Japan International Cooperation Agency (JICA)
Almaty City

The Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan

Final Report
Vol. I Summary

SEPTEMBER 2009

OYO INTERNATIONAL CORPORATION
NIPPON KOEI CO., LTD.
AERO ASAHI CORPORATION

Japan International Cooperation Agency (JICA)
Almaty City

The Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan

Final Report
Vol. I Summary

SEPTEMBER 2009

OYO INTERNATIONAL CORPORATION
NIPPON KOEI CO., LTD.
AERO ASAHI CORPORATION

Foreword

In response to a request from the Government of Kazakhstan, the Government of Japan decided to conduct “The Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan” and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team headed by Mr. Osamu NISHII of OYO International Corporation in association with Nippon Koei Co., Ltd. and Aero Asahi Corporation during the period from August 2007 to June 2009. In collaboration with Kazakhstan counterparts, the study team conducted the field survey and held a series of discussions with the officials concerned of the Government of Kazakhstan. After the team returned to Japan, further studies were made and then the report was finally completed.

I hope that this report will contribute to the earthquake disaster risk management in Almaty city and to the enhancement of the friendship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Kazakhstan for their close cooperation extended to the Study Team.

September, 2009

Izumi TAKASHIMA
Vice-President
Japan International Cooperation Agency

Letter of Transmittal

September 2009

Mr. Izumi TAKASHIMA

Vice President

Japan International Cooperation Agency

We are pleased to submit to you the final report on the Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan.

This report summarizes the study conducted in the Republic of Kazakhstan, during the period from July 2007 to September 2009, and has been prepared according to the contract between JICA and the Consortium of OYO International Corporation, Nippon Koei Co., Ltd., and Aero Asahi Corporation.

The final report consists of a summary report, main reports, sector report, and a collection of drawings: the main reports describe the results from an evaluation on earthquake risks faced by Almaty City, and a comprehensive earthquake disaster risk management plan as well as community-based earthquake disaster risk management plan created for dealing with these risks; the sector reports pull together a variety of findings obtained in the course of creating these plans; and the collection of drawings includes estimated damage maps, community-based risk management maps, and other important maps developed as part of the Study. We hope that the outcomes of the final report will contribute to an improved disaster risk management scheme vital for mitigating earthquake risk levels in Almaty City, the Republic of Kazakhstan.

In closing, we would like to express our heartfelt gratitude to JICA, the Advisory Committee, the Japanese Embassy in Kazakhstan, the Ministry of Foreign Affairs of Japan, other donors, NGOs, and our counterpart, the Department for Mobilization Preparation, Civil Defense and Disaster Response of Almaty City, and other parties concerned, for their tremendous support and cooperation extended during our endeavor. We hope that the Study will open up another path in deepening the close and cordial ties between the two countries.

Very truly yours,

Osamu Nishii
Project Manager
The Study on Earthquake Disaster Risk Management
for Almaty City in the Republic of Kazakhstan
OYO International Corporation

Outline of the Study

1. Background of the Study

The organization for implementing the Study is as follows.

Study Title:	The Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan
Counterpart Agency:	Almaty City Disaster Management Department
Study Period:	August 2007-September 2009

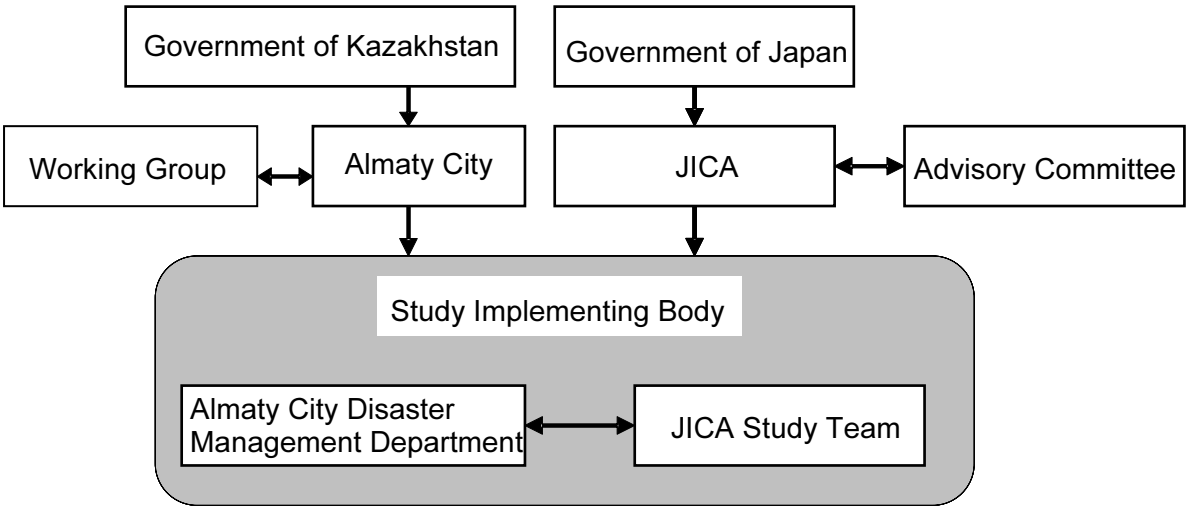


Figure 1.1 Operation of the Study

The Study aimed to "reduce damage by possible earthquakes that may hit Almaty City" and was conducted for the following objectives.

- Prepare an Earthquake Disaster Risk Management Plan based on damage estimation in order to reduce earthquake damage in Almaty City.
- Prepare a Community-level Disaster Management Plan through preparation of Disaster Management Maps and conducting Comunity-level disaster management activities in Pilot Areas.
- Transfer relevant technologies to the counterpart agencies of Kazakhstan through the implementation of the Study

The area to be covered by the Study (Study Area) extended for approximately 347 km^2 of the Almaty City.

First, the Study Team estimated earthquake risks in Almaty City by the seismic microzoning method, then produced earthquake disaster scenarios, hazard maps, and risk maps as our outputs. These outputs provided the foundation for formulating an Earthquake Disaster Risk Management Plan for Almaty City. Also, the Study Team put together a Community-Based Earthquake

Disaster Risk Management Plan through community-based activities conducted in pilot areas. Figure 1.2 summarizes the tasks carried out and the entire flow of the Study.

