitarian aid to the affected subjects of the Russian Federation and CIS countries.

The accumulated reserves of the bodies of executive power in the subjects of the Russian Federation contain material resources for the sum more than 7.816 billion of rubles, or 88.8% of the planned accumulation, including in regional centers, Moscow and Kaliningrad Region:

Central FA	-	305.6 million rubles
Northwestern FA	-	566.9 million rubles
Circum-Volga and Ural FA	-	792.4 million rubles
Southern FA	-	575.6 million rubles
Siberian FA	-	1223.5 million rubles
Far-Eastern FA	-	120.3 million rubles
Moscow	-	4230.0 million rubles
Kaliningrad Region	-	1.8 million rubles

Availability of material resources in reserves assigned for liquidation of ES by federal areas is presented in Fig. 5.2.1.

Figure 5.2.1
Availability of material resources in reserves by federal areas

1) Siberian Federal Area; 2) Circum-Volga and Ural Federal Area;
3) Southern Federal Area; 4) Northwestern Federal Area;
5) Central Federal Area; 6) Far-Eastern Federal Area

The share of material resources assigned for ES liquidation per capita of the population makes, on the average, 54 rubles 30 copeks in the Russian Federation, while the share of these resources by regional center are presented in Fig. 5.2.2.

Figure 5.2.2
Share of material resources for liquidation of emergency situations per capita of the population (rbls/man) by federal areas

1) CFA; 2) NWFA; 3) CV&UFA; 4) SFA; 5) SibFA; 6) FEFA

In 2003 the reserves of material and financial resources of the bodies of executive power in the subjects of the Russian federation were used more than once for prevention and liquidation of ES: fighting of forest fires, flood control measures, liquidation of accidents in living-municipal complexes.

The accumulation of budget reserves of finance went on. The volume of a reserve fund in 2003 increased in comparison to 2002 by 17%. Data on accumulation and use of financial resources for liquidation of ES are presented in Table 5.2.1.

Table 5.2.1

Data on accumulation and use of financial resources for liquidation of emergency situations

Federal area and RF subject	Established reserve fund (mln rbls.)	Spent (mln rbls.)	Balance (mln rbls.)
Central Federal Area	242.3	77.6	164.6
Northwestern Federal Area	322.4	66.8	255.6
Circum-Volga and Ural Federal Area	522.9	155.0	367.9
Southern Federal Area	363.3	257.7	87.6
Siberian Federal Area	495.0	189.7	305.2
Far-Eastern Federal Area	171.3	112.2	59.0
Moscow	5093.9	114.8	4979.1
Kaliningrad Region	22.0	20.2	1.7
Total:	**7233.3**	**994.3**	**6221.0**

The purpose-oriented work aimed at accumulation of material reserves is carried out by federal bodies of executive power. In the system of the Russian Ministry of Power Generation the most satisfactory situation with creation of reserves of material resources is at potentially hazardous objects of the fuel-power complex (“Gazprom” - 70–100%; “Yukos” – 80–100%).

In the system of the Russian Ministry of Defense material resources are made largely of medicines, foodstuffs and other property. In the course of ES liquidation a part of material resources for priority support of the affected population is assigned from current reserves.

The Russian Ministry of Public Health undertakes a consistent work aimed at accumulation and renewal of medical facilities for liquidation of medico-sanitary consequences of emergency situations.

At 10 federal storage bases in 9 subjects of the Russian Federation (in cities Irkutsk, Krasnogorsk of the Moscow Region, Makhachkala, Moscow, Omsk, Perm, Stavropol, Tomsk, Ufa) there are maintained in permanent readiness the reserves of immunobiological medicines for a sum over 3 mln rubles; on 3 bases (in cities Omsk, Ufa, Khabarovsk) – a stock of 19 tons of disinfection medicines for a sum of 0.75 mln rubles.

A current reserve of fuel in railway storehouses, as of 31.12.2003, was: diesel fuel – for 10 days, furnace fuel oil – for 30 days, coal – for 20 days. Available tanks and fuel storehouses enable creation of reserves of solid and liquid fuel for 40–80 days.

Railways have stores of metal constructions, cable, poles for communication lines, crushed stone, a reserve of foodstuffs for three days for teams of fire and rehabilitation trains.

Pursuant to Order of ME of Russia of 28.02.1997, No. M-271U, a financial reserve for emergency situation liquidation was established in the amount of 1.5% of profit of railways. In 2003 out of this financial reserve 30 million rubles were spent on liquidation of consequences of train wrecks and accidents.

The Russian Ministry of Transport elaborated and enforced the Regulations on a Reserve Fund of the Ministry to ensure trouble-free performance of transport systems and liquidation of emergency situation consequences in a transport complex. Out of this Reserve Fund of the Russian Ministry of Transport money were assigned for investments into safety improvement of basic transport systems of the country.

In 2003 the total input into the reserve fund from transport organizations was planned from voluntary contributions, port, ship and other duties and repayments into the reserve fund.

In order to ensure liquidation of consequences of emergency situations an emergency stock of material resources was created at enterprises of "Rosrezerv".

5.3. Coordination of Preparedness for Response to Hazards and Disasters

Coordination of activities aimed at diminishment of hazard threat was carried out within the framework of the Single State System for Prevention and Liquidation of Emergency Situations (RSES) that combines management bodies, forces and means of federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies and organizations that are responsible for decision-making on protection of the population and territories from emergency situations.

