ANNEX I PROJECT IMPLEMENTATION SCHEDULE

ANNUAL WORK PLAN

PROJECT PERIOD March 1, 2000 - February 28, 2003		1st Year Mar. 2000 - Feb. 2001	2nd Year Mar. 2001 - Feb. 2002	3rd Year Mar. 2002 - Feb. 2003
PROJECT ACTIVITIES				
1-1	To improve the seismological monitoring network strong motion observation seismic observation GPS observation			
1-2	To design training programs/plans/schedule for IS MS-AS RK staff to manage the improved seismological monitoring system			
1-3	To train seismologists-experts to manage the improved seismological monitoring system			
1-4	To train seismologists-experts to draft/complete draft of the user's manual for the improved seismological monitoring system			
2	To train seismologists-experts to collect seismic and GPS data by/with the improved seismological monitoring system			
3-1	To design training programs/plans/schedule for IS MS-AS RK staff to analyze and utilize collected seismic and GPS data			
3-2	To train seismologists-experts to analyze and manage collected seismic and GPS data			
3-3	To collect/accumulate seismic and GPS data by/with the improved seismological monitoring system for research			

ANNEX II PROJECT INPUT

PROJECT PERIOD March 1, 2000 - February 28, 2003	1st Year Mar. 2000 - Feb. 2001	2nd Year Mar. 2001 - Feb. 2002	3rd Year Mar. 2002 - Feb. 2003
JAPANESE CONTRIBUTION			
1. EXPERT ASSIGNMENT SCHEME			
(Long-term Experts)			
Team leader, management of training plan and equipment			
(Short-term Experts)			
(1) Strong motion observation network	----------	----------	----------
(2) Seismic observation network	----------	----------	----------
(3) GPS observation network	----------	----------	----------
2. EQUIPMENT PROVISION SCHEME			
Equipment is to be provided according to the budgetary allocation.	———		
strong motion observation			
seismic observation			
GPS observation network			
3. COUNTERPART TRAINING SCHEME			
(Counterpart Training Courses)			
(1) Strong motion observation network	----------	----------	----------
(2) Seismic observation network	----------	----------	----------
(3) GPS observation network	----------	----------	----------
(Group Training Courses)			
(1) Seismology and Earthquake Engineering	—— ——	——	
(2) Seminar on Seismology and Earthquake Engineering			—
KAZAKHSTAN CONTRIBUTION			
1. PROVISION OF LAND AND FACILITIES			
2. PROVISION OF EQUIPMENT			
3. EXEMPTION FROM TAX AND OTHER CHARGES			
4. OPERATING EXPENSES			
5. ASSIGNMENT OF COUNTERPARTS			
(1) Project Manager			
(2) Strong motion observation network (researcher/engineer)			
(3) GPS observation network (researcher/engineer)			
6. PROVISION OF URBAN TRANSPORTATION FACILITIES			
7. PRIVILEGES AND EXEMPTIONS			

Numbers of experts and trainees are to be decided within the budgetary allocation.

Terms of improvement of the seismological monitoring network and training of counterpart are to be decided within periods illustrated by dotted lines.

ANNEX III LIST OF MACHINERY, EQUIPMENT AND MATERIALS

(1) Strong motion observation system
(2) Seismic observation system
(3) GPS observation system

3. PDM

PDM

PROJECT TITLE:Mini-Project-Type Technical Cooperation for Continuation and Improvement of the Seismological Monitoring System for Earthquake Preparedness and Risk Assessment in the Region of Almaty City in the Republic of Kazakhstan
PERIOD OF COOPERATION:from March 1st, 2000 to February 28th, 2003
PROJECT SITE:the Institute of Seismology, Ministry of Science and Higher Education , the Republic of Kazakhstan
TARGET GROUP:staff of the Institute of Seismology, Ministry of Science and Higher Education , the Republic of Kazakhstan

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumption
Developing Ultimate Goal			
To develop administrative capability in seismological observation and earthquake preparedness for Almaty City	number of buildings of earthquake resistant design, earthquake resistance standards, systems for prevention of earthquakes and earthquake relief activities, quantity and speed of seismic information	interviews with administrative divisions, papers concerning rescue, social safety and construction	
Developing Goal			
To urge IS MS-AS RK for voluntary research for earthquake preparedness and risk assessment	quantity and quality of thesis and reports written by IS MS-AS RK staff	lists of reports and thesis	continuous will of administrative divisions to reflect study output by IS MS-AS RK in their administrative decisions
Project Purpose			
To urge IS MS-AS RK for countinuous and effective seismic and GPS data collection and analysis with the improved seismological monitoring system	quantity and quality of data analysis and collected data	reports by Japanese experts	existance of IS MS-AS RK as an important organization for seismological study in Kazakhstan
Results/Outputs			
1 To enable IS MS-AS RK staff to manage the improved seismological monitoring system	working conditions of the improved seismological observation systems	reports by Japanese experts、annual reports and reports by IS MS-AS RK	
2 To enable IS MS-AS RK staff to collect and observe seismic and GPS data at a more advanced level	number of observation reports issued	daily observations reports、reports	
3 To enable IS MS-AS RK to make observation reports at a more developed level	number of observation reports issued	daily observations reports、reports	
4 To enable IS MS-AS RK staff to analyze and accumulate seismic and GPS data collected by the improved seismological monitoring system	amount of data on seismic activities and geodynamical activities	seismic and GPS database	
Activities	***Input***		a. Necessary amount of local costs for provision of equipment should be allocated by the Kazakhstan side. b. Necessary amount of local costs for continuation of the project should be allocated by the Kazakhstan side. c. Counterparts should stay at IS MS-AS RK.
1 -1 To improve the seismological monitoring network (strong motion observation, seismic observation, GPS observation) 1-2 To design training programs/plans/schedule for IS MS-AS RK staff to manage the improved seismological monitoring system 1-3 To train seismologists-experts to manage the improved seismological monitoring system 1-4 To train seismologists-experts to draft/complete draft of the user's manual for the improved seismological monitoring system 2 To train seismologists-experts to collect seismic and GPS data by/with the improved seismological monitoring system 3 To train seismologists-experts to process collected seismic and GPS data 4-1 To design training programs/plans/schedule for IS MS-AS RK staff to analyze and utilize collected seismic and GPS data 4-2 To train seismologists-experts to analyze and manage collected seismic and GPS data 4-3 To collect/accumulate seismic and GPS data by/with the improved seismological monitoring system for research	JAPANESE CONTRIBUTION 1.EXPERT ASSIGNMENT SCHEME (Long-term Experts) Team leader, management of training plan and equipment (Short-term Experts) (1) Strong motion observation network (2) Seismic observation network (3) GPS observation network 2.COUNTERPART TRAINING SCHEME (Counterpart Training Courses) ・Strong motion observation network ・Seismic observation network ・Data Processing ・GPS observation and data processing (Group Training Courses) ・Seismology and Earthquake Engineering ・Seminar on Seismology and Earthquake Engineering (The number of experts/trainees will be decided according to budgetary allocation.) 3.EQUIPMENT PROVISION SCHEME ・strong motion observation systems ・seismic observation systems ・GPS observation systems KAZAKHSTAN CONTRIBUTION 1. PROVISION OF LAND AND FACILITIES 2. PROVISION OF EQUIPMENT 3. EXEMPTION FROM TAX AND OTHER CHARGES 4. OPERATING EXPENSES 5. ASSIGNMENT OF COUNTERPARTS (1) Project Manager (2) Strong motion observation network (3) Seismic observation network (4) GPS observation network Administrative and supporting staff will be additionally assigned by the Kazakhstan side. 6. PROVISION OF URBAN TRANSPORTATION FACILITIES 7. PRIVILEGES AND EXEMPTIONS		***Pre-Conditions*** Availability of communications net-work for transfer of seismic and GPS data

