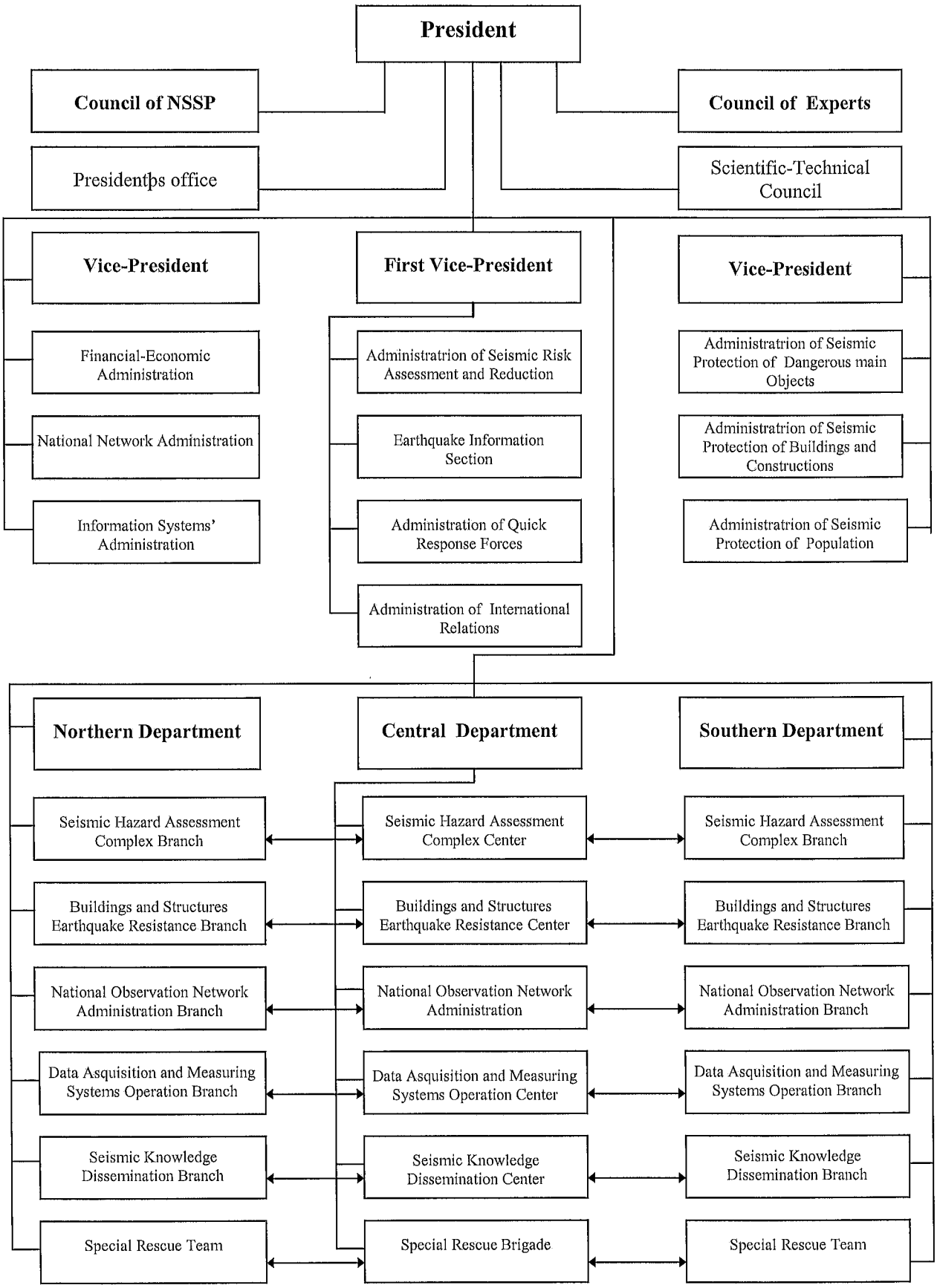
NATIONAL SURVEY FOR SEISMIC PROTECTION OF ARMENIA

In Armenia, strong earthquakes have been occurring since 20-17 Millennium BP. Considering the scope of human losses and damage, the Spitak earthquake of December 7, 1988 with a magnitude M=7.1 was, apparently, the most terrible one, during which 25,000 people died, more than 20,000 were injured, and 515,000 were left homeless.

The problem of protecting the Armenia population against strong earthquakes inevitably became one of national concern. In accordance with the project proposed by Prof. Dr. S. Balassanian to the President, Parliament and Government of the Republic of Armenia, the National Survey for Seismic Protection (NSSP) was founded under the Government of the Republic of Armenia on 17 July, 1991 and was given special governmental status and powers (Fig.1). **The basic goal of the NSSP is seismic risk mitigation in Armenia. The NSSP of Armenia is one of the future models for managing seismic risk mitigation.**

The NSSP consists of the Northern, Central and Southern Departments (Fig. 2). The structure of NSSP is given on Fig. 3.

Structure of the NSSP RA



The particulars of the NSSP are as follows:

- State management body of high status that is directly responsible for seismic risk reduction in the territory of Armenia.
- The President of the NSSP, during highly increased current seismic hazard, directly reports to the President of Armenia, Prime Minister, and the Head of EMA under the Government of RA.
- Previous separate groups and organizations separated before, solving different problems that sometimes do not interact have now merged into the one NSSP structure.
- Organizational structure, that consist of specialized centers, having close interrelation in bounding issues, taking responsibility for each element of seismic protection (from seismic hazard and risk assessment to earthquake engineering, from population education to the organization of professional rescue teams).
- Administrative structure based on the horizontal interaction of the Centers and their direct vertical subordination to the NSSP President.
- Territorial Principe of management.
- The overall goal to reduce seismic risk which combines the activities of all the Centers
- Internationalization of NSSP program activities based on international projects and agreements with leading world centers in all areas of seismic risk reduction.
- Training of experts at different scientific and engineering World Centers aimed at assimilating the progressive technologies and their wide implementation into the NSSP activities.
- Creation of a modern technical base consisting of different companies. equipment combination, best adopted to the conditions of Armenia;
- Subordination to National Service of all observation stations located in Armenia, combined in National Network which consists of stations at three different levels -global international networks (IRIS, GPS, READINESS), regional and local networks that control the overpopulated regions (Yerevan and others), and the most important sites (Armenian Nuclear Power Plant and others).
- Data processing and analyses of information on a round the clock basis, i.e. concentration of the information from all the observation stations in real time to the Seismic Hazard Assessment Center.
- Using all the communication means (such as phones, satellites etc.) to connect all the observation stations with the Seismic Hazard Assessment Center.
- Unique national database, including seismological, geophysical, geological, geochemical etc. information about the Earth Crust condition in the territory of Armenia and neighboring countries. A special part in the database is occupied by the National Earthquakes Catalogue containing information about 18 000 seismic events since 20-17 Milenium B.P.
- The NSSP President adopts decisions about the seismic hazard level at the NSSP Expert Council . Only then can the information and recommendations on corresponding activities be handed over to the Prime Minister of Armenia and the Head of Emergency Management Administration.