Coordination bodies in this Single System are:

on a federal level – Governmental Commission on prevention and liquidation of emergency situations and ensuring fire safety, commission on prevention and liquidation of emergency situations and ensuring fire safety of federal bodies of executive power;

on a territorial level (within a territory of a subject of the Russian Federation) – commission on prevention and liquidation of emergency situations and ensuring fire safety of a body of executive power in a subject of the Russian Federation;

on a local level (within a territory of a municipal formation) – commission on prevention and liquidation of emergency situations and ensuring fire safety of a local self-government body;

on an object-related level – commission on prevention and liquidation of emergency situations and ensuring fire safety of an organization.

The basic goals of these commissions on prevention and liquidation of emergency situations and ensuring fire safety pursuant to their terms of reference are the following:

a) preparation of proposals on realization of the single state policy on prevention and liquidation of emergency situations and ensuring fire safety;
b) coordination of activities of management bodies and efforts of the single system;
c) ensured coordinated actions of the federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies and organizations in coping with the problems related to prevention and liquidation of emergency situations and ensuring fire safety and also restoration and construction of living houses, dwelling-utility objects, social sphere objects, production and engineering infrastructure damaged and destroyed as a result of emergency situations.

The permanent management bodies of the single system are:

on a federal level – the Ministry of the Russian Federation on Civil Defense, Emergency Situations and Liquidation of Consequences of Emergency Situations, structural subdivisions of

federal bodies of executive power authorized to settle problems related to protection of the population and territories from emergency situations;

on a regional level – regional centers on civil defense, emergency situations and liquidation of consequences of emergency situations of the Ministry of the Russian Federation on Civil Defense, Emergency Situations and Liquidation of Consequences of Emergency Situations (hereinafter – regional centers);

on territorial and local levels – respective bodies specially authorized to settle problems of civil defense and problems on prevention and liquidation of emergency situations on the territories of the subjects of the Russian Federation and territories of municipal formations (hereinafter – management bodies on civil defense and emergency situations);

on an object-related level – structural subdivisions or workers of organizations specially authorized to settle problems related to protection of the population and territories from emergency situations.

The bodies on current management of the single system are:

- centers for management in crisis situations, information centers, on-duty and dispatch services of the federal bodies of executive power;
- centers for management in crisis situations of regional centers;
- centers for management in crisis situations of management bodies on civil defense and emergency situations, information centers, on-duty and dispatch services of the territorial bodies of the federal bodies of executive power;
- single on-duty and dispatch services of municipal formations;
- on-duty and dispatch services of organizations (objects).

ME of Russia undertakes coordination of activities of emergency-rescue services and emergency-rescue units of federal bodies of executive power, general Russian and interregional public associations involved in emergency-rescue works on the territory of the Russian Federation and also departmental, voluntary fire protection services, fire protection associations and municipal fire services.

Management bodies on civil defense and emergency situations undertake coordination of emergency-rescue services and emergency-rescue units on the territories of the subjects of the Russian Federation and municipal formations.

If there is no threat of emergency situation on objects, territories or water areas, the management bodies and forces of the single system function in an ordinary mode. By decisions of top officials of the federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies and organizations on the territory of which emergency situations may occur or really occurred, or the authorities of which extend on liquidation of emergency situations, one of the following performance regimes may be assigned to respective management bodies and forces of the single system:

a) higher preparedness regime – at a threat of emergency situations;
b) emergency situation regime – at appearance and liquidation of emergency situations.

By decisions of top officials of federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies and organizations with regard to introduction for respective management bodies and forces of the single system of a higher preparedness regime or an emergency situation regime the following is determined:

a) circumstances that were considered enough ground for introduction of a higher preparedness regime or an emergency situation regime;
b) borders of a territory on which an emergency situation can occur or borders of a zone of emergency situation;
c) forces and means attracted for carrying out actions on prevention or liquidation of an emergency situation;
d) a list of actions to ensure protection of the population from an emergency situation or organization of actions on its liquidation;
e) officials responsible for carrying out measures on prevention of an emergency situation or leader of works on liquidation of an emergency situation.

Top officials of federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies and organizations should inform the population via mass media or using any other communication channels about introduction on a particular territory of respective regimes of functioning of management bodies and forces of the single system as well as about actions on ensuring security of the population.

At a threat of occurrence or at actual occurrence of regional, federal and transborder emergency situations the performance regimes of management bodies and forces of respective subsystems of the single system may be determined by decisions of the Governmental Commission on prevention and liquidation of emergency situations and ensuring fire safety.

Principal actions taken by the management bodies and forces of the single system include the following:

a) <u>in a regime of routine activities:</u>

study of the environment condition and forecasting of emergency situations;

collection, processing and exchange, following the established procedure, of information on protection of the population and territories from emergency situations and ensuring fire safety;

elaboration and realization of purposeful and scientific-technical programs and actions on prevention of emergency situations and ensuring fire safety;

planning of actions of management bodies and forces of the single system, organization of preparation and supporting of their activities;

education of the population about behavior in emergency situations;

dissemination of knowledge on protection of the population and territories from emergency situations and ensuring fire safety;

guidance of creation, location, storage and replenishment of reserves of material resources designed for liquidation of emergency situations;

carrying out, within their authorities, of a state expertise, supervision and control in relation to protection of the population and territories from emergency situations and ensuring fire safety;

carrying out, within their authorities, of the required kinds of insurance;

taking actions on preparation for evacuation of the population, material and cultural valuables to safer regions, their placement and return to places of permanent residence, or storage, respectively, and also preparation for life support of the population in emergency situations;

keeping of statistics of emergency situations, participation in investigation of the causes of accidents and disasters and also elaboration of actions on removal of the causes of such accidents and disasters;

b) <u>in a regime of higher preparedness:</u>

more strict control of the environment condition, forecasting of occurrence of emergency situations and their consequences;

introduction, if necessary, a round-the-clock duty of leaders and officials of management bodies and forces of the single system on stationary management points;