4．機材導入計画（団内資料）

	NAME OF MACHINERY/EQUIPMENT	SPECIFICATIONS	QUANTITY
STRONG MOTION OBSERVATION NETWORK			
1	Strong Motion Seismograph	KINEMETRICS, Altus Etna PCMCIA TYPE 2, (more than) Card 40 Mbyte	15sets
	Support Software	Quicklook for windows Format converter	4sets
	Parts & Tools for Repair of Strong Motion Seismograph		1set
2	Software for analysis	KINEMETRICS SMA	1set
		KINEMETRICS PSD	1set
3	Notebook Computer	IBM compatible Windows98 PCMCIA Windows98	4sets
4	Desktop Computer	IBM compatible PCMCIA(option)	1set
5	peripheral devices for PC	printer, CD-ROM writer etc.	1set
SEISMIC OBSERVATION NETWORK			
1	High-Sensitivity Seismometer	Short-period(T-1sec) velocitymeter 3components A/D Converter with GPS clock timing	5sets
	Personal Computer	newest model	5sets
	peripheral devices for PC	printer, CD-ROM writer etc. external storage driver software	5sets
	UPS		5sets
	Batteries	12V	5sets
2	Broadband Seismometer	STS-2 A/D Converter with GPS clock timing	1set
	Personal Computer	newest model	1set
	peripheral devices for PC	printer, CD-ROM writer etc. external storage driver software	1set
	UPS		1set
	Batteries	12V	1set
3	Personal Computer(for analysis in Almaty center)	newest model	
	peripheral devices for PC	printer, CD-ROM writer etc. external storage driver software(waveform analysis software)	1set
4	Solar battery for stations		1 or 2sets
GPS OBSERVATION NETWORK			
1	GPS receiver	dual band. geodetic receiver with antenna, battery, battery charger antenna cable, attachment, memory card	4sets
2	GPS Data Processing Software	Bernese	1set
3	Personal Computer	Engineering Work Station with UNIX Operation System	2sets
4	Laser Printer	appropriate device driver	1set
5	Notebook Computer	FD, HD, WindowsOS	4sets

５．地震研究所作成資料

CONFIRMED BY
Director of the Institute of
Seismology under MS HE RK
Corr. Member of AS RK
A.K.Kurskeyev

Working schedule for Japanese experts visit to the
Institute of Seismology under MS HE PK
August 23 – September 1, 1999

Data	Time	Measure	Responsible person
Aug.23 Mond.	22:25 (LH648)	Delegation arrival to Almaty	
Aug.24 Tues.	Morning Aftern.	Courtesy visit to Japanese Embassy Courtesy visit to MS HE RK Visit to the Institute of Seimology	 Deputy Minister Drobzhev V.I. Kurskeyev A.K.
Aug. 25-26 Wedn., Thur.	Morning (1:45) Whole day	Meeting of Mr.T.Yokoi from Seul Work at the Institute of Seismology • seismic network (including visit to standard seismic station to get acquaintance with their conditions); • strong motion networks; • GPS	 Beisenbaev R.T. Romahov Yu.L. Abakanov T. Scherba Yu.G.
Aug. 27-28 Frid.,Sat.	Whole day	Discussion of the Project of Visit minutes	Kurskeyev A.K. Ospanov A.B. Beisenbaev P.T. Kazakov V.V Romahov Yu.L. Abakanov T. Scherba Yu.G.
Aug. 29 Sund.	Whole day	Visit to highmontane sportcomplex "Medeo", picture-gallery and museum	Beisenbaev R.T.
Aug.30 Mond.	Morning Aftern.	Signing a Minutes of Project Discussion Visit to Japanese Embassy	 Kurskeyev A.K. Kurskeyev A.K.
Aug.31 Tues.	Morning Aftern.	Seeing-off of the head of Japanese delegation Mme. Nanba and Mr. Kamigachi Consultations on the Program of training in Japan	Beisenbaev R.T. Ospanov A.B. Kazakov V.V.
Sep.1 Wedn.	Morning	Seeing-off of the whole delegation to Japan	Kurskeyev A.K.

1. Plan of the training for the experts of Institute of a seismology in Japan.
Under the project " Continuation and improvement of seismomonitoring for seismic protection and seismic risk assesment in region of Almaty city. "

№ пп	Surname, name	Kind of training	Time of training	Laboratory
1	L.A. Kurskeeva	Seismic risk assesment on seismic data	1999-2000	SEME
2	K.V. Panin	Digital seismogram processing technology	6 months in 2000	SEME
3	N.V. Silacheva	Seismic risk assesment on strong motion data	1999-2000	CEP
4	A.A. Jurba.	Telemetric system transfer, collection and processing for Service of Urgen Earthquakes Reports	3 months in 2000	SEME
5	Y.G. Scherba.	GPS measurements and data processing	6 months in 2000	LDP

1. Plan of the training for the experts of Institute of a seismology in Kazakhstan.
Under the project " Continuation and improvement of seismomonitoring for seismic protection and seismic risk assesment in region of Almaty city. "

№ пп	Surname, name	Kind of training	Time of training	Laboratory
1	J. Akjalov	Seismic net and telemetric system service		SEME
2	A.L. Smirnov	GPS net service		LDP
3	A.D. Dosymov	Strong motion net service		SEME

THE INFORMATION ABOUT THE INSTITUTE OF SEISMOLOGY

The institute of seismology was organized in 1976 . The stuff consists of 432 persons , including 75 scientific researches.

1.STATE –OF-THE-ART OF SEISMOLOGICAL RESEARCHES

The researches on the earthquake prediction in Kazakstan have begun since the second part of 70's.

First stage (1971-1980) – creation of experimental base of Almaty prediction site .

Second stage (1982-1990) – organization , realization and accumulation of long series of observations of geophysical fields variations seismic regime gas - chemical composition of underground waters , the earth crust deformations. A structure of fields was studied , various types of anomalies were determined and prognostic possibilities of each parameter were estimated .