The mentioned above specifications have enabled NSSP to meet the following objectives in a very short period of time. This includes the following:

- Development of a Seismic Risk Reduction Program, including all the aspects of seismic protection of population;
- Seismic hazard assessment in the 1:1000000 scale for the Crimea-Caucasus-Kopet Dagh test area (the works was carried out in the GSHAP framework; INTAS grant No. 94-1644, in collaboration with seismological organizations of Azerbaijan, Czech Republic, Georgia, Germany, Greece, Iran, Italy, Russia, Switzerland, Turkey, Turkmenistan, Ukraine). The INTAS Program "Test Area for Seismic Hazard Assessment in the Caucasus" has been implemented during the time-period from 1995 to 1997.

The project joined scientists from three INTAS countries (Italy, Switzerland, Germany) and from seven organizations of six FSU countries (Russia, Azerbaijan, Georgia, Turkmenistan, Ukraine, Armenia). The main goal was to reactivate the seismic hazard assessment program in the Crimea - Caucasus - Kopet Dagh region by establishing a test-area for multi-national, multi-disciplinary, multi-method assessment of seismic hazard, in cooperation with organizations in neighbouring countries (Iran, Turkey) and with international scientific agencies and programs (IASPEI, ESC, GSHAP).

Based on the consensus achieved between the national groups of specialists, representing the responsible seismological surveys of the adjacent in the region countris (Armenia, Azerbaijan, Georgia, Turkey, Iran, Russia, Ukraine and Turkmenistan), first maps of seismic hazard for Cremia - Caucasis - Kopet Dagh - NE Turkey - NW Iran region have been compiled.

Seismotectonic-Probabilistic method implemented by the NSSP Armenia and the resulting zonation map were considered at the 29th IASPEI General Assembly special session on GSHAP as meeting all the requirements of international standards. This map should become the part of the Global Seismic Hazard Assessment Map (Fig. 4).

Results are published in Final Report "Test Area for Seismic Hazard Assessment in the Caucasus", the NATO Kluwer Series "Historical and Prehistorical Earthquakes of the Caucasus", and presented at several international seismological assemblies, including the 29th IASPEI General Asembly, Greece, 1997, and Second International Conference on Earthquake Hazard and Seismic Risk Reduction, Armenia, 1998.

Using the same approach to seismic hazard assessment the New Seismic Zonation Map for the territory of Armenia at the scale of 1:500 000 was compilad at the NSSP RA in collaboration with Swiss Seismological Survey (Fig. 5). In 1998 the map was finally, approved by the NSSP and submitted to the Government of Armenia as a new strategic basis for the safe urbanization of the territory of Armenia. (Accomplished by the Seismic Hazard Assessment Complex Center) (Fig. 6a,b,c);

- Seismic risk assessment for the territory of Armenia. (Accomplished by the NSSP Seismic Hazard Assessment Complex Center and Earthquake Engineering Center) (Fig. 8a,b);
- Participation in the development of new earthquake engineering codes together with the Ministry of Urban Planning of Armenia and other Armenian organizations. (Accomplished by the NSSP Earthquake Engineering Center);
- Development, testing and practical usage of new methods for improvement of seismic resistance of existing buildings without evacuation of tenants from buildings in earthquake zone with the assistance of Ministry of Urban Planning (World Bank credits). (Accomplished by the NSSP Earthquake Engineering Center);
- Development and step by step realization of the population preparedness program and the State Managing bodies for the activities before, during and after the earthquakes. (Accomplished by the NSSP Seismic Knowledge Dissemination Center (Fig. 9a,b);
- Creation of Prompt Response Forces that include seismologists, communication and earthquake engineers, instructors, working with the population, rescuers from the NSSP Special Rescue Brigades furnished by Swiss equipment donated by SDR (Fig. 10a,b);
- Creation of an multiparameter observation network consisting of more then 150 observation stations for monitoring lithosphere that are connected to the global networks.
- Development of new technology for current seismic hazard assessment that includes new methods of observation, data processing and analysis. (Accomplished by the NSSP National Observation Network Administration) (Fig. 11a,b,c) and the Center of Data Acquisition and Measuring Systems Operation (Fig. 12a,b);
- Early warning system development.