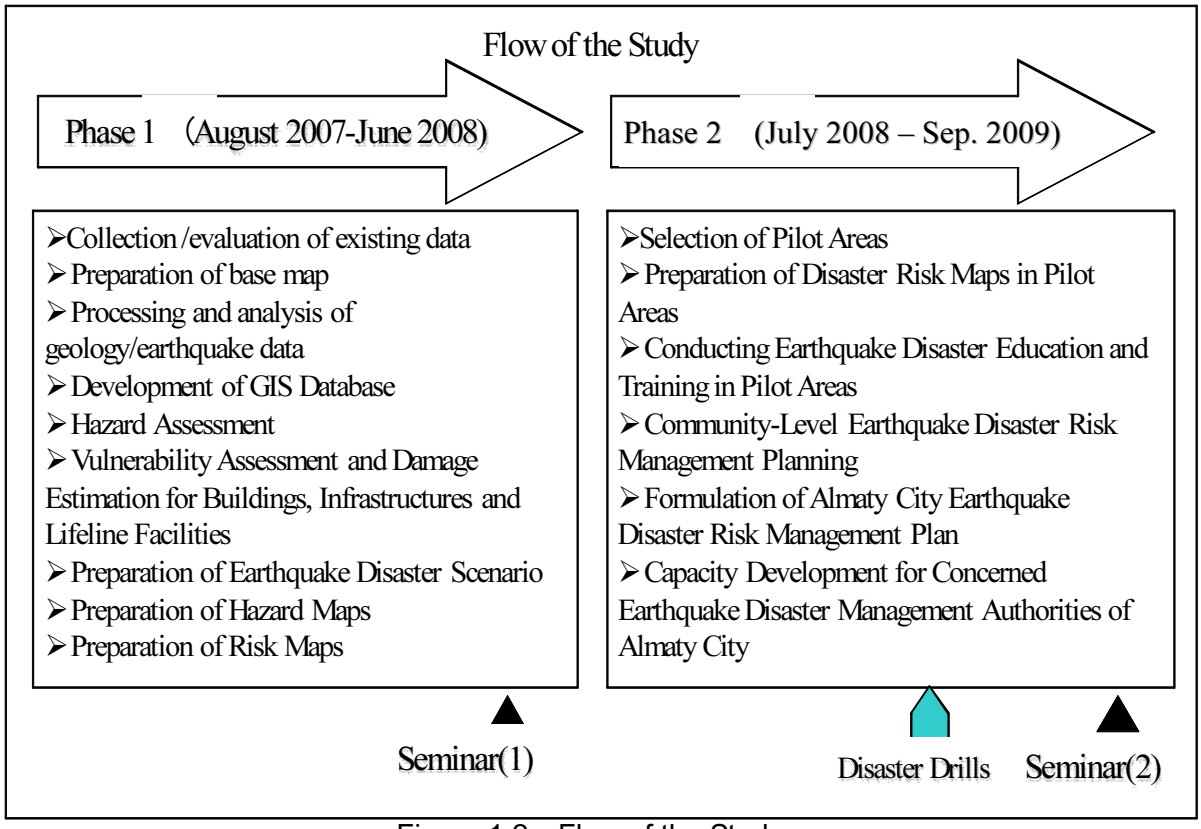


Figure 1.2 Flow of the Study

2. Evaluation of earthquake hazards and risks in Almaty City and preparation of Earthquake Disaster Scenario

2.1 Collection of information, development of base map and GIS databases

(1) Collection of information

Table 2.1 lists up various sorts of information gathered about natural and social conditions.

Table 2.1 List of materials and data obtained

Topographic maps	Satellite imagery, existing maps, etc.
Earthquakes	Earthquake catalogue, strong-motion seismograph monitoring log, faults maps, record of earthquake damage in the past, etc.
Soil/geology	Geological maps, Boring data, etc.
Buildings	Data on registered houses at the real estate center, Existing GIS data at the Rescue Center, 2007 Almaty City Statistics White Paper, etc.
infrastructure components	Road network, Bridge Diagnosis results, materials for transportation, etc.
Lifeline	Statistical data on the lengths of water supply and sewer pipelines, the length of gas pipeline and high- and mid-volta peowerlines. The above network diagrams were downloaded from the City's official website
Demographics, No. of houses	1999 Census, 2007 Almaty City Statistics White Paper

(2) Development of base map and development of GIS databases

First, 1/10,000 topographic map data and GIS databases of Almaty City were prepared plotting the existing topographic maps into digital form, and the digitized data were corrected to reflect the chronological changes based on satellite imagery(QuickBird).

Then, GIS databases were developed with data of scope of survey, scope of satellite imagery (QuickBird), 500m grid, administrative boundaries, micro regions, water supply, sewerage, gas supply, power cables, roads, bridges, hazardous substances, boring sites.

2.2 Assessment of Seismic Hazard

(1) Scenario earthquakes

In the Study, the following three major earthquakes that inflicted significant damage to Almaty City in the past 150 years were assumed to recur.

- 1887 (M7.3): Verny Earthquake (Approximately 20 km southwest of the City. 236 deaths across the city area at that time.)
- 1889 (M8.3): Chilik Earthquake (Approximately 100 km east northeast of the City. No death across the city area at that time.)
- 1911 (M8.2): Kemin Earthquake (Approximately 40 km south of the City. 44 deaths across the city area at that time.)

(2) Earthquake motion at the ground surface

Earthquake motion at the ground surface in the three scenario earthquakes was estimated as follows.

- In the Verny Earthquake scenario, 77% of the city area was subject to MSK8, and 23% to MSK 9.
- In the Chilik Earthquake scenario, almost the whole city area was subject to MSK 7.
- In the Kemin Earthquake scenario, almost the whole city area was subject to MSK 8.

(3) Hazard Assessment

The evaluation result of liquefaction danger level and slopes as hazard is as follows.

- The liquefaction danger level in the Study Area is generally low; however, liquefaction will become a concern.around
- There are some high-risk slopes along the Small Almaty River in the city area.

2.3 Estimation results

Table 2.2 shows the estimation results for building damage human damage bridge damage and lifeline damage as to each of the three scenario earthquakes.

Table 2.2 Estimation results

Scenario earthquake	No. of heavily-damaged houses and collapsed houses		Human damages(No. of persons)		No. of bridges with high possibility of collapsing
	Collective	Individual	Death	Injury	
Verny earthquake	990	24,400	22,000	28,000	18
Chilik earthquake	80	5,200	2,000	2,000	6
Kemin earthquake	430	15,200	9,000	11,000	11

Scenario earthquake	Water pipes Ave. No. of points (locations) damaged	Sewers Ave. No. of points (locations) damaged	Length of gas pipes damaged (km)	length of main power transmission line damaged (km)
Verny earthquake	500	600	600	3
Chilik earthquake	almost none	almost none	almost none	almost none
Kemin earthquake	100	100	400	0.3

The estimation result of damage by fires and spreading of fires were as follows.

- If fires occur in conjunction with an earthquake and spread without any fire-fighting activity in place, the maximum number of houses destructed by fire would be approximately 6,500 with a wind speed of 3 m/sec (10.8 km/h) or approximately 13,000 with a wind speed of 15 m/sec (28.8 km/h).

- The number of deaths by fire was estimated at 500 or fewer even in the worst case. Thus, a majority of casualties in an earthquake disaster in Almaty City would most likely result from the collapse of buildings.

2.4 Assessment of urban vulnerability

Almaty is a fairly well-developed city. However, in view of preparedness for a large-scale earthquake and reinforcement of the seismic resistance of the city, the following vulnerable aspects were identified.

(1) Road deployment and road widths

In suburban areas where low-rise houses are dominant, there are some zones where the percentage of roads with a width of less than 6 m is high. In these zones, post-disaster relief activities would expectedly be difficult and the risk of fire propagation is considered high.

(2) Parks and green space per capita

The area of parks and green space per citizen was calculated based on the current population and found as extremely small. Parks and green space are insufficient both in the city center, where midium- and high-rise residential buildings concentrate, and in suburbs, where most of the buildings are individual residential houses. This means that space for emergency evacuation and fire mitigation is inadequate.

(3) Houses

The estimated damage to collective houses is notable in the city center, where old and superannuated buildings concentrate.

The estimated damage to individual residential houses is notable in suburbs, where individual residential houses concentrate. Damage from fires caused by a disaster can also be assumed.