Main achievement of this stage is computer base forming for all observing parameters. In computer catalog of earthquakes for the period of available instrumental earthquake observations with differentiation on various periods of representability, catalog of source mechanisms of earthquakes, catalog of strong ΣQs , data bases "Geophysics" , "Geochem " , "Crust" for geophysical fields , geochemical fields , gas – chemical composition of underground waters , tilts and deformation of the earth crust are have been formed and permanently enriched. This "gold" fund forms the basis for development of methods of prediction of earthquakes.

In the beginning of 90's (Third stage) the new concept of prognostic researches development was elaborated at the Institute on the base of which the works are carried out. The observations in ionosphere, on a surface, in deep wells are carried out . In theoretical aspect we start deep researches on energetic of seismic processes, physics of source and mechanism of precursors formation on a geological basis. Large attention is given to development of methods of noise suppression and precursors selection among intensive noises. A technique of earthquake complex prediction is developed.

The most essential results obtained at a last stage, are the following.

1.1 PROBLEM OF EARTHQUAKE PREDICTION .

Two – stage earthquake prediction is developed at the Institute . At the first stage the periods end areas of activation are predicted on the base of complex data . At the second stage locations end times of earthquake occurrence are predicted .

Predictions are carried out on the base of seismic , geodesic, geophysical, hydrogeological and seismobiologycal data .

Seismological methods . In spatially – temporal distribution of earthquakes some ordering is observed . Strong earthquakes are connected with the boundaries of blocks of a different rank . In temporal aspect periods of activation and quietness of seismic processes are observed. And, the higher the energy of earthquakes , the more the sizes of blocks , in which this regularity is exhibited , and the more the duration of activation and quietness. Significant variations in periods of strong earthquakes preparation are found and their informativeness is appreciated. The most effective for the strong ΣQs prediction there were a level of seismic activity , the fraction and Lode- Nadai factors , ratio of velocities of longitudinal and transversal seismic waves and other. Dependence of precursors duration on magnitude and epicentral distances

are revealed. Generalized images of a behavior of various parameters of a seismic regime in phases of strong ΣQs preparation are created . On their basis models of seismic precursors forming and process of strong earthquakes preparation are developed . Data on a seismic regime are successfully used for earthquake prediction.

Geophysical methods. Methods of earthquake precursors revealing in variations geomagnetic, electromagnetic and electrotelluric fields are developed . The important results in the field of a research of earthquakes connection with a tidal forces alteration are obtained.

The geophysical data are used in middle-and short-term prediction of earthquakes.

Hydrogeochemical (HGC) and Hydrogeodynamical (HGD) methods.

Informativeness of separate stations is determined , the most informative parameters and hydrogeochemical precursors of a range of strong (M=57.3) earthquakes are revealed . Some of them were predicted both in meddle-term, and short-term aspect . Models of forming of hydrogeochemical hydrogeodinamical precursors of ΣQs are developed and concept of strong earthquakes prediction by hydrogeological methods is created on this base .

Deformagrafical methods. Bank of deformational field anomalies is created on the base of deformational observations. Relations between these anomalies and other physical fields is investigated .The contribution of atmospheric factors in "forming" of modern horizontal and vertical motions of the-earth crust is appreciated. A quantitative evaluation of informativeness of deformografical methods is obtained. Images of deformational precursors before a number of strong earthquakes of the region are created. With help of methods of a space geodesy (GPS) hew data on horizontal motions of the earth crust of the Tien Shan mountain system are obtained.

Seismobiological methods. A data base of activity observations for animals of various systematic groups maintaining in semifree conditions in 7 biostacionars is created. Connections between animals activity and variations of various geophysical fields are investigated. A complex of biological precursors ,preceding to number of strong earthquakes in region , is determined. Researches of biological mechanisms , governing a behavior of the animals due to variation of physical fields , are started.

Complex methods . ΣQ prediction is a rather complicated and Multiaspect problem . A lack of universal precursors as well as their instability predetermine a necessity of the comprehensive approach to solution of a problem. Methods , algorithms and programs of digital processing of results of complex observation for determination of a generalized precursor of earthquakes are created. A system of complex processing and prediction is developed . The system is realized with use of personal computers and consists of more than 200 program modules. Application of perpamently developing and upgradable system of comprehensive analysis of geophysical data has allowed to increase reliability of the short-term prediction for Almaty sesmodangerous region. Successful predictions of moderate earthquakes with K=11-12, occurring in the territory of Almaty seismodangerous region in 1995-1997 confirm this.

The work on earthquake prediction are accompanied by deep theoretical researches of physics of seismic processes, energetics of modern geodynamic processes. Basis (before critical) strained-deformed condition of an elastic stratified

model of the Earth under the influence of inertia of rotation forces, tidal and tectonical forces has been investigated. Relations between endogening and external (space) energies in seismic processes have been investigated.

The results of researches have formed the basis of a map of long-term prediction of strong earthquakes. The strong earthquakes having occurred after its compiling have proved initial scientific positions. The map is introduced in the State Committee for Emergencies of the Republic of Kazakstan and is used actively for scheduling and realization of preventive measures in regions of expected earthquakes for a diminution of material damage and human losses.

In 1996. The Institute of seismology developed the map of the intermediate-term prediction of earthquakes for the Northern Tien Shan and Dzungaria for the first time in FSU states practice. Seismomonitoring for the short-term EQ prediction is organized by the institute. The information of seismic danger in territory of Almaty prediction site is sent to the State Committee for Emergencies annually, monthly and weekly.

1.2 Problem seismic hazard assessment

Based on developed seismotectonical, geopfysical and seismological criteria of seismic hazard assessment the following maps are composed:

- General seismic zoning of Kazakstan territory (scale 1: 2500000);
- Detailed seismic zoning of Almaty industrial region (scale 1: 500000);
- A map of seismic microzoning of Almaty territory (scale 1:25000).

On the base of these maps new building cods – СНИП –98 are developed which are normative documents for engineers in RK.

1.3 Problem of prediction of damage from earthquakes

With the purpose of a maximum diminishing of damage, victims, traumatism and optimum use of material and technical resources during strong earthquakes in city of Almaty, the Institute is carrying out the following researches:

1. Seismic microzoning map development on a new methodical base.
2. Creation of a uniform information computer videosystem of prediction of damage from earthquakes and secondary seismodepending geological factors.
3. Development of governing for emergency.

2. EQUIPMENT AND TECHNICAL CONDITION OF A SYSTEM OF SEISMOLOGICAL OBSERVATIONS

Observation network consists of (application 2):

- Seismic stations
- Geophysical observatories and polygons;
- Hydrogeochemical and hydrodynamic points;
- Tiltmetre - deformational points;
- Biostacionars.