STRUCTURE OF THE
SEISMIC HAZARD ASSESSMENT (SHA) COMPLEX CENTER

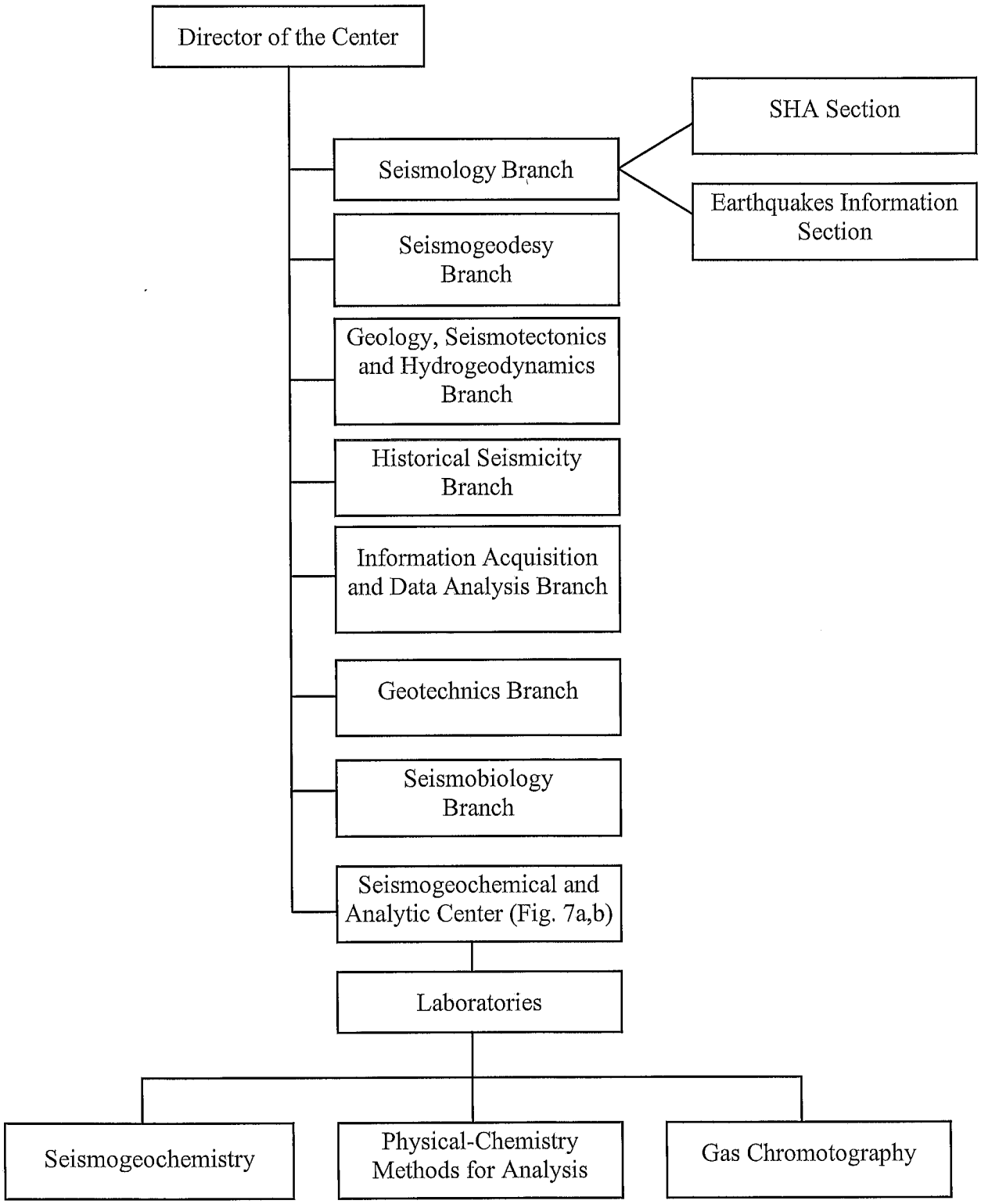


Fig. 6a

The main tasks of the SHA Complex Center are the following:

- Long-term SHA in Armenia and adjacent States, including:
  - compiling the maps of seismic zoning of different scales (1:50000, 1:200000 etc.) for the territory of Armenia in deterministic and probabilistic approaches;
  - analyzing the seismic regime of the region and compiling the National Earthquake Catalogue for the territory of Armenia and adjacent regions - for the instrumental, historical and prehistorical periods;
  - geological, seismotectonic, paleoseismic, geophysical, and geodynamical investigations in the territory of Armenia aimed at distinguishing the SSZs (seismic source zones);
  - determining the seismic effect of the distinguished SSZs on the Earth's surface;
  - physical-geological study of the source zones of strong earthquakes.
- Current SHA in Armenia and adjacent countries, including:
  - visualizing and processing the time series observations of changes in parameters of the solid, liquid and gaseous phases of the lithosphere and manifestation of those changes in the atmosphere and biosphere;
  - revealing of the "seismogenic" component of dynamics of geophysical, geodynamic and other fields in time, which are related to the process of a strong seismic event preparation and realization;
  - determining the spatial position of the source of "seismic" changes in geophysical, geochemical, geodynamic and other fields; its identifying with a strong earthquake preparation zone;
  - assessment of the time of a probable transition of quantitative changes into qualitative ones, which correspond to the time of a possible strong earthquake;
  - creating the expert system for quantitative assessment of current seismic hazard in Armenia including determining the location, intensity and time of a possible strong seismic event.
- Compilation of the map of seismic risk over the territory of Armenia and her big cities and especially crucial objects.
- Development of the programs on seismic risk reduction for the entire territory of Armenia and for the big cities and their transference to the RA Government.
- Participation in the works of the NSSP operative brigades at strong earthquake realization in Armenia, including:
  - study of the earthquake influence in a source zone;
  - operative work on seismic data acquisition and processing;
  - operative analysis of current seismic hazard, including prediction of further development of the seismic situation;
  - development of a plan for interaction between the NSSP, local authorities and the RA Government.