continuous collection, processing and transmission to management bodies and forces of the single system of data on forecasted emergency situations, informing of the population on ways and methods of protection from them;

taking prompt actions to prevent occurrence and development of emergency situations, diminishment of damage and losses if there are such and also ensuring more stable and safe operation of organizations in emergency situations;

verification of plans of actions (interaction) on prevention and liquidation of emergency situations and other documents;

bringing, if necessary, of the forces and means of the single system to alert to respond properly to an emergency situations, formation of operative groups and organization of their movement to the assumed regions of action;

replenishment, if necessary, of reserves of material resources created for liquidation of emergency situations;

organization, if necessary, of evacuation;

c) <u>in a regime of an emergency situation:</u>

a continuous control of the environment condition, forecasting of development of occurred emergency situations and their consequences;

warning of leaders of the federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies and organizations and also the population about the emerged emergency situations;

taking actions on protection of the population and territories from emergency situations;

organization of works on liquidation of emergency situations and all-round support of the actions of forces and means of the single system, maintenance of public order during their realization and also attraction, if necessary, following the established procedure, of public organizations and the population to liquidation of the occurred emergency situations;

continuous collection, analysis and exchange of information on a situation in the zone of an emergency situation and on progress of works on its liquidation;

organization and maintenance of continuous interaction of the federal bodies of executive power, bodies of executive power in the subjects of the Russian Federation, local self-government bodies and organizations on issues related to liquidation of emergency situations and their consequences;

taking actions on life support of the population in emergency situations.

Emergency situations should be liquidated in accordance with the following classification of emergency situations adopted by the government of the Russian Federation:

restricted – by forces and means of an organization;

local – by forces and means of a local self-government body;

territorial – by forces and means of a body of executive power in a subject of the Russian Federation;

regional and federal – by forces and means of bodies of executive power in subjects of the Russian Federation found themselves in a zones of emergency situation.

Liquidation of a transborder emergency situation is carried out by decision of the government of the Russian Federation in compliance with international treaties.

If necessary, those responsible for liquidation of emergency situations have the right to take independent decisions on the following issues:

organization of evacuation;
stopping of activities of organizations being in the zone of an emergency situation;
organization of emergency-rescue works on objects and territories of organizations being in the zone of an emergency situation;
restricted access of the people to the zone of an emergency situation;
utilization of reserves of material resources of organizations being in the zone of an emergency situation, except for material valuables of the state material reserve;
use, as stipulated in the legislation of the Russian Federation, of communication and warning means, transport means and other property of organizations being in the zone of an emergency situation;
attraction to works on liquidation of emergency situations of supplementary and public emergency-rescue formations and also rescuers not being on the staff of the mentioned formations if they have documents confirming their attestation to participate in emergency-rescue works;
attraction on a voluntary basis of the population to carrying out urgent works and also some private persons not being rescuers to participation in emergency-rescue works.

Those responsible for liquidation of emergency situations should inform respective bodies of executive power, local self-government bodies and organizations about decisions taken by them in case of urgent need.

SECTION 6. SUCCESSFUL EXAMPLES OF ACTIVITIES ON RISK MANAGEMENT ON A REGIONAL LEVEL

6.1. Interstate Council on Natural and Anthropogenic Emergency Situations (ISC on ES)

6.1.1. Existing Hazards and Interstate Tasks on Their Prevention and Mitigation of Consequences

The territory of states being participants of the Commonwealth of Independent States (CIS) covers a considerable part of the Eurasian continent and is equal to over 22 million sq. km. The number of the population living there reaches nearly 300 million. Scales and geographic specific features of such vast region predetermine a possibility that many of the existing kinds of natural hazards may occur here. Saturation of many regions with industrial objects, a developed economic infrastructure, high degree of urbanization, often poor technical condition and wear-out of production assets increase a possibility of accidents and anthropogenic disasters. A complicated environmental situation in all CIS countries aggravates still more the situation with prevention and liquidation of natural and anthropogenic emergency situations.

By expert estimates an average economic damage incurred by all kinds of natural and anthropogenic emergency situations may be evaluated in total for the whole territory of the Commonwealth in dozens of billions of dollars for a year. It should be noted that with every passing year this damage becomes 10–20% more. Thus, rather perceptible effect in the recent years on national economics and social sphere was produced by fluctuations of the Caspian sea level and its influence on the coastal zone in Azerbaijan, Russia and Turkmenia, burning of forests and peat in Byelorussian, some earthquakes in Georgia, gradual death of Aral in Kazakhstan and Uzbekistan, mudflows and landslides in Kyrgyzstan and Tajikistan, the earthquake in Neftegorsk, typhoons in the Far East, forest fires, disastrous floods and mudflows

in Russia, bank scouring in the Amudarya and Syrdarya valley, drought and invasion of locust in Ukraine.

In view of the mentioned difficulties and also as a result of awareness of own and general interests the CIS countries started seeking integration and cooperation in coping with the problems on prevention and liquidation of natural and anthropogenic emergency situations by creation of a system of collective security in this field.

Initial organizational and legal foundations of integration of CIS countries were laid on January 22, 1993, when the leaders of the Commonwealth governments signed in Minsk the "Agreement on interaction in prevention and liquidation of consequences of natural and anthropogenic emergency situations". So in the recent decade the CIS countries together with other countries of the world community are developing and consolidating quite purposefully the multi-lateral cooperation with a view to hedge the modern community from the advance of natural and anthropogenic emergency situations.

In the recent decade the role of the Commonwealth of Independent States as a large regional organization in the Eurasian region has gained in importance, and this fact obviously make imperative a more close cooperation of the CIS countries with the MSUOP Secretariat. And this is the more so as in the recent years the Commonwealth countries started realization of some major national and interstate (regional) programs on response to natural and man-made hazards and disasters and also realization of a strategy of prevention of these hazards and alleviation of their impacts.