The equipment, used in a system of observations of SOME, is in general morally and physically obsolete. The seismological equipment was made 60s - 70s. Seismic
events are recorded on oscillograph paper. Observation points are started equipping with digital stations in 1998 only.

The equipment, used for hydrogeochemical observations was made in 80's and has been working at stations during 10-15 years. The equipment is morally and physically obsolete.

Equipment for a measurement of geophysical fields : magnetic, electromagnetic, telluric corresponds partially to the modern requirements. It has high metrological parameters and can be involved in an automatic system of information gathering and transmission.

The equipment for modern motion measurements is represented by strain-meters and tilt-meters, placed in wells. Strain-meters have been working during 20 years already and require a full replacement; development of modern ways of detecting and registration of data from these instruments is extremely necessary. Tilt-meters also require renewals. To raise sensitivity and to diminish an influence of surface noises the supplementing of observation system with well strain- meters and tilt-metres is necessary.

Hydrogeochemical Q, Hg

All instrument at Institute stations, are maintained in a continuous regime during 24 hours per days for the whole service-time. The wear of an equipment is very great and periods of its use always exceed normative. Practically all instrument park requires urgent renewal.

Communication system is based on receiving –transmitting equipment of short-wave range. This equipment does not allow to transmit an information with necessary velocity. Besides owing to peculiarities of short wave range it is impossible to supply reliable connection any time of day. To ensure day-night receiving of information from stations by processing center, it is necessary to equip the stations and center of gathering and processing with satellite system of communication or with telemetry system of communication of FM range.

3. THE TASKS OF FURTHER RESEARCHES

In Kazakstan territory earthquakes are natural disasters threating safety of the population and an economic potential of the country. More than 30 % of territory of our Republic is seismically active. Its population is about 6 mln. Here more then 40 % of an industrial potential is concentrated, more than 400 cities and populated areas including the largest industrial and cultural center of the country – the city of Almaty is located. According to preliminary prediction estimations, in case of destructive earthquakes occurrence (similar to Vernenskoe EQ 1887) number of victims in seismoactive areas of Almatinskaya, Dzambylskaya and Southern-Kazakstanskaya regions can be up to 17 % of the population. Occurence of destructive earthquake in Almaty vicinity can cause more than 80 % of structures to be destroyed and about 300 thousand persons to become victims of natural disaster. Such damage can be

stipulated not only by the force of earthquakes, but also owing to underestimation of seismic hazard assessment in the course of technical and economic substantiation and choice of places for large objects construction.
Industrialization of a modern society and large density of the population create conditions for occurrence of technical catastrophes connected with earthquakes.
Understanding of the facts that disastrous and earthquakes take away hundreds of human life's (Vernenskoe ,1887; Chilicskoe, 1889; Keminskoe, 1911) and drastically influence economic development of the country (Zaisan, 1992), caused to the situation that the task of population safety ensurence from seismic disasters is considered by the RK Government as a problem of national security and its solution aimed to protect economical potential of the country from possible influence of natural and technogenic factors seismic, geological, ecological.
The basis strategy of relative safety endurance from seismic disasters is creating of a prediction system and timely warning of authorities and population about forthcoming disaster Experience of long-term domestic and foreign researches in the field of this natural phenomenon knowledge has allowed in last years to outline a circle of scientific and technical problems, the development of which enables to realize preventive measures on reduction of the number of victims and economical damage from earthquakes caused by EQ and their accompanying unfavorable natural and technogenic factors. In this aspect the Institute of a seismology MS-AS, RK considers priority following directions of fundamental researches:

- study of regularities of seismicity and variations of geophysical fields as a reflections of tectonosphere geodynamics with the purpose of development of methods of prediction of a location, intensity and time of strong earthquakes occurrence and creation of monitoring system of this natural phenomenon.

- study of modern ingeneering-geodinamic processes in the upper Earth crust connected with large-scale technogenic influences upon it, with the purpose of development of methods of monitoring and danger assessment of exited seismicity appearance in regions of industrial development of mineral deposits and construction of large hydrotechnical constructions.
- study of characteristics of a deep structure, seismotectonics, geodynamics newest orogenes and focal zones of strong earthquakes to develop the methods of seismic danger assessment of various scale maps of seismic zoning as a base of normative documents for earthquake engineering and rational landuse;
- study of regularities of manifestation of seismodependent processes and phenomena as well as technical damages of various buildings and communications for development of prognostic methods of social economic from strong earthquakes and secondary factors caused by them;
- study of development peculiarities of natural and accompanying disastrous phenomena in connection with occurrence of strong and destructive earthquakes with the purpose of governing systems development for seismic emergence for damage diminishing both during events, and after them.

Thus, the fundamental problems developed at the Institute of Seismology , MS-AS, RK are the problems of earthquake prediction seismic hazard assessment and assessment of damage from earthquakes, i.e. problem, stipulated by the governmental task on seismic safety ensurance. Scientific – methodical developments of the Institute of Seismology MS_AS, RK in the field of earthquakes prediction and seismic hazard assessment are at a high international level.

At the same time the negative tendencies typical for present crisis period take peace in Kazakstan. So, owing to reduction of financing, the basis researches of the Institute of Seismology are concentrated in regions of Zailiskiy Alatau and Southern Dzungaria. The ranges of the Kazakstan, Tarbagatai, Altai as well as Pricaspiyskaa platform remain poorly investigated regions. For the same reason there was not realized the idea of the arrangement of a measuring seismo-geophysical equipment in deep wells. A telemetry network of a prediction site is in the rudimentary condition. Slow, but steady outflow of "qualified" specialists and personal, mainly of young age take place.

Based mainly on results of fundamental researches in field of a seismology, analysis of a condition and system study of problems of development of seismological observations and earthquake prediction the program "Development of a Republican system of seismological observations and earthquakes prediction" has been developed in the Republic. Its basis purpose is to reach qualitatively new level of the population safety, living in seismodangerous regions of Kazakstan, to diminish the number of victims and material damage caused by natural and technogenic earthquakes.

Kazakstan being a sovereign state, will contribute to decision of an actual and important problem of natural disasters by development and realization of its natural program of seismological observation system creation and earthquake prediction on the one hand and will use scientific achievements and assistance of world scientific community on the other. We can succeed not due to separation and competition but due to efforts cooperation in mutual improvement of different methods of earthquake prediction.

ROMAHOV. **PROBLEMS FOR DISCUSSION**

1.Lists of equipment for regional station

Recorder — 24 — digit ;
Number of channels — not less than 6;
Computer — 300 mH ;
2 sets of batteries — 12 Volt /125 A / h
Solar battery , power — 0.5- 1 kW
CPS Clock
Time code--standard
Sensors:
— STS-- 3 sets
GMC-- 7sets
UPS-- operating time not less than 1,5 hours;
Modems USW>28,8 kB/ min;

2.Telemetry

AGP--24--digit;
Computer (butter);
Repeaters-- computer"trunk"(bush) technique of data transmission —3-4 sets ;
Modems USW>28,8 kB / min
Modems SW>9,6 kB/ min;
Computer"Pentium" —350 мН for receiving center--4 sets ;
Lazer printer — 2 .