STRUCTURE OF THE EARTHQUAKE ENGINEERING CENTER

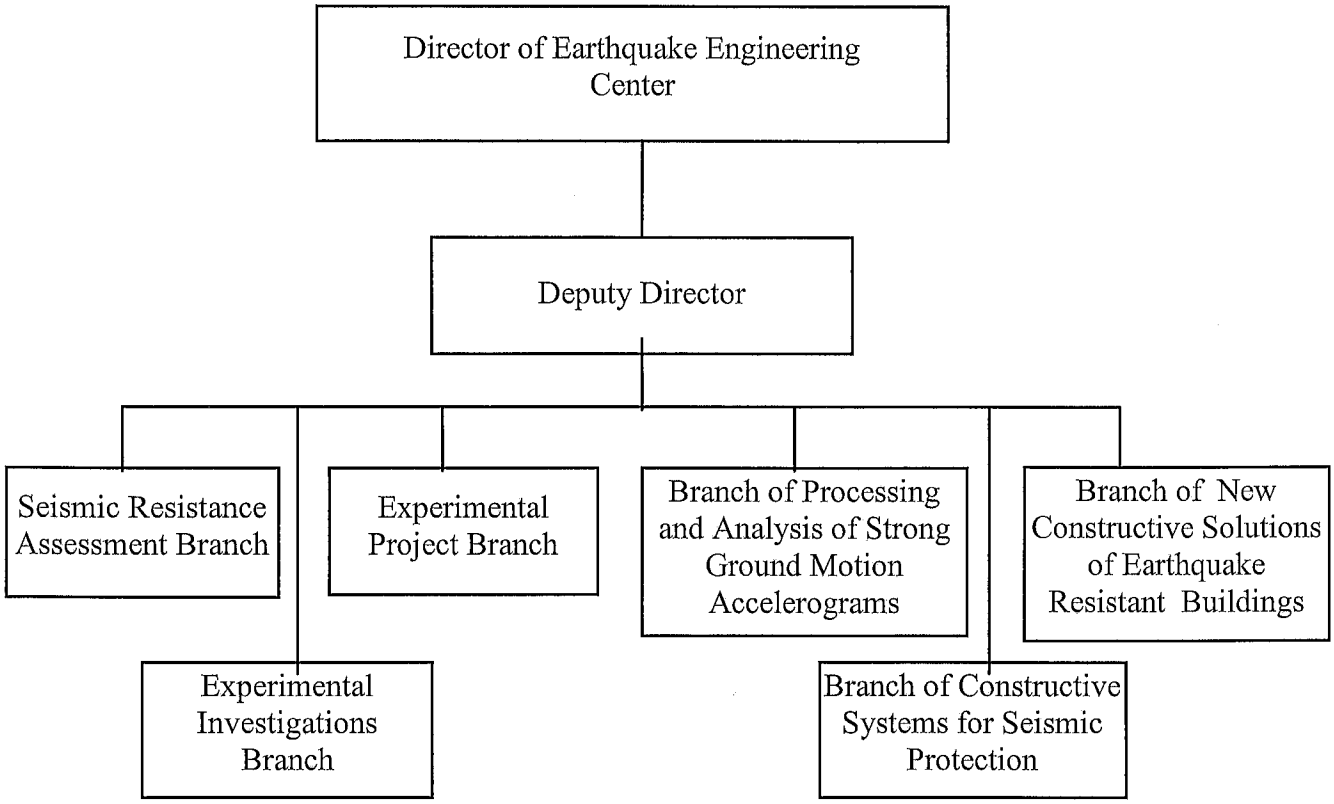


Fig. 8a

The main tasks of the Earthquake Engineering Center are the following:

- creation of data base on strong ground motions in the territory of Armenia and other countries;
- assessment of buildings and structures vulnerability at different levels of seismic hazard;
- prediction of buildings and structures behavior during expected earthquakes;
- compilation of the seismic risk map and the scheme of actions on risk reduction for the populated sites of Armenia;
- development of normative documentation on construction;
- development of the methods on upgrading earthquake resistance of existing buildings and structures (Fig. 13 - 4-storey seismoisolated living block in the town of Spitak, and 9-storey earthquake resistant living block in the town of Vanadzor);
- estimation of the technical state and earthquake resistance of existing buildings and structures and control over the quality;
- participation in the works of the operative brigades.

STRUCTURE OF THE SEISMIC KNOWLEDGE DISSEMINATION CENTER

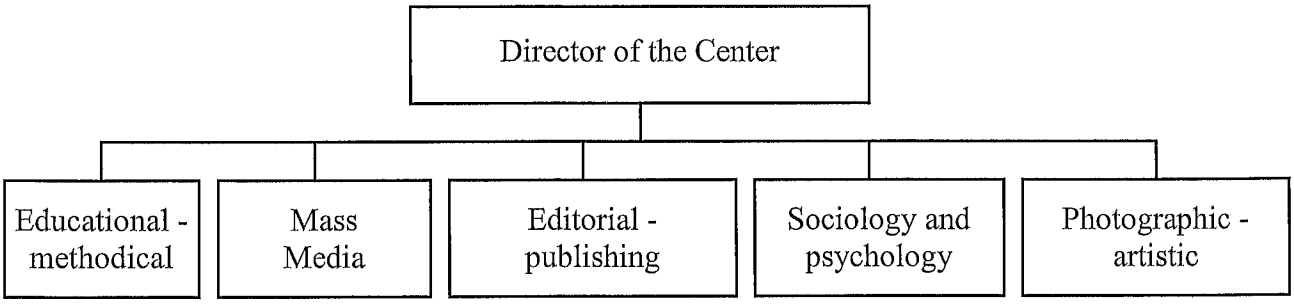


Fig. 9a

The main tasks of the Seismic Knowledge Dissemination Center are the following:

- delivering lectures and preparation of corresponding instructions for training the population the rules of seismic protection;
- delivering lectures for the NSSP employees to teach them the rules of seismic safety and increasing of watchfulness on work places and at the observation points;
- radio and TV broadcasting on training the rules of behavior before, during and after an earthquake;
- periodic elucidation of the seismic situation in Armenia and adjacent countries by means of mass media;
- periodic organization of press-conferences;
- publication of educational guides on protection against earthquakes;
- publication of illustrative and video materials on protection from earthquake;
- organization of planned sociological and psychological works on estimation of the population preparedness in the field of seismic protection.

STRUCTURE OF THE RESCUE BRIGADE

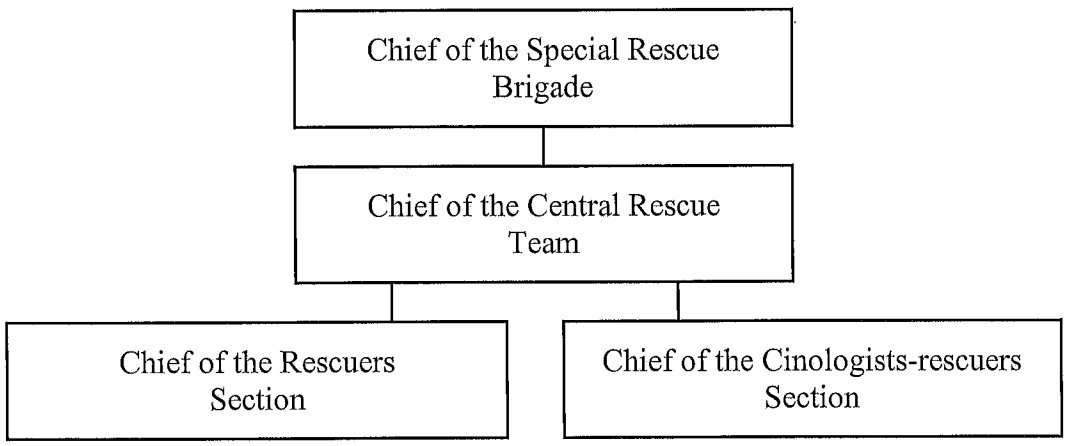


Fig. 10a

The main tasks of the Special Rescue Brigade are the following;

- conduction of rescue works;

- organization of rescue dogs training;
- preparation of instructors and cinologists-rescuers;
- interaction of the NSSP Special Rescue Brigade with EMA RA and other professional and volunteer rescue detachments of Armenia.