These key issues of security are resolved by formation of a new stage in international cooperation on the basis of analysis and reduction of risks of man-made and natural-anthropogenic disasters having most grace social-economic, economic and demographic consequences with regard to all affecting factors. Such cooperation should be spearheaded to elaboration for CIS countries and also for all world states of a common basis of a concept on ensuring security, risk reduction and mitigation of emergency situations in the 21st century.

For practical realization of provisions of the Agreement of 1993 the Council of Government Leaders of the Commonwealth set up the Interstate Council on Natural and Anthropogenic Emergency Situations (ISC on ES) comprising authorized representatives of countries – participants to this Agreement. Most of these representatives are deputies of leaders of national state bodies on civil defense and emergency situations. The Council identifies a policy of the Commonwealth countries in protection of the population and territories of CIS countries from natural and man-made emergency situations.

The Secretariat of ISC on ES was responsible for current organizational work. Later, by decision of the Council of State Leaders of 02.04.1999 the responsibility for routine activities were transferred to the CIS Executive Committee. The Regulations on the Council state that its meetings are convened when the necessity arises, but at least twice a year (see the photo showing participants of the 17th Meeting of the Interstate Council on Natural and Anthropogenic Emergency Situations, July 15–17, 2003, Almaty, Republic of Kazakhstan).

Basic tasks of the Council concerning realization of the Agreement are:

a) elaboration of recommendations so that the states – participants of the Agreement pursue a coordinated policy in prevention of emergency situations and liquidation of their consequences;

b) elaboration of recommendations aimed at bringing closer the legislative norms on the mentioned issues and development of agreements necessary for interaction and cooperation in prevention of emergency situations and liquidation of their consequences;
c) coordination of activities of international organizations and participation in international programs in a respective field, international and interregional cooperation in prevention of emergency situations and liquidation of their consequences;
d) promotion of integration of systems and interaction of bodies responsible for prevention of natural and man-made emergency situations, protection of the life and health of the population, material and cultural valuables, natural environment and liquidation of impacts of such ES, coordination of national plans of actions related to such situations;
e) promotion of elaboration and realization of interstate purposeful and scientific-technical programs in prevention of emergency situations, including issues on protection of the population, material and cultural valuables, natural environment;
f) promotion of education and improvement of qualifications of specialists on prevention of emergency situations and liquidation of their consequences;
g) promotion of monitoring of the condition of potentially hazardous objects, natural environment, forecasting of arrival of emergency situations and their scales;
h) elaboration of recommendations on organization of mutual warning about a condition of potentially hazardous objects and natural environment, arising emergency situations, their development and likely consequences, actions that are taken for liquidation of their impacts;
i) coordination of actions on liquidation of consequences of emergency situations realized on a request from the states – participants of the Agreement, including on rendering of material and other aid, accommodation of the affected population on the territory of other states – participants of the Agreement.

For the past period ISC on ES has done much for creation of the Interstate System for Prevention and Liquidation of Emergency Situations, the CIS Corpse of Forces for liquidation of consequences of emergency situations, the CIS Agency on monitoring and forecasting of such situations and also as concerns seeking of ways for bringing closer the national legislations related to these issues.

6.1.2. Interstate System for Prevention and Liquidation of Emergency Situations of the CIS Countries

Among the most complicated issues that the Commonwealth countries had to resolve in the recent time is formation of a system of interaction in prevention and liquidation of emergency situations.

Further integration of the CIS countries for rebuff to emergency situations realized in formation of the Interstate System for Prevention and Liquidation of Emergency Situations (MSES CIS). In March 1996 on a request of the government leaders the Presidium of the Interstate Economic Committee of the Economic Union (MEC) approved the basic regulatory document prepared by ISC on ES – Regulations on the Interstate System for Prevention and Liquidation of Emergency Situations of CIS Countries.

This the Interstate System for Prevention and Liquidation of Emergency Situations is called to ensure:

pursuance of a coordinated policy in mutual warning and informing about threats of emergency situations in border areas;

interaction among bodies and points of management, communication and warning systems, forces and means;

protection of the life and health of the population, stable performance of economic and social objects during accidents, disasters and other hazards.

The CIS countries participate in this System on the principles of strict observance of state sovereignty.

After creation of this MSES CIS system the states moved to a new level of interaction as relates to prevention and liquidation of emergency situations. A warning system is functioning. It was established in cooperation with the Center for Crisis Situation Management of ME of Russia for collection of information on prevention of emergency situations in the CIS countries and control of the processes of their liquidation, involving also the CIS Corpse of Forces for liquidation of emergency situations.

The MS Presidium approved the Register of units assigned by the CIS countries to enter the Corpse of Forces of the Commonwealth for liquidation of the consequences of natural and man-made emergency situations. Later in 2002 the Register was approved by the Council of CIS Government Leaders. This document specifies specific units assigned by CIS countries to enter the Corpse, a number of the personnel by specialities and also a list of transferred technical means. Further on for more prompt rendering of assistance the cover forces were grouped by three regions – Western (Byelorussian, Moldova, Ukraine, Russia), Southern (Transcaucasian states, Russia), Eastern (Central Asian states, Kazakhstan, Russia).

Beginning from December 1994 ISC on ES adopted the following regulatory documents supporting activities of the Commonwealth Corpse of Forces: Basic lines for development of the Commonwealth Corpse of Forces, Concept of its development, Regulations on Executive Directorate (management body) of the Corpse, Regulations on a warning procedure of CIS countries about natural and anthropogenic emergency situations.