3.Equipment standartization at regional stations , telemetric points and strong votion points

Uniform type of recorders (IDS--24) for regional stations ;
Uniform type of recorders (GSR--18) for telemetric stations and strong motion stations .

4. Software

Sertificated programms:
— "WINDOWS--98" ;
— reception— transmission
— epicenter fixing (modern technology)
— UNIX + "WINDOWS" environment

5.Visit to stations

Medeo — as a station proposed for STS-3;
Izvestkovyi and Maytube — for short-period instruments;
CSS--for IDS -24 ;

Discussion :
Electricity supply : apart from capital and regional centers the interraptions in electricity supply may reach 2 and more monthes .

The quality of telephone lines is low , in Almaty as well .

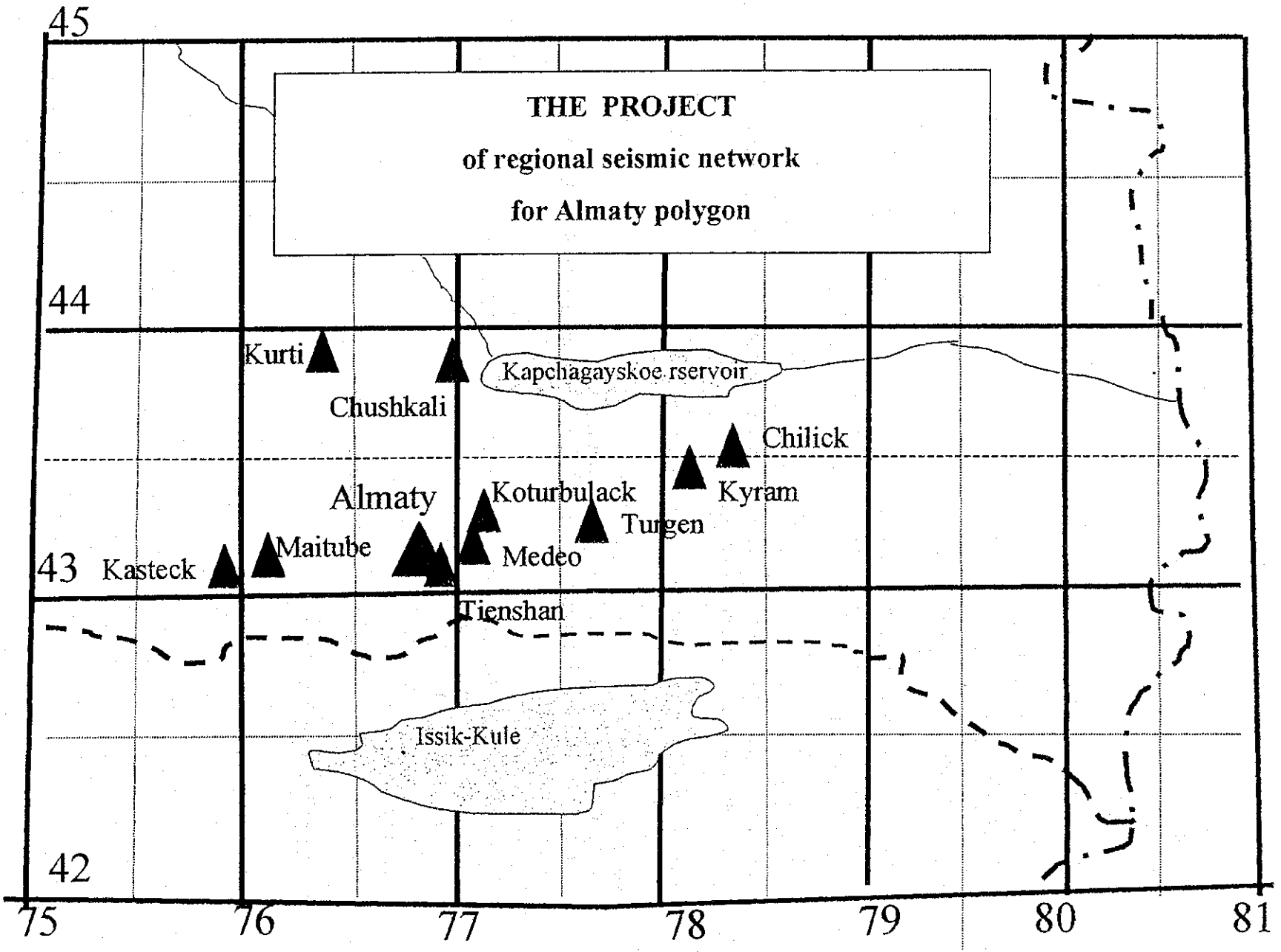
6.Custom — house

Customhouse process must be done by any Japanese firm.
It is better to go through customs process along the line of "humanistic aid ", then the taxes will be lower .

7.Other points :

32 sets of chips (5322+5321)-- for completeness IDS-24 with disk capacity - 4 rBt
5(+1 in reserve) computers of notebook type :
— with two entries P- 232;
— with front - end disk - 46 Bt
— GPS Clock ;
Possibility to finance the works on calibrative explosions .

Compiled by : Romahov . Yu. I .