STRUCTURE OF THE NATIONAL OBSERVATION NETWORK ADMINISTRATION

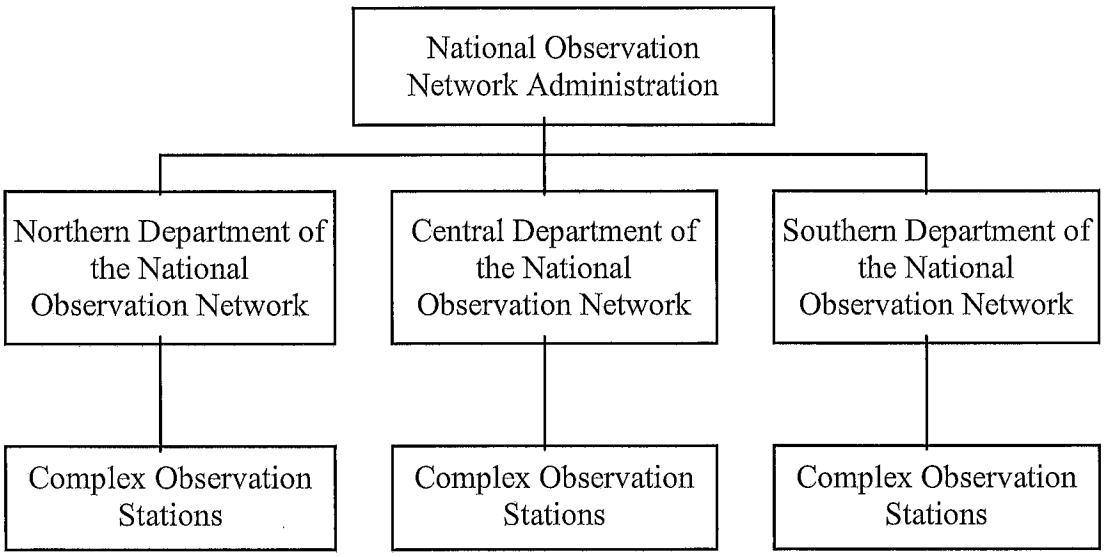


Fig. 11a

The main tasks of the National Observation Network Central Administration are the following:
- development and upgrading of the national observation network;
- scientific-methodical, industrial and economic control at observation points;
- design and confirmation of juridical documents at observation points;
- control over repairing-maintenance works at observation points;
- geological and geophysical attestation at all observation points;
- obtaining the uninterrupted time-series of data from the observation points;
- participation in the works of the operative brigades.

STRUCTURE OF THE CENTER OF DATA COLLECTION AND MEASURING SYSTEMS OPERATION

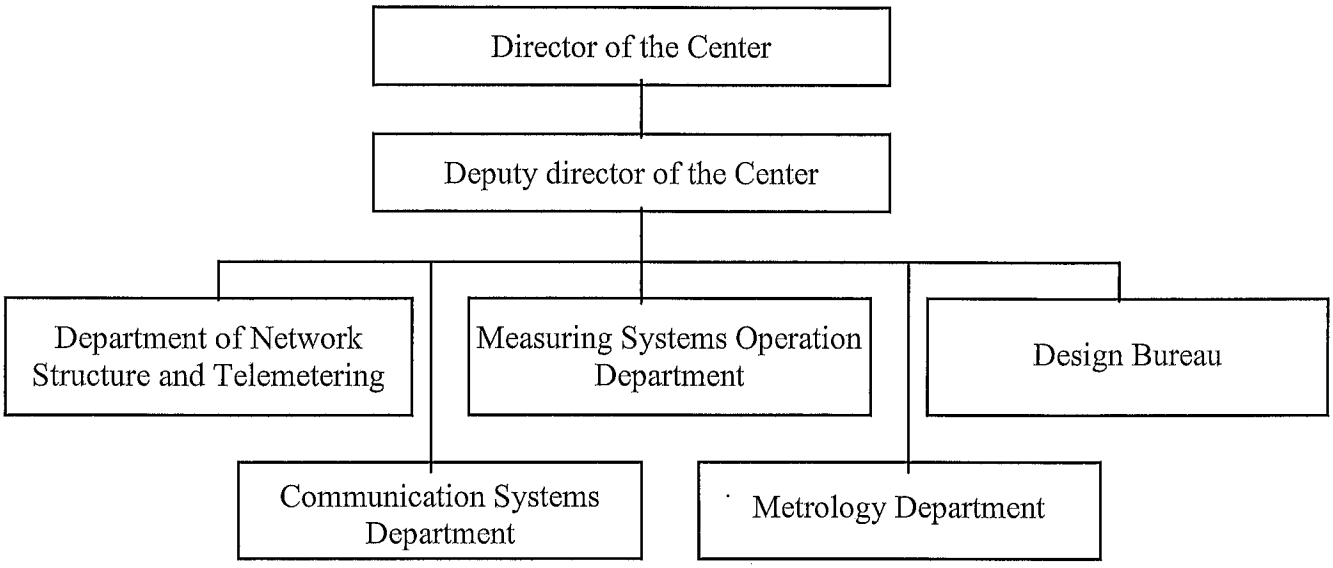


Fig. 12a

The main tasks of the Center of Data Collection and Measuring Systems Operation are the following:

- operation and service of the NSSP telemetering systems;
- communication systems maintenance and exploitation;
- the NSSP measuring systems operation and service;
- repair of the NSSP computer park;
- selection of the essential measuring apparatus using Technical Assignment;
- elaboration and manufacture of experimental samples of non-standard apparatus;
- the NSSP measuring systems attestation.

NON CONVENTIONAL APPROACHES FOR RETROFITTING OF EXISTING APARTMENT BUILDINGS AGAINST FUTURE STRONG EARTHQUAKES

The conventional approaches for retrofitting of an existing buildings are not acceptable in Armenia, with its keen housing problems, as far as they require re-settlement of residents and, consequently, providing them with temporary shelters, that in turn entails additional investments. Non conventional approaches, allowing the retrofitting of existing buildings without interruption of their functioning are more preferable. That is why, the EEC of the NSSP since 1992 has launched active works marching for new structural concepts, and now, one can say with confidence, that solutions leading to revolutionary changes in the field of retro6tting and upgrading of earthquake resistance of buildings and structures in the country have been found. Within a very short period of time, new unique and e6ective seismic protection methods were developed and introduced into the construction practice. The proposed non conventional methods are based on the application of laminated rubber bearings (LRBs) in two ways: beneath the buildings and over them.

THE NON CONVENTIONAL APPROACH TO UPGRADE EARTHQUAKE RESISTANCE OF EXISTING 9-STORY R/C FRAME BUILDING WITH SHEAR WALLS BY MEANS OF AN ADDITIONAL ISOLATED UPPER FLOOR (AIUF)

The 9-story R/C buildings (series 111) are designed as precast framed systems the horizontal stiffness of which is provided in the longitudinal direction by the frames with strong beams and in the transverse direction by the frames with weak beams and shear walls. Precast columns with their cross-section of 40x40 cm are designed with the length of three stories, precast strong beams with their cross-section of 40x52 cm (including thickness of slabs) are designed with the length of one span and weak beams with their cross-section of 120x25 cm are also designed with the length of one span. The slabs of these buildings include the different by their width precast void floor panels with 22 cm of thickness. Shear walls are also prefabricated and have thickness of 14 cm. Basically, all joints of factory-produced precast elements, i.e. joints of columns, columns and both types of beams, shear walls and columns, are designed by using on-site welding. The joints of floor panels, shear walls and weak beams are designed by using connections of reinforcement. Exterior walls of precast concrete are attached to the outer face of the frames. The buildings designed by above described concept were widely used in Armenia, and particularly in Gumri and Vanadzor and were heavily damaged during the 1988 Spitak earthquake.