In November 1998 the Council of Government Leaders approved the Interstate Purposeful Program of Development of the Commonwealth Corpse of Forces for the period till 2010 that envisages actions on improvement of structural organization of the Corpse, systems of management, communication and warning, creation of aeromobile, emergency-rescue detachments, outlines needs of technical refurbishments of the Corpse, creation of a system of special rear and moral-psychological support of its activities and also a system of personnel training. This interstate program also include issues of further improvement of a regulatory-legal base regulating the Corpse activities, fulfillment of research and trial-design works as regards its development. This program will be realized on the basis of share financial support of the participating countries. Unfortunately there are some difficulties with assignment of financial resources by the CIS countries and this essentially arrests realization of the adopted program.

On the basis of the Conceptual program on Personnel Training of ISC on ES adopted in 1996 in Ashkhabad there was resolved a problem on training of specialists of the CIS countries for the Interstate System for Prevention and Liquidation of Emergency Situations, including for units of the CIS Corpse of Forces, at educational establishments of ME of Russia (the Academy of Civil Defense of ME of Russia and the Russian International Center for Rescuer Training). Trained are also civil defense officers for the CIS countries and specialists for other subdivisions of the CIS Corpse of Forces on organization and carrying out of rescue and other urgent works. In 1998 the Academy of Civil Defense admitted first 34 students.

Till January 2003 all organizational and coordination works were carried out by the Council's working body – Department on Emergency Situations of the CIS Executive Committee, while at present – by the Department of Environmental Safety and Emergency Situations of the CIS Executive Committee.

It should be also stressed that for prompt decision-making on participation of the units of the Commonwealth Corpse of Forces in liquidation of an emergency situation on a territory of one of the CIS countries on a request from its government, on the initiative of ME of Russia a package of standard documents was approved concerning engagement of Corpse units. A special management body of the Commonwealth Corpse of Forces was formed of authorized representatives of the states – the Executive Directorate which activities are guided by a Coordinator appointed from representatives of the countries (at present – from Russia).

On 29 November 2001 the Council of CIS Government Leaders approved "Procedure of Interaction of the CIS Countries in Liquidation of Consequences of Natural and Anthropogenic Emergency Situations" that outlines priority actions needed for organization of such interaction among the CIS countries in natural and anthropogenic emergency situations, including with a transborder effect, for rendering assistance on life support to the affected population and also for organization of interaction in such cases of national and interstate authorized executive bodies of MSES CIS.

With a view to improve preparedness of the Corpse units for actions in emergency situations in the recent years there were organized a number of staff exercises on maps with participation of the Corpse management bodies, study-methodological meetings with participation of representatives from the Commonwealth countries and Russia and also joint exercises of rescuers from Armenia, Georgia and Russia on the basis of the European Training Center in Yerevan.

The Center for Crisis Situation Management (CCSM) at ME of Russia together with national bodies of the countries on civil defense organizes every year control checks of preparedness of mutual warning of the Commonwealth countries on natural and anthropogenic emergency situations.

The Interstate System for Prevention and Liquidation of Emergency Situations of the CIS countries is an open system. First, this system is open for cooperation within its scope of reference with other international organizations. Second, the Commonwealth countries, independently on a bilateral or multilateral basis develop wide international cooperation in this field with other countries and international organizations. And, at last, this system is open for admittance of other states. The proof to the above may be the fact that ISC on ES was granted a status of an associated member of the International Civil Defense Organization (ICDO).

6.1.3. CIS Agency on Monitoring and Forecasting of Emergency Situations

A new direction in prevention of emergency situations is establishment of the CIS Agency on Monitoring and Forecasting of Natural and Anthropogenic Emergency Situations. A decision on its establishment was taken at the meeting of ministers and leaders of specially authorized bodies of state management responsible for issues of prevention and liquidation of emergency situations in the CIS countries held in 1998 in Odessa on the initiative of the Interstate Council of Emergency Situations.

This Agency was created with a view to spur information support of the Interstate System for Prevention and Liquidation of Emergency Situations of the CIS countries, to improve forecasts and to rally scientific, technical and information capacities of the Commonwealth countries.

The Agency functions in accordance with the Regulations on the Interstate System for Prevention and Liquidation of Emergency Situations of the CIS countries, regulatory legal acts of the CIS countries concerning emergency situations and also in compliance with the Regulations on the Agency approved by Decision of ISC on ES of July 4, 1999.

The Agency combines scientific, technical and information capacities of state and other bodies of the Commonwealth countries, specially authorized to resolving problems on prevention and liquidation of emergency situations with a view to develop and improve the interstate system for monitoring and forecasting of emergency situations.

Commitments of the Agency in relation to a concrete state and functions of the state system for monitoring and forecasting of emergency situations in this country are outlined in joint agreements of the Agency concluded with a respective national management body authorized to cope with such issues.

As a joint management body the Agency forms the Council of Representatives of the Agency Participants which membership is approved by the Interstate Council on Natural and Anthropogenic Emergency Situations.

The CIS Center for Monitoring and Forecasting of Emergency Situations was set up on the basis of VNII CDES with a view to ensure routine activities of the CIS Agency. It undertakes collection, processing, analysis and interpretation of data on forerunners of hazards and also regular transmission of forecasts of likely emergency situations to the officials of state bodies of the states – participants of the Commonwealth of Independent States. Current activities of the CIS Agency are guided by the Agency Director approved by the Interstate Council on Natural and Anthropogenic Emergency Situations.