(4) Land use around the rivers

Many individual residential houses are widely dispersed and the road widths are mainly less than 6 m in the areas along the rivers. Damage from debris flow in the areas where river improvement work has not pursued and fires in built-up areas is estimated as severe.

(5) Aging of the population

A simple estimation of the ratio of senior citizens (65 years or above) to the total population of Almaty City has revealed that the municipal population is and continues to be aging in the city center. Considering that the damage to collective houses is estimated as severe in the city center and that the ratio of senior citizens to the total number of deaths has proven high in the past seismic hazards, the vulnerability in the city center, where the number of senior citizens is on the rise, is assessed as increasing.

2.5 Earthquake Disaster Scenario

Based on the outcomes from the damage estimation in the Study, an earthquake disaster scenario was formulated.

The Objective of this scenario is to prepare a reliable source for the formulation of an effective disaster management plan and to provide aid for promoting disaster management activities where possible. From this standpoint, the scenario was arranged in the following form.

(1) Scenario earthquake

The consequence scenario was formulated based on the damage estimation in the Verny scenario earthquake.

(2) Subjects of the scenario

The consequence scenario was formulated with respect to the following 23 subjects that involve emergency response.

1) Emergency headquarters, 2) Evacuation and shelters, 3) Fire fighting and rescue,
4) Public security, 5) Injured persons and medical treatment, 6) Sanitation, 7) Missing persons,
8) Body recovery, 9) False information and panic, 10) Mental care, 11) Education,
12) Acceptance of assistance, 13) Food, 14) Drinking water, 15) Power supply, 16) Heating line, 17) Gas supply, 18) Telecommunications, 19) Media, 20) Air transportation, 21) Bridges,
22) Roads, 23) Handle of debris

(3) Scenario of each subject

For each subject mentioned above, two scenarios were prepared: a scenario in the worst case and another in an improved case. Then, recommendable measures for the realization of the improved scenario were extracted and added.

(4) Time axis

In order to clearly show the transition of damage and select effective measures accordingly, the scenario was divided into five steps in the time axis: (1) immediately after the earthquake to one hour later, (2) one to twenty four hours later, (3) one to three days later, (4) three to seven days later, and (5) seven days onward.

3. Development of Disaster Risk Management Plan for Almaty City

In consideration of evaluation of earthquake hazards and risks in Almaty City and result of preparation of earthquake disaster scenario, the disaster risk management plan for Almaty City was developed. The plan is proposed to Department of DM based on the study result of Phase 1 and community activities in Phase 2 of the Study, and desired to be adopted by Almaty City Mayor as a plan of the City.

3.1 Aim, policies, priorities for the plan

Under "promotion of comprehensive disaster management" as an overall aim of this earthquake disaster risk management plan, earthquake disaster management activities are promoted from the following perspectives.

(1) Systematic disaster management (activities based on defined ultimate goals)

To mitigate risks related to earthquake disasters, promotion of earthquake disaster management activities is recommended upon definition of ultimate goals, which are 1) Saving human lives, 2) Securing the livelihood of citizens, 3) Maintaining social / economic systems and 4) Maintaining the country's governance.

(2) Comprehensive disaster management (responsibilities shared under vertical and horizontal organization schemes-coordination, activities by all stakeholders with a sense of ownership)

In order to facilitate earthquake disaster management activities, it is necessary for all organizations/ citizens to clarify their own roles and to engage in activities with a sense of ownership through coordination with one another

(3) Systematic disaster management (Sequencing activities within the disaster management cycle)

In order to mitigate earthquake disasters, it is important that mitigation activities and emergency response activities are initiated ahead of the occurrence. Emergency response immediately after the occurrence is followed by subsequent rehabilitation / reconstruction activities. Furthermore, the rehabilitation / reconstruction should take a consistent approach for quake-resistant community development by not only recovering to the pre-earthquake state but also linking with disaster mitigation and preparedness for future earthquakes

(4) Specific / efficient disaster management (activities upon risk awareness)

In order to efficiently implement disaster management activities, one needs to, upon learning hazard and vulnerability primarily as well as risks, formulate a disaster management plan and take measures accordingly to mitigate risks selected in consideration of importance, urgency and efficiency of response measures.

(5) Precise and feasible disaster management (activities aligned with one's capacity and accumulation of activities)

In consideration of requests from residents and financial conditions, measures should be taken from feasible ones based on risk assessment at a capable level. It is recommended that these activities be accumulated for risk mitigation and quake-resistant community development.

Further, The following policies for formulating this plan were defined in conjunction with the issues identified through the study.

- Utilizing scientific risk assessment and earthquake disaster scenarios
- Lowering vulnerability by enhancing prior measures that emphasize building reinforcement
- Improving disaster management awareness of all citizens ranging from administrative officers to residents
- Formulating a sustainable plan that emphasizes system / budget / governance enhancement through coordination with related organizations and the community
- Disaster imagination exercise / simulation-based planning for specific conditions
- Introduction of the pilot area's community activities to other areas and the mechanisms for securing sustainability

The key elements which should facilitate mitigation and preparedness activities for earthquake disasters under the policies above are as follows;

- Organization / governance for disaster management
- Earthquake protection and regulation on buildings
- Formulation of community-based disaster management measures
- Regulation / guide on land usage
- Earthquake protection and regulation on infrastructure/ lifelines
- Enhancement of the communication system
- Enhancement of the emergency response plan

The Plan addresses the mitigation and preparedness measures in relation to these priorities, and at the same time, action plans were drawn up so as to smoothly implement measures associated with them (see Table5.1 and Table 5.2).

3.2 The Earthquake Disaster Risk Management Plan for Almaty City

Table 3.1 shows structures and contents of The Earthquake Disaster Risk Management Plan for Almaty City formulated in the Study.

Table 3.1 Structures and contents of The Earthquake Disaster Risk Management Plan for Almaty City

Structures		Contents
Part 1	Basic Considerations	Chapter 1 Basic Considerations Chapter 2 Overview and damage estimation of the city Chapter 3 Basic responsibilities of risk management entities
Part 2	Mitigation Plan	Chapter 4 The city' governance related to implementation of mitigation measures Chapter 5 Quake-resistant human development Chapter 6 Quake-resistant community development Chapter 7 Quake-resistant Urban Development Chapter 8 Enhancing quake resistance of facility structures Chapter 9 Seismic Study / research
Part 3	Preparedness Plan	Chapter 10 Process for preparedness and assistance by the city Chapter 11 Preparedness by the citizens and communities Chapter 12 Preparedness related to initial response Chapter 13 Preparedness related to communication Chapter 14 Preparedness for fire and hazardous materials Chapter 15 Preparedness for rescue and evacuation Chapter 16 Preparedness for emergency transportation Chapter 17 Preparedness for emergency medical care Chapter 18 Preparedness for missing person search / body recovery Chapter 19 Drinking water and food procurement / supply process Chapter 20 Preparedness for rehabilitation of lifeline / communication / mudslide prevention facilities Chapter 21 Preparedness for handling of garbage, human waste, and debris
Part 4	Emergency Response Plan	Chapter 22 Basics of emergency response Chapter 23 Establishing and managing the Emergency Management Headquarters Chapter 24 Collection and offering of information Chapter 25 Security, traffic control, emergency transport Chapter 26 Mutual coordination with disaster risk management bodies Chapter 27 Evacuation and relief Chapter 28 Emergency medical care, sanitation Chapter 29 Search and rescue of missing persons, handling of remains Chapter 30 Fire-fighting, countermeasures against hazardous materials Chapter 31 School measures Chapter 32 Supply of drinking water and food Chapter 33 Emergency rehabilitation of lifelines, telecommunications, traffic, and debris flow protection facilities Chapter 34 Handling of garbage, human waste, and debris Chapter 35 Emergency response to housing and livelihood
Part 5	Rehabilitation / Reconstruction Plan	Chapter 36 Basic ideas for reconstruction Chapter 37 Reconstruction Headquarters Chapter 38 Formulating reconstruction plans Chapter 39 Stability of civilian life Chapter 40 City reconstruction
Part 6	Assistance Plan	Chapter 41 Assistance plan