The project on upgrading seismic resistance of a 9-story frame R/C building with shear walls by means of AIUF method pioneered in applying seismic isolation structures to the top part of the building instead of its base. The considered existing building has the square plan with the distance between columns 6x6 m. There are 16 columns in the plan of the building. All columns are passing through the slab of the ninth floor on the height of 1.0 m into the space of the attic floor. The assembling of AIUF over the 9-story building starts after dismantling of the attic floor. The connection of AIUF to the building was designed by means of LRBs. In this project the high damping rubber bearings (HDRBs) were used. All 16 columns on the top of the building were taken into steel jackets with the height of 1.0 m so that the horizontal parts of the each jacket in the size of 414x414 mm represented steel plates with the thickness of 25 mm, to which recess rings were bolted. To simplify the manufacture and installation on site of the bearings, a simple recess connection detail was chosen. The steel jackets of all 16 columns were connected to each other by means of steel trusses. Thus a rigid structure is created to transfer the forces from AIUF to the building.

To implement the project 16 bearings were manufactured by Min Rubber Products Sdn. Bhd., Beranang, Selangor, Malaysia. It is assumed that HDRBs will he installed on each column (jacket). After installation of all HDRBs the structures of AIUF were assembled above them. The AIUF represents a steel frame structure with the same number of columns in plan as in the building. The base of each column is a steel plate bolted to the upper recess rings of HDRBs. All steel columns of AIUF also were connected to each other by means of steel trusses. On the level of upper belts of trusses a R/C slab is designed using precast panels with the thickness of 22 cm. The plane roof and the exterior walls of AIUF were designed using light "sandwich" type elements. In essence, the additional floor itself also represents the rigid structure, which during the earthquakes, being supported by HDRBs, practically has no deformations.

Under the earthquake impact AIUF, acting as vibration damper, reduces stress-deformed state of the building and increases earthquake resistance rate for the latter in average by a factor of 1.6. The reduction of shear forces in the building with AIUF takes place because of increase of the period of vibration of the whole system (building plus AIUF) and decrease of the first mode vibration coef6cients. The new type of second mode of vibration appears and becomes prevailing and as a result AIUF oscillates in anti-phase related to the building. All these factors are leading to the reduction of shear forces and horizontal displacements.

It is worth noting, that the isolated upper floor allows not only upgrading earthquake resistance of a building, but enlarging its useful space as well. The most distinctive feature of the new earthquake resistance upgrading method, however, is that there is no need to re-settle residents from the building during construction works. Opponents may argue that the method does not provide increase of earthquake resistance rate for two or more times. Nevertheless, assuming keen housing problem in Armenia along with increased seismicity of its territory, it is obvious that any, even slightest upgrading of earthquake resistance for existing buildings will improve their chance to escape destruction in future strong earthquakes. In present time the upgrading of earthquake resistance of two buildings by means of AIUF is already accomplished in the city of Vanadzor.

THE NON CONVENTIONAL APPROACHE FOR RETROFITTING OF EXISTING 5- STORY STONE BUILDING BY MEANS OF BASE ISOLATION

Buildings of this type (series 1A-450) also have been erected in all regions of Armenia. They have the bearing walls with 45-50 cm of thickness located mainly in transverse direction. The horizontal stiffness in the longitudinal direction is provided partly by the R/C frames with strong beams and columns, made inside the body of walls, and by longitudinal walls at the edge parts of the buildings. The analysis of consequences of the Spitak earthquake has shown, that the most vulnerable zones in this buildings are the edge parts where the direction of bearing walls had been changed. It is in these very zones that intensive plastic deformations resulting in failure of the buildings have been developed due to the weak connections between longitudinal and transverse walls.

The developed structural concept aims to retrofit of an existing building by means of seismic isolators using simple working technology. This is a unique pioneering seismic isolation project introduced for an existing 5-story stone building. The idea is to supply this building with seismic isolation in the foundation by gradually cutting the isolators into the walls at the level of foundation upper edge by means of a two-stage system of R/C beams. The operation is made without re-settlement of the dwellers. The world practice has had no similar precedent in retrofitting of apartment buildings. To implement the project 60 HDRBs were used, 28 bearings have been manufactured in MRPRA and 32 in Malaysia by Min Rubber Products Sdn. Bhd. and Sime Engineering Rubber Products Sdn. Bhd.

Seismic isolation method for an existing building with bearing walls, that envisions placing seismic isolators at the level of basement, solves the problem as follows. According to the innovative technology, openings are made in the basement and in the bearing walls to accommodate lower reinforcement frames with seismic isolator sockets. Binding reinforcement lower frames are passed through them along both sides of bearing walls and concreted. The next step is to place seismic isolators in the lower sockets. Here again a simple recess connection detail was chosen. Upper sockets and upper reinforcement frames are placed on the isolators passing upper binding reinforcement frames through the upper reinforcement frames along both sides of bearing walls and concreting them. In concreting the frames, ends of binding reinforcement frames are left free beneath and above seismic isolators. In the parts of walls between seismic isolators, openings are made where binding reinforcement frames are placed leading additional reinforcement frames through them The latter tie binding reinforcement frames of neighboring seismic isolators and are concreted then. Thus, continuous upper and lower beams are formed along all bearing walls of the building. Parts of walls between seismic isolators are removed at that and the building appears separated from its foundation and linked to it only with seismic isolators.

It is very important that openings in walls are made with single-spacing, i.e., two adjacent openings should not be made simultaneously; parts of walls existing between seismic isolators should be cut off beginning from the building middle in plan. It is obvious that suggested working technology is rather facilitated and supervision of working performance simpli6ed. In present time the retro6tting of one building by means of base isolation is already accomplished also in the city of Vanadzor and without moving residents from the building during construction works.