The basic tasks of the CIS Agency are:

- collection, processing and integrated analysis of monitoring information on natural and man-made hazards and also regular and timely issuance of forecast of likely emergency situations, their impacts with proposals on response scenarios to top officials of ministries and other state bodies in the CIS countries responsible for prevention and liquidation of emergency situations;
- coordination of activities of the member-countries, their authorized bodies and organization in exchange of the results of observations and control of the natural environment condition, a situation on potentially hazardous objects and nearby territories;
- creation of a single information base of the CIS Agency comprising data on natural and man-made hazards, population, build-up, the information on occurred disasters and their impacts and other information needed for forecasting of emergency situations;
- organization of development and duplication of software and hardware complexes for automation of evaluation processes in relation to emergency situations for state bodies of executive power of various levels in the CIS countries;
- coordination of activities on determination of the actual stability of buildings, structures and potentially hazardous objects to the effect of natural disasters and hazards;
- elaboration for power bodies of scientifically and economically validated proposals and recommendations on a complex of preventive actions to protect the population and territories, on prevention and reduction of damage caused by emergency situations, etc.

At the 12th meeting of ISC on ES held on June 4, 1999 in Dushanbe the Regulations on the Agency was approved and its Director was appointed.

As of March 2004, among the participants of the CIS Agency on monitoring and forecasting of emergency situations are the Republic of Armenia, the Republic of Byelorussia, the Republic of Kazakhstan, the Kyrghyz Republic, the Republic of Moldova, the Russian Federation, and the Republic of Tajikistan. The founders of the Agency are management bodies of national state systems for prevention and liquidation of emergency situations of the member countries.

Every year pursuant to the plan of principal actions approved by the Council the Agency takes actions on development and improvement of its activities.

Thus, the elaboration of the Basic Geoinformation System (GIS) for forecasting of seismic hazards and threat of forest fires on the territory of the Armenian republic is nearing completion.

The Republic of Kazakhstan and the Kyrghyz Republic are finalizing preparation of initial data for development by the Agency of principal GIS for forecasting of emergency situations on the territories of these states. The Kazakh Agency on emergency situations is also planning to conclude an agreement on establishment in Kazakhstan of the Central-Asian Center for monitoring and forecasting of emergency situations.

An agreement is attained with MS of the Republic of Byelorussia and MS of the Republic of Tajikistan on organization in these states of national centers for monitoring and forecasting of emergency situations as a component of the CIS Agency.

From May 2001 the Agency transmits to all member-states and also to the Republic of Uzbekistan and Ukraine the information about earthquakes, accidents in the CIS area and over the world with a magnitude higher than 5.5, including about their impacts, which enables state bodies take timely decisions on alerting of national units of the CIS Corpse to taking actions and also on organization of humanitarian aid to affected countries, etc.

Routine activities are also underway with the Agency participants on agreeing a procedure, methods and forms of information exchange and development of GIS. Already now such exchange is already conducted by the CIS Center for monitoring and forecasting of emergency situations via “Internet’.

6.2. Scientific Council on Prevention and Liquidation of Emergency Situations

For coordination of scientific investigations and shaping of a coordinated scientific-technical policy in prevention and liquidation of natural and anthropogenic emergency situations ISC on ES by its decision of 18 May 1995 established a Scientific Council on Prevention Liquidation of Emergency Situations and also approved the “Regulations on the Council on Prevention Liquidation of Emergency Situations”. ISC on ES also approved the membership of the Council that comprises well-known scientists from the Commonwealth countries.

The Scientific Council is a scientific-consultancy body of ISC on ES. It undertakes organization and coordination of scientific investigations on natural-anthropogenic security relying upon its operational apparatus – the Department on Emergency Situations of the CIS Executive Committee.

Among principal tasks of the Scientific Council there are:

support of interstate interaction on scientific issues of prevention of natural and man-made emergency situations, including with transborder effects;

organization and coordination of efforts on elaboration and realization of joint scientific-technical programs and plans of research and trial-design works in relation to prevention and liquidation of emergency situations;

identification of priority lines of joint researches concerning provision of security during emergency situations;

coordination of preparation and submission of information on joint scientific developments along main lines of activities of ISC on ES.

Among case studies of elaboration and realization by the Scientific Council of joint scientific-technical programs on prevention of natural and anthropogenic emergency situations applying uptodate scientific achievements we can note elaboration and adoption of two interstate programs.

On November 25, 1998 the Council of Government Leaders of the Commonwealth of Independent States approved the "Interstate Scientific-Technological Program of Organization of Seismic Monitoring on the Territories of the CIS Countries". This program outlines the goals, tasks, methodological basics of investigations and the content of activities as well as systematizes a complex of principal actions on seismic monitoring in seismic-risk regions of the CIS countries for the period 1998–2001.

On March 16, 2001 the CIS Economic Council, on the initiative of governments of the CIS countries, approved the "Interstate Program of Joint Researches by the Commonwealth Countries on Natural and Anthropogenic Emergency Situations for the Period Till 2003".

The interest to coordinating activities of the Scientific Council will grow with time on in view of an objective tendency to deepening of cooperation in protection of the population and territories from emergency situations, development on this basis of the unified national and interstate principles, norms and documents on the issues of legal, scientific-technical, economic interaction of the CIS countries taking into consideration a perspective of passing to security regulation in a natural-anthropogenic sphere by risk criteria.

6.3. Interstate Program of Joint Scientific-Technical Investigations in the CIS Countries of Natural and Anthropogenic Emergency Situations

In view of a clear-cut tendency observed in all CIS countries to a growing number of emergency situations of natural and man-made origin and gradually increasing scales of material damage the CIS countries faced the principal task on formation and realization of a single scientific-technical policy on assessment of natural and anthropogenic risks, methods of prevention and alleviation of emergency situation impacts and also development of a regulatory-legislative base.