4. Formulation of a Community level Earthquake Disaster Risk Management Plan

4.1 Outline of the plan

(1) Objective and target

Not only administrative organizations such as Disaster Management Organizations, but local communities consisting of community organizations such as KSK, schools and enterprises, and each family must also themselves prepare to reduce damage by possible earthquakes. This community- based disaster risk management plan is prepared in order to define activities, procedures, implementing and supporting organizations, the time of implementation, and target figures, so that that the importance of communities' responsibilities are widely recognized and the holding of community based disaster risk management activities is targeted at community organizations, schools, and enterprises.

The target of the Community Based Earthquake Disaster Management Plan is "You should be responsible for protecting your community".

The constituents of the Community indicated in the Almaty City Community Based Earthquake Disaster Risk Management Plan are the three actors, namely community organizations such as KSK or other associations of individual houses, schools, and enterprises.

(2) Promotional Structure, Activity Flow and the method of expansion

The promotional structure for implementing the community based earthquake disaster plan will be as follows.

- Department of DM prepares plans, a framework of activities, and educational materials.
- Based on the plans, framework of activities, and educational materials, seven district offices of the Dep. of Emergency guide residential organizations, schools, and enterprises to prepare community based earthquake disaster management activities, community based disaster management plans and conduct disaster management drills.
- Almaty branch office of Red Crescent continually implements ongoing activities for KSK in cooperation with Department of DM.

Community Activities are categorized into the following three steps.

1) Recognizing Disasters
   By explaining the results of damage estimation, showing damage photos and visual images, and conducting table- top exercises, external force can be understood and disaster images are created. Furthermore, by engaging in town observation and preparing disaster management maps, local risks are recognized.
2) Considering Countermeasures
   While imagining disaster scenarios, countermeasures are considered and compiled as disaster risk management plan, which also include drill plans.

3) Conducting Disaster Management Activities
The disaster management organizations defined in the plan are enacted, and drills of evacuation, registration of evacuees, fire extinguishing, first- aid, community kitchen, and notice boarding are practiced. Through such activities, improvements are sought and the plan is revised.

Regarding the implementation of community activities, the method of expansion is as follows.

1) As the primary step, under the guidance of Dep. of Emergency Situations, facilitators who assist in conducting disaster management workshops are trained as trainers.

2) As the second step, teachers are trained to enhance the capacity of teaching disaster management education by the Dep. of Emergency. After such preparatory steps, community activities are launched.

3) -In 2010, which is the first year in which community activities are conducted, one residential organization, one school and one enterprise will be selected to conduct activities in all seven districts, making a total of 21 places in all seven districts. After the second year, 10 places are selected in each district, and activities conducted for a further 14 years till 2025. In each district, the number of community organizations differs, but within 15 years, all the residential organizations, schools and enterprises will be covered.

4.2 Community level Earthquake Disaster Risk Management Plan

The contents of the measures of the Plan are shown in Table 4.1.

Table 4.1 Measures of the Plan (1/2)

Category	Contents	Short	Mid	Long	Managing body	Implementing body	Supporting body	System	Budget
Preparation of Plan for Community Based Disaster Risk Management Activity	Setting targets, preparing short, mid, long term plans, annual plan				-	Dep. of DM	—	defining in law and DM plan	City
	Securing Budgets				-		—		
Preparation of Public Awareness Materials	Preparing educational materials for disaster management				-	Dep. of DM	District	defining in law and DM plan, training of staffs	Materials, Printing by Dep. of ES
	Preparing education materials, visual materials, and experience study materials of disaster management for citizens				-		Press Center		
	Preparing education materials, visual materials, and experience study materials of disaster management for students				-		—		
	Preparing education materials, visual materials, and experience study materials of disaster management for enterprises				-		—		
	Preparing guidance for disaster management plan for citizens				-		District		
	Preparing guidance for disaster management plan for schools				-		Dep. of Education		
	Preparing guidance for disaster management plan for enterprises				-		—		
	Preparing educational contents for disaster management training center				-		none		
Conducting Awareness Raising Activities	Conducting events of disaster management				City	Dep. of ES	District	defining in law and DM plan, training of trainers at training center	Instruction, Materials, Printing by Dep. of ES
	Training of workshop facilitators for citizens				City	Dep. of ES	District		
	Training of school teachers				City	Dep. of ES	Dep. of Education		
	Training of workshop facilitators for enterprises				City	Dep. of ES	—		
	Preparing disaster risk management plan for residential organizations, schools, and enterprises				City	Residential Organizations, Schools, Enterprises	Dep. of ES		
	Conducting joint disaster manage drills at community（KSKs, schools, enterprises）				City	Dep. of ES	—		
	Public Information by radio and TV programs				-	Dep. of ES Dep. of DM	Press Center	defining in law and DM plan	Materials, Printing by Dep. of DM
	Awareness raising activities at Disaster Management Training Center (for citizens, students, and enterprises)				-	Dep. of ES Dep. of DM	—		
Formulating Disaster Management Organizations	Formulation of disaster response organizations, clarifying and announcing responsibilities				Dep. of ES (instruction)	Residential Organizations, Schools, Enterprises	District offices Dep. of ES	defining in law and DM plan, training of trainers at training center	Dep. of ES
	Preparing member lists								
	Conducting onsite drills							subsiding the all costs	
Installing and Inspection of Equipments for Disaster Management	Preparing lists of equipments for Disaster Management, deciding places for storing, and managers for the equipments				Dep. of ES	Residential Organizations, Schools, Enterprises	Dep. of ES	training of trainers	Costs by residential organizations, schools, enterprises Instruction by District offices of Dep. of ES
	Purchasing equipments for disaster management							No subsidies	
	Training method of handling equipments (at drills)							Training of Trainers	
	Inspection of equipments for disaster management								
Stockpiling water, foods, daily commodities at residential organizations, schools, and enterprises	Preparing lists of stockpiling, deciding stock place, person in charge				City	Residential Organizations, Schools, Enterprises	Dep. of ES	Training of Trainers	Residential Organizations, Schools, Enterprises
	Purchasing water, foods, daily commodities							Residential Organizations, Schools, Enterprises bear costs	
	Announcing places for stockpiling							Training of Trainers	
	Periodical inspection and renewal								
Preparing Earthquake Disaster Management Maps	Setting boundary of disaster management unit				City	Dep. of ES	Dep. of DM	defining in DM plan	Dep. of ES
	Conducting town watching (compiling risk and resources)					Dep. of ES, Residential Organizations, Schools, Enterprises		defining in law and DM plan, training of trainers	Instruction, Materials by Dep. of ES
	Preparation of diagnosis maps, disaster management maps by community participation								
	Compiling disaster management registers					Dep. of ES		defining in DM plan	Printing by Dep. of ES (This is not included in the existing 3 year plan till 2011, but positive about implementation)
	Distributing disaster management maps to all households, schools, enterprises								
Publicizing Places for Evacuation	Preparing information boards				-	Dep. of DM	—	defining in DM plan	Materials, Setting by Dep. of DM
	Installing information boards				-		—		
Preventing Fire Outbreaks, Applying Non-structural Measures	Inspection of hazardous materials				City	Residential Organizations, Schools, Enterprises	Dep. of ES	defining in DM plan	Instruction by Dep. of ES
	Implementing countermeasures				City		Dep. of ES		Residential Organizations, Schools, Enterprises