Nowadays the NSSP RA takes part in the following main international agreements and programs:

International Agreements

France-Agreement with "Institute de Physique du Globe de Strasburg". **Georgia-** Agreement on Cooperation with Institute of Geophysics of the Georgian AS. **Germany**-Agreement with the GeoForschungsZentrum (GFZ, Potsdam) about joint works on studies of large- scale interactions of fault zones in E. Mediterranean and seismic risk mitigation in Armenia.
Works within the framework of the international program READINESS (Real Time Data Information Net in Earth Sciences) and in connection with IDNDR (International Decade for Natural Disaster Reduction) with Germany, Georgia, Israel, Russia, Syria, Turkey. **Greece**-Agreement with EPPO (Earthquake Planning and Protection Organization on "Cooperation in the Field of Seismic Risk Reduction in Armenia and Greece" .**Iran**-Memorandum of mutual understanding between the NSSP RA and the Geophysical Institute of Tehran University. **Italy**-Agreement with the National Institute of Geophysics of Italy about collaboration in the field of seismic risk reduction in Armenia and Italy. **Russia**-Agreement on Scientific Technical Cooperation with the Institute of the Earth's Physics of the Russian AS. Agreement on Scientific Technical Cooperation with Test-Methodical Expedition of Institute of the Earth's Physics of the Russian AS. **Switzerland-** Collaboration with the Swiss Federal Institute of Technology (ETH, Zurich) and operating at the same Institute the Swiss Seismological Service (SSS). SMACH Accelerographs Collaboration with the Swiss Disaster Relief (SDR). **USA**-Agreement with the US Geological Survey (USGS) on "Creation of the Station of Global Seismographic Network" (IRIS).Agreement with the National Aeronautics and Space Administration (NASA) about cooperation in the field of space geodesy.

International Programs

INTAS (International Test Area for SHA in the Caucasus), and GSHAP (Global SHA Program), "Short period time dynamics of the seimicity " Italy and Russia.
"COPERNICUS" " Tectonic early warning system through real time radon (RN) monitoring; a geophysical method for forecasting earthquakes", with Greece, UK, Russia and Albania. **PICS** (Program International Cooperation on Scientific) of the National Center of Scientific Research. "Intensity fields, hydrogeochemical variations of underground water and kinematics of faults in a seismic zone: on the example of the Lesser Caucasus (Armenia)", with France.**GPS** (Global Positional Satellite Geodesic System). Study on Regional Deformations on the Territory of Armenia, with Bulgaria, Germany, Georgia, Greece, Egypt, Russia, Turkey, the USA and Switzerland. **The Study of strong movements of the ground on the territory of Armenia on the basis of Swiss stations SMACH-1** with Switzerland. **The study of strong movements of the ground on the territory of Armenia and Georgia** with Georgia and Russia. **Cooperation in the field of historical catalogues** with Italy. **NATO Science for Peace Programme**. Draft programs: "Oil Pollution Detection in Ground Water from Real Time Early Warning to Overall Assessment" with Greece, Macedonia. "Archaeo-tomographer: design, development and evaluation of a high-tech geophysical system for the three-dimensional imaging of the archaeological sites", with Albania, Bulgaria Georgia, Greece, Russia, Turkey. "Risk assessment of natural and manmade disasters and planning of countermeasures for prevention or mitigation of losses for big cities in the Caucasus", with Azerbaijan, Georgia, Russia.

International Conferences, Workshops organized by NSSP

Under the harshest conditions for Armenia in 1991-1993, on 1-6 October, 1993 NSSP organized the First International Conference on "Continental Collision Zone Earthquakes and Seismic Hazard Reduction", devoted to the 5th Anniversary of the Spitak earthquake where about 200 experts from more than 20 countries of the world participated.

On July 11-15, 1996 the NATO Advanced Research Workshop on "Historical and Pre-Historical Earthquakes in the Caucasus " was conducted under the aegis of NATO, where experts in the field of strong earthquakes on the territory of the Caucasus from different countries came together.

On September 15-21, 1998 The Second International Conference on "Earthquake Hazard and Seismic Risk Reduction" - the IDNDR Regional Conference for the Countries of the Commonwealth of Independed States (CIS) and Central and Eastern Europe, Commemorating the 10th Anniversary of the Spitak Earthquake was held, where more than 300 experts from 43 countries participated. The Conference adopted following Declaration.

YEREVAN DECLARATION

The Second International Conference on "Earthquake Hazard and Seismic Risk Reduction" - The International Decade for Natural Disaster Reduction (IDNDR) Regional Conference for the Countries of the Commonwealth of Independent States (CIS) and Central and Eastern Europe - Commemorating the 10th Anniversary of the Spitak Earthquake
15-21 September, 1998
Yerevan, Armenia

The Second International Conference on "Earthquake Hazard And Seismic Risk Reduction" - The International Decade for Natural Disaster Reduction (IDNDR) Regional Conference for the Countries of the Commonwealth of Independent States (CIS) and Central and Eastern Europe - dedicated to the 10th Anniversary of the Spitak Earthquake (later referred to as Yerevan Conference), summarized the experiences and achievements of different countries in the field of seismic risk reduction and other natural disaster reduction, as well as discussed possible strategies for disaster reduction in the 21st century. The participants of the Conference would like to draw the attention of the General Assembly of the United Nations and the Armenian Government to the following:

1. The meeting brought together more than 300 participants from 43 countries, including all the countries of the CIS, several countries from Central and Eastern Europe and Asia, and Greece, Germany, the US and others. The participants included local and national decision-makers, scientists, disaster reduction experts and representatives from research institutes. There were also representatives from the private sector and the media. The Conference was sponsored by the Government of the Republic of Armenia and the IDNDR Secretariat. The conference was organized by the National Survey for Seismic Protection (NSSP) of the Republic of Armenia.

2. The conference was inaugurated by the Prime Minister of the Republic of Armenia, the All-Armenian Patriarch and the Director of the IDNDR Secretariat. Both the PM and the Patriarch of RA noted in their keynote addresses that in order to overcome the obstacles that disasters pose to national and regional sustainable development, technically consistent disaster prevention measures should be adopted. They also noted that with the increasing scale of disasters that experts project for the 21st century, scientists, local, regional and national authorities and religious community leaders must come together in order to devise a strategy for the prevention of the impacts of hazards on the population, vital infrastructure and property. Particular emphasis must be placed on the protection of vital social and economic infrastructure because these are intimately linked to the ability of a country to function appropriately, for the guarantee of business continuity and hence economic growth, and the potential of a country to prosper and develop. The subsequent discussions and presentations at the conference stressed that disaster reduction should continue to be a major priority in regional, national and

international development and civil protection strategies.

3. While there have been notable achievements in natural disaster reduction during the Decade, and while awareness of risk from natural disasters has increased considerably at the global scale, there remain areas where loss of life and the impoverishment of large communities continue to increase at an alarming rate. The participants anticipate that the severity and frequency of natural and environmental disasters, and their impact on society, will intensify in near future. The participants reaffirmed the central importance of disaster reduction as an essential element of government policy. Recent events and disasters have again demonstrated the need for permanent sustained strategies to reduce disaster risk in order to save lives and protect economic and social assets.