THE PROJECT
of regional seismic network
for Almaty polygon
45
44
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42
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76
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80
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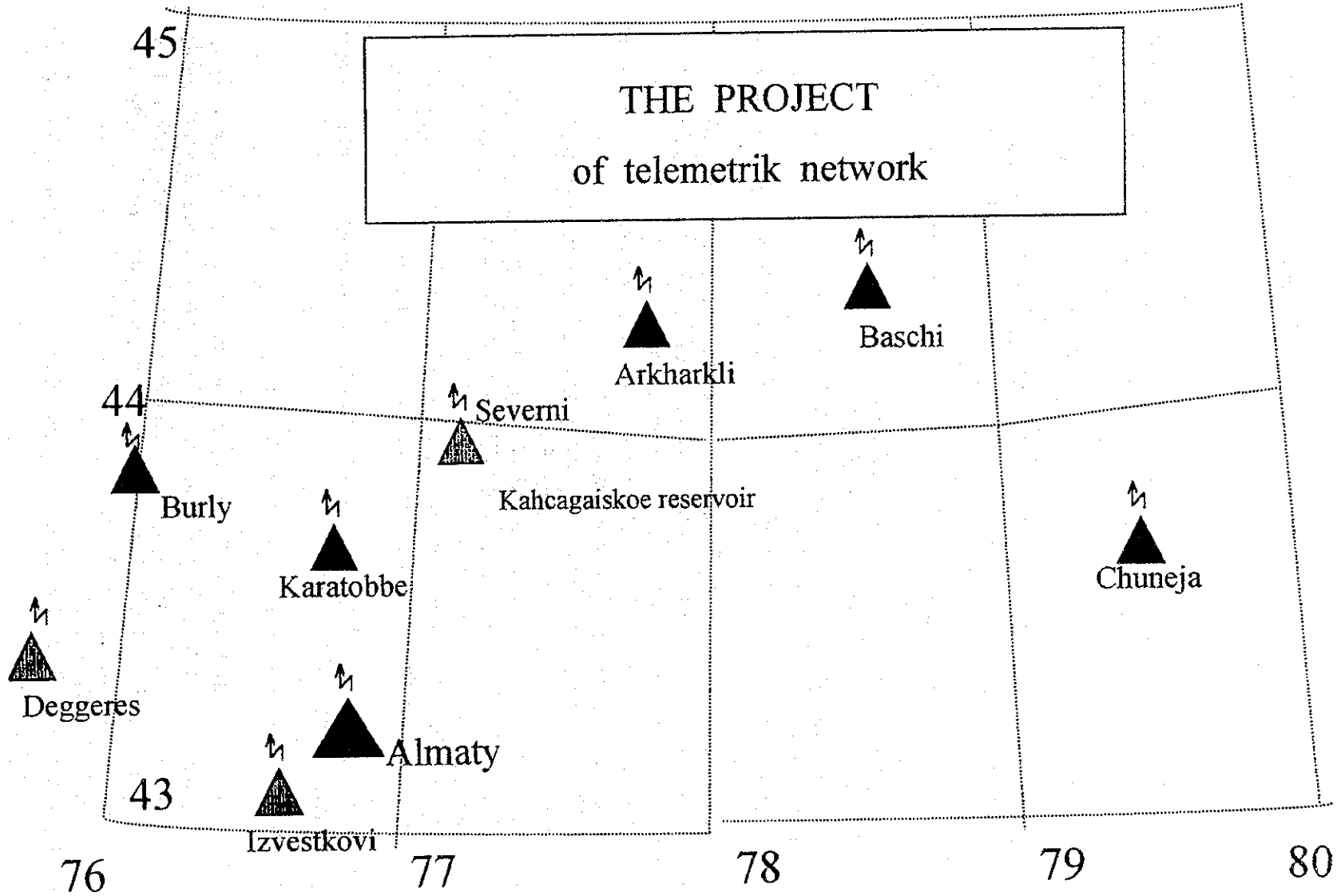
Kurti
Chushkali
Kapchagayskoe rservoir
Chilick
Kyram
Almaty
Koturbulack
Turgen
Maitube
Medeo
Kasteck
Tienshan
Issik-Kule


THE PROJECT
of telemetrik network
45
44
43
76
77
78
79
80
Arkharkli
Baschi
Severni
Burly
Kahcagaiskoe reservoir
Karatobbe
Chuneja
Deggeres
Almaty
Izvestkovi

PROBLEMS to the EXPERTS ON STUDY of GEODYNAMIC CONDITIONS ON NORTHERN ТЯНЬ-ШАНЕ БЛИЗ Г АЛМАТЫ
With USAGE SATELLITE PRECISION
GPS-supervisings

THE PURPOSE of OPERATIONS: - development of scientific grounds(bases) of technology of monitoring of geodynamic conditions in сейсмоопасном locale Northern Тянь-Шаня близ. Алматы with usage of satellite precision GPS-measurements of coordinates of points of a surface.

1. DISCUSSION of the CONTENTS And STRUCTURE of OPERATIONS
- Acquaintance of the experts with state of operation on satellite
- To GPS-supervisings in Institute of seismology,
- Clarification of parameters of the network of supervisings and its(her) processing,
- Substantiation of the rules of supervisings,
- Creation of the network of permanent stations,
- Organization of primary processing of field supervisings on points the ordinary of the network and permanent stations,
- Organization of processing of outcomes of GPS-supervisings and creation of a databank,
- Research of the hindering factors and their account(record-keeping),
- Error estimation of definition(determination) of coordinates of points of the network, their accretions, travelling speed of points,
- Selection geotectonic constituting in parameters of observed movements(traffic) and their derivative,
- Kinds and methods of submission of outcomes of GPS-supervisings,
- Interpretation of outcomes of supervisings,
- Preparation of the experts for realization of supervisings, processing of primary datas, processing and interpretation of outcomes of primary supervisings,
- Organization of cooperation and interplay c by the Japanese experts and experts by realization of consultations, scientific business trips, training of the experts,
- Organization of interplay and cooperation to republican and foreign organizations and experts.

2. OFFERED DIRECTIONS of COOPERATION

2.1. to create in Republic Centre of precision satellite measurements of coordinates of points of a surface the providing monitoring of geodynamic conditions in locale of city Алматы on the basis of Institute of seismology (ИС) and Seismological is experimental of methodical expedition(dispatch) (СОМЭ).

PROBLEMS of CENTRE:
- Development of a technique, organization and realization of GPS-supervisings and

Monitoring on inspected territory;

- Progressing available, before the created network of GPS-supervisings;
- Creation of the network of permanent stations;
- Realization of a complete cycle of processing of primary datas with introduction of the indispensable corrections, receiving three (X, Y, Z) exact space coordinatess of points of supervisings, accretions them between sessions of supervisings, definition(determination) of speeds of offsets of points in space, создание of a databank;
- Maintenance and maintaining of cooperation with world(global) centres of satellite measurements with a possibility of an operating exchange of the indispensable information, and also with other organizations leading similar researches in Republic and on сопредельных territories;

2.2. for creation of centre to provide assistance in realization of measures both delivery of the following equipment and software:

- Packages of receiving instrumentation for supervisings on points the ordinary of the network and permanent stations such as 4000SSE and NT in an amount 215 packages;
- Auxiliaries for maintenance of support of measuring packages;
- Computing means and software for a complete cycle of primary data processing of GPS-supervisings (on the basis of computers such as SUN or other, problem, providing solution,);
- To organize the channel of satellite communication(connection) for information interchange with world(global) centres indispensable for realization of primary data processing of GPS-supervisings;
- The information retrieval system for organization of a databank of GPS-supervisings;
- The typical civil-engineering design of permanent stations or recommendations for their structure and technological equipment;
- The program complex on processing and automation of procedures of interpretation of outcomes of satellite measurements for problems geospeakers;

2.3. to train:

- The experts in service and support of measuring packages of instrumentation - 2 persons;
- Operators for realization of supervisings - 2 persons;
- The experts in processing primary datas - 2 persons;
- специалистов on application of satellite precision measurements for problem solving geospeakers.

2.4. to provide measures on an exchange of experience by mutual sending of the experts and transfer of software on conditions of the appropriate agreement.