Table 4.2 Measures of the Plan (2/2)

Category	Contents	Short	Mid	Long	Managing body	Implementing body	Supporting body	System	Budget
Conducting Disaster Dills	Planning drills, preparing implementing plans				City	Residential Organizations, Schools, Enterprises	Dep. of ES	Training of trainers, defining in annual plan	Instruction by Dep. of ES
	Publicizing events						—		Residential Organizations, Schools, Enterprises
	Implementing joint drills for disaster management						Dep. of ES		Dep. of ES
	Evaluation, revising plans						Dep. of ES		Instruction by Dep. of ES
Strengthening Buildings for Earthquakes	Establishing system of promoting earthquake resistant				City	Dep. of building and urban planning City	Dep. of DM	law of promoting earthquake resistance, subsidy system, low interest rate loan, providing temporary houses or subsidies when rebuilding, tax favorable system for enterprises, no charge system for diagnosing earthquake resistance	Dep. of building and urban planning City
	Building diagnosis of earthquake resistance					KazNISSA	None		State Subsidies
	Agreement formation					Residential Organizations, Private Houses, Enterprises	Dep. of building and urban planning City		-
	Implementing earthquake retrofitting						None		Partial State Subsidies
Operating Evacuation Sites	Designating indoor evacuation sites				City	Dep. of ES	None	defining in DM plan	Dep. of ES
	Preparing manuals for opening and operating evacuation centers				None	Dep. of DM	—		Dep. of DM
	Informing responsibilities of the concerned				City	Dep. of ES	Dep. of ES		Printing by Dep. of ES
	Conducting onsite drills				City	Residential Organizations, Schools, Enterprises	—		Instruction and Materials by Dep. of ES
Conclusion of Agreement for Providing and Logistically Supporting Daily Commodities and Foods	Compilation of agreement with private company				City	Dep. of DM	Assoc. Of Trade and Manufacturing	defining in DM plan, commendation system	Materials by City
	Conclusion of Agreement with private companies				City	Dep. of DM	Assoc. Of Trade and Manufacturing		
Establishing System for Accepting Volunteers	Deciding method of procedure for volunteers, allocating activity areas for volunteers				-	Dep. of ES	RCS	defining in DM plan, commendation system	Dep. of ES
	Regular information exchange with volunteer groups, reviewing plans				-				
	Drills				City		Dep. of DM		

- Management entity: an entity that an implementing entity assumes obligation for reporting, or that acquires budgets for activities and coordinates the activities with related organizations other than the implementing entity
- Implementing entity: an entity implementing each measure as a central role
- Support entity: an entity supporting the implementing entity by implementing duties beyond responsibilities of the implementing entity which conducts each measure as a core party, and by providing the entity with advice and instruction

5 Earthquake Disaster Risk Management Action Plan

Action plans shown in Table 5.1 were drawn up so as to smoothly carry forward specific measures with priority given to the predefined priorities for facilitating mitigation and preparedness activities for earthquake disasters.

Table 5.1 Earthquake Disaster Risk Management Action Plan

No.	Action Plan	Components
0	Approval on the Disaster Management Plan for Almaty City	0 Approval on the Disaster Management Plan for Almaty City
1	Capacity building of organizations/structures relevant to disaster management	1-1 Clarification of the actionees and time frames for individual items in the Plan 1-2 Formulation of detailed plans, monitoring on the implementation, and evaluation of the results 1-3 Reinforcement of the management system of CD & ES Modules (grouping/ hierarchization)
2	Earthquake protection and regulation on buildings	2-1 Quake-resistance measures for existing collective houses 2-2 Improving quake-resistance of newly-constructed buildings 2-3 Earthquake protection on buildings along emergency transport roads
3	Formulation of community-based disaster management measures	3-1 Mitigation activities 3-2 Preparedness activities
4	Regulations and guidance on land use	4-1 Project for land reallocation in vulnerable areas along rivers 4-2 Introduction of housing measures 4-3 Designation and development of emergency routes
5	Earthquake protection and regulation on infrastructure/ lifelines	5-1 Enhancement of quake-resistance of existing bridges 5-2 Enhancement of quake-resistance of water supply and sewerage systems

Each component of the action plans describes the items in Table 5.2 below.

Table 5.2 Earthquake Disaster Risk Management Action Plan Items

1. Purpose
2. Method
3. Content (itemize implementation items in chronological order)
4. Time (for each implementation item)
5. Cost (classify into some categories: personnel costs, other direct costs, project costs, etc.)
6. Reference (plan items to be referred)

The Study on Earthquake Disaster Risk Management for Almaty City
in the Republic of Kazakhstan

Final Report
Vol. I Summary

Contents

Chapter 1 Background....1-1
1.1 Background of the Study....1-1
1.2 Objectives....1-1
1.3 Study Area....1-1
1.4 Implementing organization....1-2
Chapter 2 Evaluation of earthquake hazards and risks in Almaty City....2-1
2.1 Collection and evaluation of information....2-1
2.2 Digital plotting of existing 1/10,000 topographic maps and development of GIS databases....2-4
2.3 Seismic analysis and development of hazard maps....2-6
2.3.1 Setting of scenario earthquakes....2-6
2.3.2 Estimation of seismic motion....2-7
2.3.3 Evaluation of liquefaction danger level and slopes....2-9
2.4 Damage estimation and development of Risk Maps....2-11
2.4.1 Building damage estimation....2-11
2.4.2 Human damage estimation....2-13
2.4.3 Bridge damage estimation....2-14
2.4.4 Lifeline damage estimation....2-14
2.4.5 Fire damage estimation....2-17
2.5 Assessment of urban vulnerability and preparation of Earthquake Disaster Scenario....2-19
2.5.1 Assessment of urban vulnerability....2-19
2.5.2 Preparation of Earthquake Disaster Scenario....2-21
Chapter 3 Disaster Risk Management Plan for Almaty City....3-1
3.1 Basic Considerations....3-3
3.1.1 Aim of the plan....3-3
3.1.2 Policies for planning....3-5
3.1.3 Priorities for the plan....3-5
3.1.4 Detailed plans....3-5
3.1.5 Familiarizing with and modifying the plan....3-6
3.1.6 Overview and damage estimation of the city....3-6
3.1.7 Basic responsibilities of risk management entities....3-6
3.2 Mitigation Plan....3-7
3.2.1 The city' governance related to implementation of mitigation measures....3-7
3.2.2 Quake-resistant human development....3-7
3.2.3 Quake-resistant community development....3-8
3.2.4 Quake-resistant Urban Development....3-9
3.2.5 Enhancing quake resistance of facility structures....3-11
3.2.6 Seismic Study / research....3-13
3.3 Preparedness Plan....3-14
3.3.1 Process for preparedness and assistance by the city....3-14
3.3.2 Preparedness by the citizens and communities....3-15
3.3.3 Preparedness related to initial response....3-17
3.3.4 Preparedness related to communication....3-19