4. Within the framework of the Yerevan Conference, the V Conference on Cooperation of Central, Eastern and South-Eastern European Countries on the Protection Against Natural and Other Disasters (The "Magdeburg Process") was held from 15-17 September. The V Magdeburg Conference brought together all the Ministers and Heads of Departments for Civil Protection from the countries of the CIS, and many representatives from Central and Eastern Europe, including Hungary, Slovenia, Germany, Croatia and Austria. The V Magdeburg Conference provided the necessary political backdrop for the discussions on disaster prevention, reduction and response taking place on the 10th Anniversary of the Spitak Earthquake. The V Magdeburg Conference held rescue exercises in Gyumri, Armenia as well as discussions on the future of the IDNDR. The V Magdeburg Conference was organized by the Emergency Management Administration of the Republic of Armenia. (See attached final declaration from the Magdeburg Conference)

5. Another important component of the Yerevan Conference was the organization and hosting of the RADIUS Initiative mid-term Workshop for the evaluation of progress in the RADIUS Case Studies and for discussions on urban seismic risk reduction practices. The RADIUS Initiative was launched by the IDNDR Secretariat, aiming to prepare earthquake disaster scenarios and the risk management plans in 9 selected cities worldwide and develop manuals for seismic risk assessment in urban areas. The progress of the RADIUS Case Studies was reported during the session as well as the achievements of similar effects in other cities. It was stressed in the session that the scientific knowledge should be applied in an appropriate way, involving various sectors of the community such as the decision makers, press, public and private sectors.

6. The participants noted the need for the exchange and transfer of up-to-date scientific technology and the strengthening of international cooperation in the field of disaster reduction, in particular in the field of seismic risk reduction. A forum for this cooperation, in the form of an international coordinated framework, was proposed as a desirable initiative for the improvement of scientific and technical cooperation in the field of disaster reduction.

7. The participants reiterated the need to move away from a disaster response oriented approach towards disaster prevention and reduction methodologies. The participants stated their appreciation for the important work that the IDNDR has carried out over the past decade in order to reduce the vulnerability of communities around the world to natural disasters, through the promotion and coordination of Disaster Reduction worldwide.

8. The participants expressed their belief that effective disaster reduction depends upon a multi-sectoral and interdisciplinary collaboration among all concerned actors, as successfully demonstrated during the Yerevan Conference.

9. Strategies for seismic risk reduction in 21st century must focus more on "Preparedness and Prevention" rather than only the "Recovery" approach.

10. One of the most important elements for the implemention of "Preparedness and Prevention" is the development of long-term Government policies in the field of disaster risk reduction.

11. The participants of the Conference fully recognized and acknowledged the significant achievements of the NSSP RA in the field of seismic risk reduction and international cooperation in this field. The program of future work of the NSSP RA is appropriate and well planned.

12. The importance of consolidating the final phase of the Decade on a regional scale was recognized as appropriate since countries of the same region share a common history, types of risk and often have coordinated strategies for disaster reduction. The participants noted in particular that the Yerevan Conference, which is the IDNDR Regional Conference for the Countries of the CIS and Central and Eastern Europe has been a very useful forum for the exchange of disaster reduction information and the coordination of future disaster reduction strategies in the region.

13. The participants of the Conference highly appreciate the agreements on cooperation reached between the Seismological Surveys of Armenia, Azerbaijan and Georgia based on the understanding that the nature of seismic hazards is trans-boundary and trans-regional and that close collaboration between the countries of the region is absolutely necessary for protecting the population against strong earthquakes.

14. The participants of the Conference express their gratitude to the Government of Armenia, UN/IDNDR, and NSSP of Armenia for organizing and holding a very successful Conference.

RECOMMENDATIONS

- The participants of the Conference recommend that NSSP be used as a model for seismic risk reduction initiatives in other countries of the region.

- The participants of the Conference recommend that Armenia be considered as one of the international test areas for the carrying-out of comprehensive scientific engineering and technical investigations for the protection of populations against strong earthquakes.

- The participants of the Conference recommend that NSSP of Armenia act as the UN Caucasus Regional Center for Seismic Risk Reduction in close cooperation with focal points in Azerbaijan, Georgia and Russia.

- The participants of the Conference recommend that a distinct and visible capacity within the UN system be set up as a successor to the IDNDR Secretariat in order to ensure an effective and continued international support to ongoing efforts in disaster reduction after the close of the Decade. This permanent disaster reduction capacity should have a multi-disciplinary mandate and global geographic coverage, to act as a catalyst for environmentally and socially sustainable development through effective disaster reduction.

- The participants of the Conference recommend that RADIUS-type projects be carried-out in other cities that are facing the threats of strong earthquakes. Similar efforts should be initiated in as many communities as possible, following the manual which will be developed through RADIUS, based on the experiences of the Case Studies. The projects should set up the conditions for the initiation of long-term risk management processes which should be institutionalized. The final goal is to make the cities and their people capable to solve, by themselves, the problems affecting their communities.

- The participants of the Conference recommend that RADIUS-type initiatives be administered (by the successor to the IDNDR Secretariat, should one be formed) for other types of hazards, including floods and forest fires. These initiatives should be limited in time (suggested time frame 3 or 4 years) and have clearly defined measurements of success. They should each have independent funding arrangements and country participation. The participants also recommend that the scope of these initiatives not be limited to hazard risk assessment and risk management plans, but also include the development and use of early warning systems. A closer cooperation with the private sector in order to improve economic impact reduction should also be introduced into the above mentioned initiatives.

- The participants of the Conference recommend that, for the development and realization of Government policies in the field of seismic risk reduction, coordination and management bodies at both the national and international levels are necessary. A model for such a body on the international level could be a distinct seismic risk reduction subprogram of a cross-cutting disaster reduction organization such as the IDNDR Secretariat, and, on the national level, an interagency governmental body which would act as the focal point for seismic risk reduction activities. The latter organization should benefit from contributions and participation from all sectors of the Government and society relevant to seismic risk reduction.

- The participants of the Conference recommend that the UN and the Governments of different states promote the collaboration of authorities responsible for the protection of cultural heritage from natural disasters, technical institutes, and humanitarian actors in order to prevent the deterioration of cultural heritage monuments.

- The participants of the Conference recommend that the international community answer the calls for assistance from the three Governors of Northern Armenia who have requested help in rehabilitating the Spitak disaster zone, where roughly 1 million people continue to live in very difficult conditions.

Publications

Since 1991, NSSP experts have participated in all the main international, European, Asian conferances and congresses devoted to seismology and seismoresistance of various constructions. More then 200 scientific works of NSSP representatives have been published in France, Germany, Great Britain, Greece, Holland, Italy, Japan, Russia, USA, Portugal, China, Indonesia, Spain, Austria and other countries since 1991.