2.5. to develop and to accept to performance(fulfillment) the program of joint scientific researches oriented to solution of following basic problems:

- Perspective study and formulation of problems of GPS-researches with allowance for of available information and features of a crustal architecture in locale of. Алматы and сопредельных of territories;

- Research of the nature of observed variations of coordinates of points of supervisings and removal(elimination) of alien influencings;
- Development and perfecting of the program - mathematical vehicle of the analysis of datas about modern movements(traffic) of points of a surface;
- Development of the scientific approaches of construction of the prognosis of seismic hazard on datas on nature of modern movements(traffic) with allowance for of world(global) experience;
- The scientific substantiation and attending of monitoring of inspected territories with allowance for of concrete problems and features of a crustal architecture of inspected territories.
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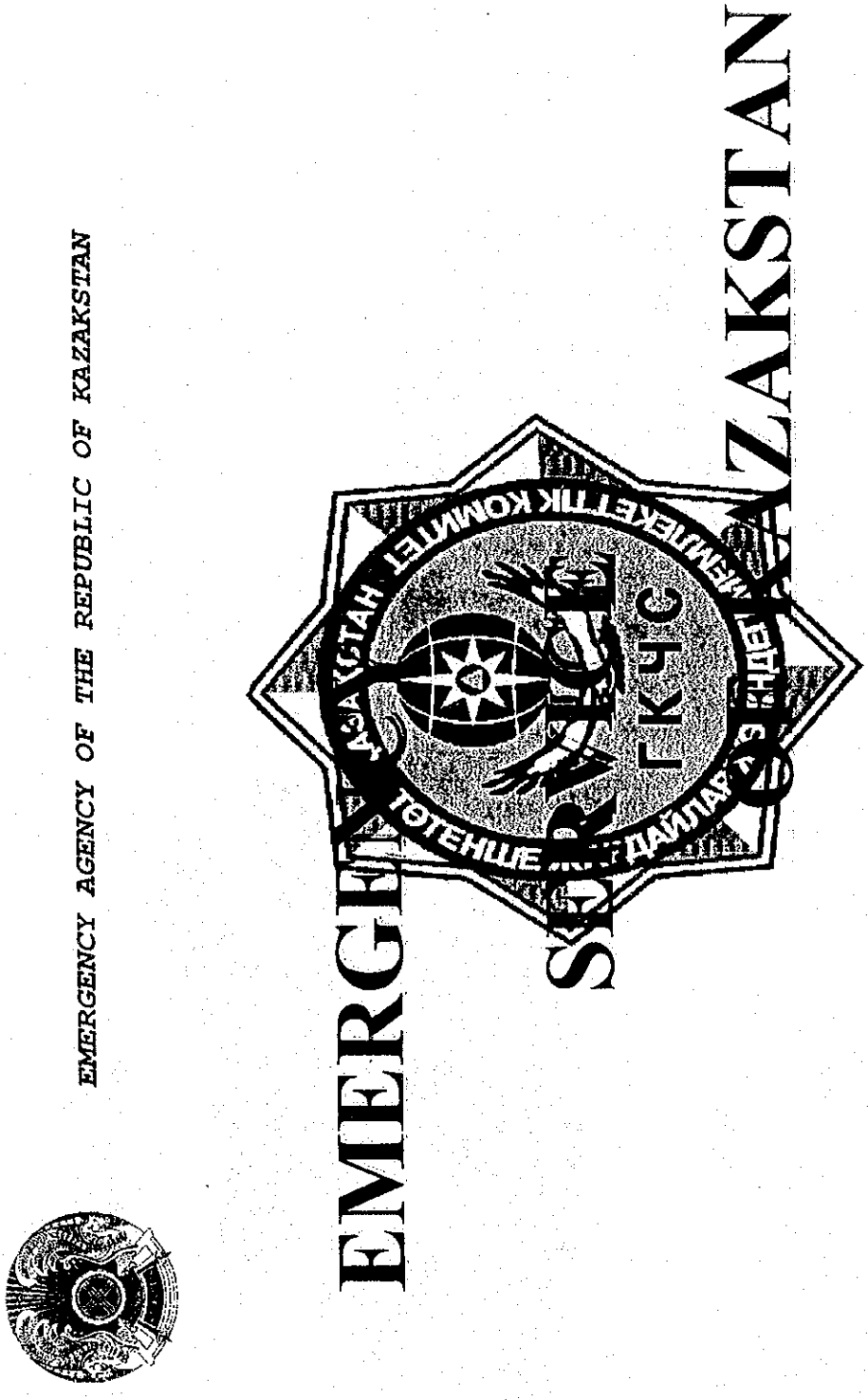
6．“Emergency Service of Kazakhstan”：カザフスタン国家非常事態委員会の紹介



The Republic of Kazakhstan is the young sovereign state of Central Asian region with territory more than 2,7 million square km and population 16,5 million people. Southern and Southeastern regions of a Kazakhstan (about 650 thousand square km), as well as territory of many other countries of Central Asia, are highly seismic. Here the earthquakes with magnitude more 8 (on the Richter scale) and above are marked. In these regions the most powerful earthquakes were: Vernenskoye (1887, M=7.3), Chilikskoye (1889, M=8.3), Keminskoye (1911, M=8.2), Zaisanskoye (1990, M=6.3), Baisorumskoye (1991, M=6.5), Tekeliyskoye (1993, M=7.3) Fig. 1.

Fig.1. The ruptures of ground's surface occured during Kemin earthquake 1911 near village Felbaumskoe.

In the Kazakhstan's seismic-hazard zones are located 27 cities, 400 other settlements, more than 40 % of republic industrial potential is placed and lives about 6 million people.

At all Kazakhstan's mountain regions are rather widely widespread such dangerous phenomenon as debris flows, snow avalanches, collapses, landslides, etc. Fig.2.

Fig.2. The consequences of debris flow in Talgar River basin of 1979.

The significant annual losses are connected to the dangerous hydrometeorological phenomena, such as floods, debris flows, rainfalls, thunder-storms, snowfall, frosts, ice-crusted ground, hurricanes, droughts. To these phenomena the whole territory of a

Kazakhstan is subject practically, but heaviest negative consequences they bring on plane territories.
The problem of Caspian Sea was got an extreme character. Since 1978, its level had increased on 2,4 m. The coastal area in total more than 20 thousand square km has flooded. The coastal line of the sea has advanced up to 20-70 km. The situation is more complicated by wind surging, because of height of the waves reaches up to 2,5-2,7 m.

In connection with catastrophic depletion, crisis conditions have developed in Aral Sea region. Significant damage brings the infection diseases. A number of Kazakhstan areas are the natural centers of a plague. Due to wear of fixed capital, considerable number of emergencies and accidents in an industry and transport is marked.

The annual direct damage from impact both natural and man-made emergencies make a few tens and often grow up to several hundreds of million US dollars.