3.3.5 Preparedness for fire and hazardous materials 3-20
3.3.6 Preparedness for rescue and evacuation 3-21
3.3.7 Preparedness for emergency transportation 3-23
3.3.8 Preparedness for emergency medical care 3-24
3.3.9 Preparedness for missing person search / body recovery 3-25
3.3.10 Drinking water and food procurement / supply process 3-26
3.3.11 Preparedness for rehabilitation of lifeline / communication / mudslide prevention facilities 3-27
3.3.12 Preparedness for handling of garbage, human waste, and debris 3-29
3.4 Emergency Response Plan 3-30
3.4.1 Basics of emergency response 3-30
3.4.2 Establishing and managing the Emergency Management Headquarters 3-30
3.4.3 Collection and offering of information 3-33
3.4.4 Security, traffic control, emergency transport 3-35
3.4.5 Mutual coordination with disaster risk management bodies 3-36
3.4.6 Evacuation and relief 3-37
3.4.7 Emergency medical care, sanitation 3-39
3.4.8 Search and rescue of missing persons, handling of bodies 3-40
3.4.9 Fire-fighting, countermeasures against hazardous materials 3-42
3.4.10 School measures 3-43
3.4.11 Supply of drinking water and food 3-44
3.4.12 Emergency rehabilitation of lifelines, telecommunications, traffic, and mudslide prevention facilities 3-45
3.4.13 Handling of garbage, human waste, and debris 3-47
3.4.14 Emergency response to housing and livelihood 3-48
3.5 A rehabilitation / reconstruction plan 3-51
3.5.1 Basic ideas for reconstruction 3-51
3.5.2 Reconstruction Headquarters 3-51
3.5.3 Formulating reconstruction plans 3-52
3.5.4 Stability of civilian life 3-53
3.5.5 City reconstruction 3-53
3.6 Assistance plan 3-55
Chapter 4 Formulation of a Community Based Earthquake Disaster Risk Management Plan 4-1
4.1 Outline of the Plan 4-1
4.1.1 Objective and Contents 4-1
4.1.2 Constituents of the Community 4-1
4.1.3 Basic Idea of the Community Based Earthquake Disaster Risk Management Plan 4-1
4.1.4 Target of the Community Based Earthquake Disaster Management Plan 4-2
4.1.5 System of the Community Based Disaster Management Plan 4-2
4.1.6 Promotional Structure 4-3
4.1.7 Activity Flow 4-4
4.1.8 Expansion of Activities 4-6
4.2 Community based Earthquake Disaster Risk Management Plan 4-7
4.2.1 Premise of the Plan 4-7
4.2.2 Setting Targets for the Plan 4-8
4.2.3 Plan of Implementing Time 4-8
4.2.4 Contents of Measures 4-8
Chapter 5 Earthquake Disaster Risk Management Action Plan 5-1

Table

Table 1.1 Implementing organization and Members of the Study 1-3
Table 1.2 Implementation schedule 1-5
Table 2.1.1 List of materials and data obtained 2-1
Table 2.1.2 Population and No. of households in Almaty City 2-3
Table 2.2.1 Specifications for topographic maps 2-4
Table 2.3.1 Parameters of the faults 2-6
Table 2.3.2 Summary of hazardous slopes 2-9
Table 2.4.1 Damage to residential houses 2-12
Table 2.4.2 Number of casualties 2-13
Table 2.4.3 Damage to bridges 2-14
Table 2.4.4 Damage to water supply and sewerage systems 2-15
Table 2.4.5 Damage to gas pipes 2-16
Table 2.4.6 Damage to powerlines 2-17
Table 2.4.7 Damage by fire 2-18
Table 2.5.1 Road width by district 2-19
Table 2.5.2 Area of parks and green space by district 2-19
Table 3.1.1 Structures and contents of The Earthquake Disaster Risk Management Plan for Almaty City 3-2
Table 3.2.1 Mitigation activities by citizens 3-7
Table 3.2.2 Contents of earthquake disaster management education for city officials 3-8
Table 3.2.3 Contents of earthquake disaster management for citizens 3-8
Table 3.2.4 Community-based mitigation activities and assistance for these activities 3-9
Table 3.2.5 Measures for mutually-coordinated community building 3-9
Table 3.2.6 Preparatory measures for economic / industry reconstruction 3-9
Table 3.2.7 Measures for mitigating damages caused by indoor furniture falls 3-11
Table 3.3.1 Preparedness by the citizens 3-16
Table 3.3.2 Preparedness by the communities and its assistance 3-16
Table 3.3.3 Evacuation phases in time of disaster 3-22
Table 3.3.4 Measures for preparing local disaster management sites 3-22
Table 3.3.5 Measures for enhancing the rescue / evacuation process 3-22
Table 3.3.6 Category of designated emergency routes 3-23
Table 3.3.7 Vehicles subject to emergency vehicles 3-24
Table 3.3.8 Items to be prepared under the initial medical care process 3-24
Table 3.3.9 Task force / sub-task force formation for lifeline / communication / transport facilities 3-28
Table 3.4.1 Classification of emergency situations due to natural disaster 3-32
Table 3.4.2 Points to be noted in assembling 3-32
Table 3.4.3 Items to be included in an announcement by the Emergency Management Headquarters 3-34
Table 3.4.4 Security activities in earthquake disasters 3-35
Table 3.4.5 Measures concerning traffic in earthquake disasters 3-35

Table 3.4.6 Preparations for accepting assistance at the Emergency Management Headquarters....3-36
Table 3.4.7 Information to be collected for initial response of fire fighters....3-42
Table 3.4.8 Policies concerning fire control activities....3-43
Table 3.4.9 Information concerning food and daily commodities....3-45
Table 4.7.1 Workshop Flow and Activities (Model plan)....4-6
Table 4.8.1 Number of Residential Organization, Schools, and Enterprises....4-7
Table 4.9.1 Measures for Community Based Disaster Management (1/2)....4-9
Table 4.9.2 Measures for Community Based Disaster Management (2/2)....4-10
Table 5.1 Outline of the Action Plans and the Components Thereof (1/2)....5-1
Table 5.2 Outline of the Action Plans and the Components Thereof (2/2)....5-2