This task was realized within the framework of the "Interstate Program of Joint Researches by the Commonwealth Countries on Natural and Anthropogenic Emergency Situations for the Period Till 2003", approved on March 16, 2001 by the Economic Council of the Commonwealth of Independent States on behalf of governments of the CIS member-countries. This program is the first stage of efforts of the CIS member-countries on ensuring security during emergency situations. In 2003 its realization was completed.

This program was prepared by 11 CIS member-countries: the Republic of Armenia, the Republic of Azerbaijan, the Republic of Byelorussia, Georgia, the Republic of Kazakhstan, the Kyrghyz

Republic, the Republic of Moldova, the Russian Federation, the Republic of Tajikistan, the Republic of Uzbekistan and Ukraine.

This program was targeted to coordination of efforts of all interested state and scientific organization in the CIS member-countries in relation to elaboration of the single interstate foundations of the socio-economic, legal and regulatory-technical support of security regulation and protection of the population, objects, territories and natural environment in the CIS countries from accidents and disasters of a anthropogenic and natural origin and also of likely transborder drifts. Such comprehensive formulation of the target in the CIS countries is witnessed for the first time.

The program included three main sections – scientific developments to ensure improvement of the Interstate System for Prevention and Liquidation of Emergency Situations in the CIS Countries; perspective scientific developments to ensure security and protection of the population and economic objects from natural and anthropogenic disasters and scientific-organizational actions.

On the basis of the Program implementation results there were presented systematized developments on analysis and elaboration of a regulatory-legal and methodological base of the CIS countries on prevention and liquidation of emergency situations and also results of investigations on development of principles, methods, criteria and systems of forecasting, approaches to assessment of risks, damage and ensuring security during emergency situations on national and interstate levels of cooperation.

One of the key directions of researches, carried out within the framework of the Interstate Program, is analysis of legal regulation in the CIS member-countries of the security issues during emergency situations and preparation on its basis the proposals on bringing closer and harmonization of national legislations in this sphere.

Among most important results in the field of legal support in the CIS member-countries of security issues during emergency situations obtained in the course of realization of the Interstate Program it is necessary to mention elaboration of approaches to structural systematization of national legislations of the CIS countries in relation to security issues in emergency situations, including the following groups:

- provisions in national constitutions identifying the basic principles of state regulation of relationships in the security sphere;
- basic (principal) acts, including constitutional laws setting legal foundations for ensuring security in emergency situations;
- specific (branch-related) legislative acts regulating legal relations in particular spheres of ensuring security in emergency situations;
- regulatory and legal by-laws presenting in more details the acting legislations of the CIS countries in the considered sphere.

As the results of the Interstate Program accomplishment have shown, the devised system of classification criteria and features made it possible to undertake a systems comparative analysis of national and interstate legislations of the CIS member-countries in the sphere of ensuring security in emergency situations in the context of problems of emergency situations and to prepare proposals concerning elaboration of single approaches to harmonization and bringing closer of national legal systems and also in the field of interstate and national standardization.

Materials of the mentioned investigations were published as three Collections of Materials of the Commonwealth Member-Countries on prevention and liquidation of emergency situations with circulation up to 350 copies in 2000, 2001 and 2003, respectively.

In the course of accomplishment of the Interstate program some practical steps were taken to harmonization of the national legislations of the CIS countries concerning security issues in emergency situations. Among such steps there are preparation and publication of three mentioned Collections of Materials of the CIS Member-Countries on prevention and liquidation of emergency situations and also preparation of the Draft Convention on Legal Interaction of the CIS Countries in prevention and liquidation of emergency situations.

Beginning from 2001 the concept as well as the first, second and final version of the Draft Convention were developed and agreed upon with respective bodies and organizations of the CIS member-countries.

This Convention is called to resolve the following problems:

- shaping of identical outlook on issues related to prevention and liquidation of emergency situations;
- bringing closer the legislations of the CIS countries concerning security from emergency situations;
- application of international norms and rules in operation of national systems related to ensuring security in emergency situations;
- improvement of a level of legal regulation of the activities on ensuring security in emergency situations in the CIS member-countries.

The idea of the Convention is in creation of mechanisms of interstate interaction that will help resolving the problems on bringing closer of legislations of the states signatories to the Convention on the basis of the norms of the international law. This Convention sill be submitted for approval to ISC on ES in 2004 for its subsequent adoption following the established procedure.

Therefore, as a result of investigations carried out under the Interstate Program there justified the basic theoretical and methodological provisions concerning formation of the coordinated legislation of the CIS member-countries in ensuring security in emergency situations, and some practical steps are taken for their realization.

Here are some examples of realization of scientific-technical developments carried out within the framework of the Interstate Program.

One important example of development of the Interstate System for prevention and liquidation of emergency situations in the CIS member-countries is elaboration by VNII CDES of a coordinated regulatory document – Regulations on Complex Risk Assessment on the Territory of the Russian Federation including a methodology for assessment of a complex risk for the population from emergency situations of the natural and man-made origin.

As concerns elaboration of the initial interstate regulatory base for assessment of security and risk the interstate standardization and a procedure of application of interstate standards are of essential significance. At present twenty interstate standards are adopted within the framework of the Interstate Council on Standardization, Metrology and Certification that are included into a complex “Security Issues in Emergency Situations” and are based on national standards of the Russian Federation GOST P.

The Ministry of Emergencies of the Republic of Byelorussia developed and approved at the 17th Meeting of ISC on ES on August 15, 2002 the "Classifier of Emergency Situations". This Classifier sets a single approach to classification of emergency situations of natural and mad-made origin that occurred or may occur on the territory of the CIS countries and also in zones of responsibility of these countries (on the territories of rivers and seas). An exchange of information on emergency situations in a special format is also envisaged.