Emergency Agency is in the structure of Kazakhstan's Government. Among main directions of committee's activity are:

- developing and realizing of state policy for civil defense of population and territories from natural and man-made disasters;
- ensuring of function of the State System for Prevention and Activity in Emergencies;
- co-ordination and state supervision for execution of the legislation, norms and standards in the sphere of civil defense and decreasing of possible social and economic damages in emergencies by the ministers, central and local authorities, organizations and enterprises independently from its forms of properties;
- civil emergency planning;
- developing and realizing of complex and special civil defense programs for protection of population from natural and man-made disasters;
- raising of economic stability in emergencies;
- training of population, officials of managing bodies, executives of all levels, personnel of rescue services;
- international cooperation and integration of republican civil defense system to corresponding international structures;
- ensuring of special-purpose using and distribution of means of government and international humanitarian assistance
- carrying out of prevention measures;
- managing of rescue service activity;
- carrying out of state examination of projects and city building documentation in part of civil defense requirements;
- coordination of activity, control of condition and readiness of systems of communication and notification, republic automatic information managing system in emergencies;
- notification of population about emergencies;
- organizing of research and experimental works connected with civil defense problems.

The committee authorities allow him, in order of legislative initiative, to develop and introduce for confirmation by President and Parliament of the Republic of Kazakhstan the projects of laws, other legislative and directive acts in the area of civil defense.

The committee confirms instructions, standards, rates and other documents on questions that are in the competence. It also accepts special decrees for organizing, coordination and carrying out of works for prevention of emergencies, that must be obligatory for ministers, local authorities, enterprises and organizations. In purposes of tasks effective decision the Committee has a right to create an enterprise and organizations, scientific-technical and engineering centers.

The Emergency Agency heads the works for developing of republic seismic observance's system and earthquakes prediction. Corresponding services (round-the-clock) are carrying out of collection and analysis of input data about of natural and man-made risks and emergencies for total territory of the country.

The Emergency Agency by territorial principle is including the regional and municipal boards, districts' departments, civil defense structures and military units, Emergency Medical Center, Republic Rapid Rescue Detachment, State Republic Enterprise "Computer, Telecommunication, Informatics & Situational Analysis", Republic Training Center, Organization for rescue on the water, Department for Supervision of Emergencies and Mining, Fire-Prevention Service, State Republic Enterprise "Kazselezaschita", territorial rescue services, moreover other enterprises, organizations and structures that activities are in the sphere of the Committee's competence.

More than 20 thousand people employed at the Committee's structure. The management of activity of the Committee is carrying out the high qualification personnel with considerable practice experience that training both international and domestic studying centers. Interdepartmental State Commission for Prevention and Reduction of the Consequences of Emergencies, Interdepartmental Commission for Safety of Road Traffic, Republic Emergency Epidemic Commission, Science-Technical Council operate under aegis of the Committee. Among the largest natural disasters of last years, the Zaisan earthquake in of Eastern Kazakhstan region which had occurred during 14 June 1990. It's magnitude has reached 7,0. As a result in 120 settlements 8874 inhabited buildings, or 70 % of total are destroyed, 36 thousand people are remained without shelters. Total damage has made about 300 billion rubles. Restoration works were carried out under a management of the Emergency Committee. Civil and industrial buildings and structures, school, hospitals and other objects were restored.

Destructive consequences were caused by debris flow of 6 July 1993 in the Talgar River of Zaili Alatau. The transport communications, water pipeline, objects of water-power engineering, inhabited and economic buildings were destroyed. Total damage has exceeded 5 billion rubles (in the prices of 1993). For realization of restoration works the Emergency Committee has attracted the means both republican and local budgets and ministries, departments, other enterprises and organizations.

In spite of difficult conditions, caused increasing of emergencies, the Republic of Kazakhstan rendered the humanitarian assistance for other neighboring countries, which were subjected from disasters. Only for

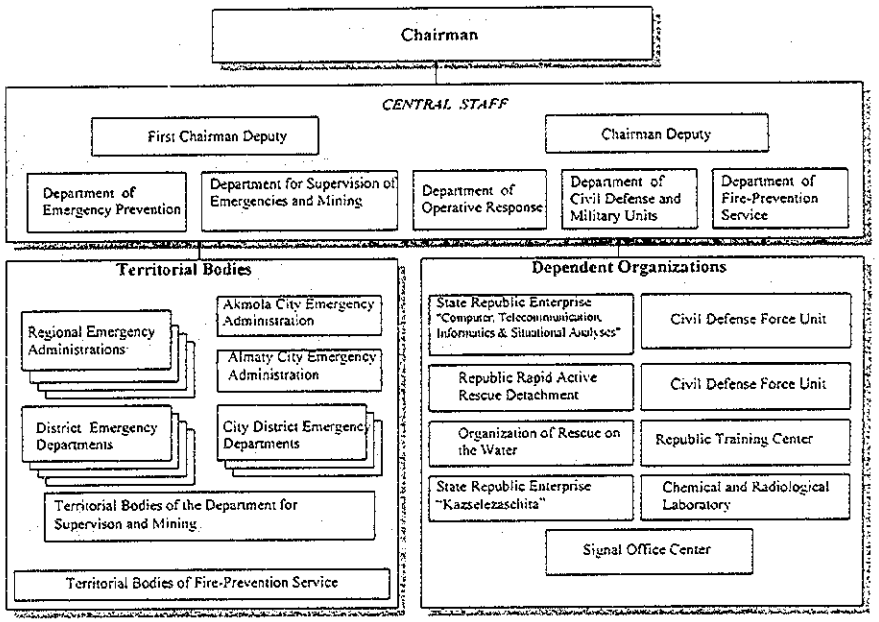
three last years this humanitarian assistance has made more than two million US dollars.

The Agency heads and organizes of work for international investments, international projects to protection of the population and territories from natural and other disasters, reduction of possible social and economical damages and preservation of property. The special state status of the committee allows him to access into databases independently from its departmental subordinate, gives the possibility carrying out of science-technical examination for projects on rationale use of natural resources, development of economy for regions and territories.

The Agency is connected with number of international organizations. It is actively participate in the NATO Program "Partnership for Peace".

The contacts with the Interstate Council on Emergencies both natural and man-made characters of the Commonwealth Independence States (CIS), Department of Humanitarian Affairs of UN are developing. In 1996 the Republic of Kazakhstan had entered to International Civil Defense Organization. The international mutual relations in the field of civil emergency planning, and prevention of emergencies with such countries as USA, Germany, France, China, Japan, Sweden, Israel and other become close.

The attraction of the Agency to planning and developing of the investment projects and programs, especially with the participation of foreign capital, that corresponding to international practice, permits reduction of possible damages, ensuring stabile activity in the condition of high natural and man-made risks and hence rising its recoupment.



Structure of the Emergency Agency of the Republic of Kazakhstan

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JICA