Figure

Figure 1.1 Study Area (347km^2) 1-2
Figure 1.2 Organization for implementing the Study 1-2
Figure 1.3 Flowchart 1-6
Figure 2.1.1 Distribution of houses according to building type (collective house) 2-2
Figure 2.1.2 Distribution of houses according to building type (Individual residential house) 2-3
Figure 2.2.1 Lifeline network diagram 2-5
Figure 2.3.1 Fault models for the scenario earthquakes 2-6
Figure 2.3.2 Distribution of accelerations at the ground surface 2-8
Figure 2.3.3 Distribution of MSK intensities 2-8
Figure 2.3.4 Results of the risk assessment of hazardous slopes 2-10
Figure 2.4.1 Building damage functions 2-11
Figure 2.4.2 Results of building damage estimation 2-12
Figure 2.4.3 Distribution of deaths by districts 2-13
Figure 2.4.4 Distribution of the maximum numbers of buildings destructed by fire 2-18
Figure 2.5.1 Results of estimating the increase in the number of senior citizens 2-21
Figure 3.1.1 Coordination of vertical / horizontal organizations 3-3
Figure 3.1.2 Concept disaster management cycle 3-4
Figure 3.1.3 Activities under the disaster management cycle in chronological order 3-4
Figure 3.3.1 Almaty city's preparedness process 3-15
Figure 3.3.2 Preparedness process for the Civil Defense and Emergency Situations Modules 3-15
Figure 3.3.3 Disaster management community unit-Concept 3-17
Figure 3.3.4 Formation of the Emergency Management Headquarters 3-18
Figure 3.3.5 Emergency communication process in Almaty City 3-20
Figure 3.4.1 Structure for emergency response in Almaty City 3-31
Figure 3.4.2 Outline of evacuation and relief activities 3-37
Figure 3.4.3 Outline of emergency medical care activities 3-39
Figure 3.4.4 Outline of activities to rescue the missing and handle human remains 3-41
Figure 3.4.5 Outline of activities to provide drinking water, food and commodities 3-44
Figure 3.4.6 Outline of activities associated with emergency rehabilitation of lifelines, etc. 3-46
Figure 3.4.7 Outline of activities associated with emergency response to housing and livelihood 3-48
Figure 4.5.1 System of Community Based Earthquake Disaster Risk Management Plan 4-3
Figure 4.6.1 Promoting Structure of Implementing Community Based Earthquake Disaster Risk Management Activities 4-4
Figure 4.7.1 Activity Flow 4-5
Figure 4.8.1 Expansion of Activities 4-7
Figure 4.9.1 Image of Self-help, Mutual-help, and Public-Help 4-8

Аббревиатуры 略語 Abbreviations

Аббревиатуры, сокращения	Полное наименование, определение
略語、省略形	正式名、定義
Abbreviation	Long Form
Изучение 調査 Study	
Изучение JICA	Изучение по управлению рисками землетрясений в городе Алматы Республики Казахстан
本調査	カザフスタン国 アルマティ市地震防災対策計画調査
The Study	The Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan
ПУРЗ	План управления рисками землетрясений в городе Алматы
本計画	（本調査内で策定される）アルマティ市地震防災対策計画
The Plan	The Earthquake Disaster Risk Management Plan for Almaty City (prepared in the Study)

Организация 組織(国内) Organizations (Domestic)	
г. Алматы	город Алматы
—	アルマティ市
—	Almaty City
УМПГОиЧС Управление МПГОиЧС	Управление по мобилизационной подготовке, гражданской обороне, организации предупреждения и ликвидации аварий и стихийных бедствий города Алматы [настоящее название]
(アルマティ市) 防災局	アルマティ市 動員準備、民間防衛、非常事態・災害対応局
Department of DM	Department of Mobilization Preparation, Civil Defense, and Disaster Response of Almaty City
ДМПГОиЧС Департамент МПГОиЧС	Департамент по мобилизационной подготовке, гражданской обороне, организации предупреждения и ликвидации аварий и стихийных бедствий города Алматы [прежнее название]
旧防災局	旧アルマティ市防災局［2008 年 7 月以前の組織に限定する場合］
Previous Department of DM	Previous Department for Mobilization Preparation, Civil Defense, and Disaster Response of Almaty City
Центр МПЧС	Центр по мобилизационной подготовке, организации предупреждения и ликвидации аварий и стихийных бедствий города Алматы
(アルマティ市) 防災センター	アルマティ市 動員準備、非常事態・災害対応センター[防災局が建設中の防災教育や防災訓練を行うための施設]
DM Center	Center for Mobilization Preparation, and Disaster Response of Almaty City
МЧС РК	Министерство по чрезвычайным ситуациям Республики Казахстан
—	（カザフスタン共和国）非常事態省
MOES	Ministry of Emergency Situations of the Republic of Kazakhstan
ДЧС	Департамент по чрезвычайным ситуациям горда Алматы МЧС РК
—	（カザフスタン共和国 非常事態省 アルマティ市）非常事態局
DOES	Department of Emergency Situations for Almaty City under the Ministry of Emergency Situations
АГУЧС	Алматинское городское управление по чрезвычайным ситуациям
—	旧（非常事態庁）非常事態局［2004 年以前の組織に限定する場合］
—	Previous Department of Emergency Situations under the Agency of Emergency Situations
—	Казселезащита
—	（非常事態省）土石流防護
—	Kazselezaschita
УГКНОЧС	Управление по государственному контролю и надзору в области чрезычайных ситуаций города Алматы Министерства чрезвычайных ситуаций Республики Казахстан
地方部	カザフスタン共和国非常事態省アルマティ市非常事態国家管理監督局
Department of state control	Department of state control and supervision of emergency situations for Almaty City, Ministry of Emergency Situations of the Republic of Kazakhstan
ССГА	Служба спасения города Алматы
—	（アルマティ市）レスキューサービス
—	Almaty Rescue Service
АПП	Аварийно-поисковое подразделение
—	（アルマティ市）レスキュー隊
—	(Almaty) Emergency Search and Rescue Team
ЕДДС	Единая дежурно-диспетчерская служба
—	（アルマティ市）統一管制センター
—	(Almaty) Integrated Control Center
ЦУКС	Центр управления в кризисных ситуациях
—	（アルマティ市）緊急事態管理センター
—	(Almaty) Crisis Management Center
МОН	Министерство образования и науки
—	教育科学省
—	Ministry of Education and Science
МООС	Министерство охраны окружающей среды
—	環境省
—	Ministry of Environmental Protection
ГАСК	Управление государственного архитектурно-строительного контроля
GASK	国家建築建設管理局
GASK	Department of National Architecture and Construction Management
АН	Академия наук
	科学アカデミー
	Academy of Science
ИС	Институт сейсмологии
—	地震研究所
—	Institute of Seismology
Межведомственная комиссия ПЛ ЧС г. Алматы	Межведомственная комиссия по предупреждению и ликвидации ЧС города Алматы
—	市部局間防災連絡委員会
—	Inter-departmental Disaster Management Committee
—	Городская эвакокомиссия
—	市避難対策委員会
	Almaty city Evacuation Commission
Районная Комиссия ПЛ ЧС	Районная комиссия по предупреждению и ликвидации ЧС
—	地域防災連絡委員会
—	District Disaster Management Committee

—	Районная эвакокомиссия
—	地域避難対策小委員会
—	District Evacuation Commission
КСК	Кооператив собственников квартир
KSK	集合住宅管理組合
KSK	Condominium Associations
АПК	Алматы Пауэр Консолидэйтед
APK	アルマティパワーコンソリデイテッド [電力会社]
APK	Almaty Power Consolidated [an electric company]