Therefore, gradual realization of national, interstate and international programs will make it possible to elaborate and introduce in practice of international relations in the 21st century the single theory-based national and international regulatory and legal base on technical, legal and socio-economic regulation of the security issues and risk assessment in a natural-anthropogenic sphere. And this basis will enable development of an effective international mechanism for risk reduction, warning on and prevention of natural, man-made and natural-anthropogenic disasters and mitigation of their impacts.

SECTION 7. PRIORITY ISSUES TO BE DISCUSSED AT THE WORLD CONFERENCE ON DISASTER REDUCTION

7.1. General Perspectives and Problems of International Activities in Disaster Control and MSUOB

At present the international activities on disaster risk reduction, including MSUOB, are based to a great extent on the UN efforts and efforts of other international organizations. At the same time the efforts on disaster control are largely realized on national levels. However, with the growing organizational, technological and resource capacities of states the need in international efforts in this sphere, including in international aid during hazards, is maintained and even increasing. That is why in the future MSUOB will remain on demand.

For the Russian Federation its participation in international efforts on disaster control matches its national interests. Active participation in these activities serves to improve the international authority of Russia, secures Russian interests abroad, creates conditions for receiving foreign aid during hazards and forms prerequisites for the Russian economy to use advantages of the global economic ties. Having attained certain success in development and manufacturing of protective means and emergency-rescue facilities, Russia is capable to create a new export direction meaning delivery of advanced technologies, commodities and services for international humanitarian operations and projects.

As the situation being established in the world, national and international interests show that in the future the need in international humanitarian cooperation, in realization of the International Strategy of disaster risk reduction will be maintained, the agenda of the World Conference should include the issues on overcoming of certain difficulties and drawbacks of these activities, such as:

insufficiency of financial and material resources for disaster control being at the disposal of UN and other international organizations for rendering assistance in the required volumes, including for realization of MSUOB;

political, ethical and religious frameworks existing in some countries that impede their efforts on disaster risk reduction;

orientation of governments in some developing countries during disasters mostly to external aid and not relying on their own means;

lack of possibilities or will of governments in some countries to follow the recommendations of UN or other international organizations in addressing disasters, application of the advanced experience of other states in this field;

border and customs difficulties faced by operative management bodies, emergency-rescue forces and humanitarian convoys (expeditions, columns) when they urgently need to cross state borders;

the humanitarian aid not reaching the affected population, lack of direct access to the affected population that leads to plundering of this aid;

arising in many emergency situations, especially caused by conflicts, of a risk to the life and health of the personnel of international humanitarian organizations and the personnel of international states arrived for rendering assistance;

difficulties with management during disasters by emergency-rescue and other forces from different countries having different composition, training, equipment and applying different technologies;

drawbacks in organization of rescue operations and other kinds of aid directly in the disaster zones, a low level of coordination of operative actions of units from different countries.

7.2. Priorities for Improvement of International Activities on Disaster Risk Reduction

International humanitarian organizations led by UN are constantly seeking, including with the help of MSUOB, for ways to ensure more efficient and coordinated response to disasters and resultant emergency situations.

In the recent time the international activities and international cooperation in this field were developing on the basis of agreed upon conclusions adopted by the UN Economic and Social Council (1999) at a stage of humanitarian issues consideration. The Council has confirmed that humanitarian aid should be rendered in accordance with the guiding principles contained in an annex to Resolution 46/182 of the UN General Assembly (December 1991) at their proper observance.

At the same time the Russian Federation believes that for improvement of these activities a more detailed outlining of respective directions and their discussion at the World Conference are needed. They are:

further development and improvement of the international humanitarian law, harmonization of national legislations;

development of international systems of monitoring and forecasting, improvement of international exchange of information on disasters;

promotion by the international community of development of national systems of disaster reduction, extension of own capacities of countries, especially developing ones, in coping with this issue;

integration of national systems of disaster reduction, establishment of international (interstate) systems for disaster control, joint bodies, separate international institutions and organizations, formation of a system of collective security;

establishment of national formations capable to act abroad, organization of international groups of forces acting under the auspices of UN and other international organizations;

promotion unification of organizational structures, methods of work, technical equipment, management bodies and forces of national and international systems of disaster control with a view to attain their more efficient interaction;

elaboration and implementation of actual interstate and international projects, programs and actions on alleviation of hazards, disaster risk reduction and downscaling of their impacts;

improvement of international mechanisms of disaster response, improvement of participation of national and international forces in liquidation of their impacts;

better organization of humanitarian aid to affected countries and their population;

improvement of emergency evacuation of foreign citizens from countries in which large-scale emergency situations occur;

wider education of specialists for national disaster reduction systems in other countries;

improved organization of international exercises on disaster control;

development of international trade with technical means and facilities designed for disaster control;

development of international scientific cooperation in disaster reduction;

expansion of practice, actualization and deepening of themes of international collective actions on disaster reduction.

Each of these directions may be discussed at the World Conference, for each direction it is possible to suggest many actions of various purpose, content and scale. However in the established international reality the most essential or urgent actions deserve primary attention. International activities on disaster control should be improved mainly within the framework of the International Strategy of disaster risk reduction.

At the World Conference it is advisable to consider also conservation of the natural and cultural heritage as a specific problem including the following aspects:

- state policy on reduction of disaster risks leading to perishing of the heritage;
- identification of perishing risks of the most valuable objects of the heritage, first of all, monuments of the world heritage UNESCO;
- scientific and educational programs on disaster risks leading to destruction of nature and culture monuments;
- preparedness and emergency planning of actions on prevention of perish and saving of the heritage objects.

It is important that the issues on conservation of the historical, cultural and natural heritage was not removed from the MSUOB structure and is considered as its logical element.