Организация (по управлению ЧС) 組織(緊急対応) Organizations (Emergency management)	
Штаб ЧС	Штаб по управлению чрезвычайными ситуациями
—	緊急司令本部
—	Emergency management headquarters
Службы ГО и ЧС	Службы по гражданской обороне и чрезвычайным ситуациям
—	緊急対応機構
CD & ES Modules	Civil Defense and Emergency Situations Modules
—	Автотранспортная служба (дорог и мостов)
—	輸送道路橋梁機構
—	Motor Transport, Roads, and Bridges Module
—	Служба водоснабжения
—	給水排水機構
—	Water Supply and Sewerage Module
—	Служба газоснабжения
—	ガス供給機構
—	Gas Supply Module
—	Служба горюче-смазочных материалов
—	燃料供給機構
—	Fuel Supply Module
—	Служба защиты животных и растений
—	動植物保護機構
—	Animal and Plant Protection Module
—	Инженерная служба
—	工学的対応機構
—	Engineering Module
—	Медицинская служба
—	医療機構
—	Medical Module
—	Служба оповещения и связи
—	警報通信機構
—	Warning and Communication Module
—	Служба охраны общественного порядка
—	社会秩序維持機構
—	Public Order Protection Module
—	Противопожаная служба
—	消防機構
—	Fire-Fighting Module
—	Санитарно-эпидемиологическая служба
—	衛生防疫機構
—	Sanitation and Epidemic Control Module
—	Служба ритуальных услуг
—	葬儀機構
—	Mortician Service Module
—	Служба спасения
—	事故救助機構
—	Rescue Service Module
—	Техническая служба
—	技術機構
—	Technical Maintenance Module
—	Служба торговли и питания
—	通商食料供給機構
—	Trade and Food Supply Module
—	Служба энергетики
—	エネルギー機構
—	Energy Module

Организация (зарубежная) 組織(海外) Organizations (Foreign)	
РК	Республика Казахстан
「カ」国	カザフスタン共和国
RK	Republic of Kazakhstan
СССР	Союз Советских Социалистических Республик
ソ連	ソビエト連邦
USSR	Union of Soviet Socialist Republics
США	Соединённые Штаты Америки
アメリカ	アメリカ合衆国
USA	United States of America
ООН	Организация Объединённых Наций
国連	国際連合
UN	United Nations
ADRC	Азиатский Центр Снижения Риска Стихийных Бедствий
ADRC	アジア防災センター
ADRC	Asian Disaster Reduction Center
JICA	Японское Агентство Международного Сотрудничества
JICA	国際協力機構
JICA	Japan International Cooperation Agency
Группа JICA	Группа изучения по управлению рисками землетрясений в городе Алматы Республики Казахстан [Данный термин используется для обозначения исследовательской группы данного проекта, состоящей из японских специалистов.]
本調査団	カザフスタン国 アルマティ市地震防災対策計画調査 JICA 調査団
The Team	The Study Team for the Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan

Форма собственности организации 組織形態 Form of organizations	
РГКП	Республиканское государственное казенное предприятие
—	（共和国）国有企業
—	state company
ГКП	Государственное казенное предприятие
	国有企業
	state company
РГП	Республиканское государственное предприятие
—	（共和国）国有企業
—	national company
ЗАО	закрытое акционерное общество
	非公開型株式会社
	closed joint-stock company
АОЗТ	Акционерное общество закрытого типа
	非公開型株式会社
	closed joint-stock company
ООО	Общество с ограниченной ответственностью
	有限（責任）会社
LLC	limited liability company
ТОО	Товарищество с ограниченной ответственностью
—	有限（責任）団体・組合
LLP	limited liability partnership
АО	Акционерное общество
—	株式会社
—	Joint-stock company
НИИ	Научно-исследовательский институт
—	研究所、研究機関
—	Research institute
НПО	Неправительственная организация
NGO	非政府団体
NGO	non-governmental organization
НКО	Некоммерческая организация
NPO	非営利団体
NPO	nonprofit organization

Здание 建築 Building	
Ж/Б, ж/б	Железобетонный
—	鉄筋コンクリート
RC	reinforced concrete
464-АС	Крупнопанельные, тип 464-АС
464-AS	大型パネル構造 464-AS [壁式プレキャスト鉄筋コンクリート造、464-AS ﾀｲﾌﾟ]
464-AS	Large panel, type 464-AS
ВП/ВТ	Железобетонные, тип ВП/ВТ
VP/VT	鉄筋コンクリート造、VP/VT ﾀｲﾌﾟ
VP/VT	Reinforced concrete, type VP/VT
464-ДС	Крупнопанельные, тип 464-ДС
464-DS	大型パネル構造 464-DS [壁式プレキャスト鉄筋コンクリート造、464-DS ﾀｲﾌﾟ]
464-DS	Large panel, type 464-DS
СНиП	Строительные нормы и правила
SNiP	建設規格・規定
SNiP	building code
ГОСТ	Государственный стандарт
GOST	国家基準
GOST	National standards

Землетрясение　地震　Earthquake	
MSK	окала интенсивности землетрясений, названная так по заглавным буквам фамилий авторов: С.В. Медведев, В. Шпонхойер, В. Карник
MSK	メドヴェーデフ・シュポンホイアー・カルニク
MSK	Medvedev- Sponheuer-Karnik
P-S сейсморазведки	Сейсмическая разведка
PS 検層	弾性波速度検層
–	P-S logging
Vs	скорость поперечной волны
Vs	横波（S 波）速度
Vs	secondary wave velocity
PGA	пиковое ускорение поверхности грунта
–	地動最大加速度
–	peak ground acceleration

ГИС　GIS　GIS	
ГИС	Географические информационные системы
GIS	地理情報システム
GIS	Geographic Information Systems
GPS	Глобальная система позиционирования
GPS	全地球測位システム
GPS	Global positioning system
WGS84	Мировая Геодезическая Система 1984
WGS84	WGS84 測地系 [GPS で使用される米国の測地系]
WGS84	World Geodetic System 84

Отчет　レポート　Report	
IT/R	Промежуточный отчет
IT/R	インテリムレポート
IT/R	Interim Report
P/R	Отчет о ходе работ
P/R	プログレスレポート
P/R	Progress Report
DF/R	Проект заключительного отчета
DF/R	ドラフトファイナルレポート
DF/R	Draft Final Report
F/R	Заключительный отчет
F/R	ファイナルレポート
F/R	Final Report

Прочие　その他　Others	
S/W	Объём Работ, Соглашение об объёме работ
S/W	（本調査開始時の）業務範囲合意書
S/W	Scope of Work (of the Study)
M/M	Протокол заседания
M/M	（本調査開始時の）議事録
M/M	Minutes of Meeting (of the Study)
ЧС	Чрезвычайная ситуация
–	非常事態
–	Emergency situation
ГО	Гражданская оборона
–	民間防衛
–	civil defense
СМИ	Средства массовой информации
–	（マス）メディア
–	(mass)media
GSHAP	Программа оценки глобальной сейсмической опасности
GSHAP	世界地震ハザード評価プログラム
GSHAP	Global Seismic Hazard Assessment Program
ЛЭП	Линия электропередач
–	送電線
–	Power transmission line
ТБО	твердые бытовые отходы
–	固形家庭ごみ
–	Domestic solid waste
ДД	Дорожное движение
–	交通
–	Traffic

Необходимые термины в области сокращения риска бедствий
防災用語
Terms of earthquake disaster risk management

Необходимые термины в области сокращения риска бедствий (землетрясения)	**地震防災に関する主要な用語**	**Essential terms of earthquake disaster risk management**
Афтершок / Форшок Предварительный толчок является толчком, предшествующим перед большим толчком (главным толчком) землетрясения, а афтершок — толчком вслед за главным толчком и возникает в одной зоне разрушения.	**余震／前震** 前震は、より大きな地震（本震）に先立って発生する地震であり、余震は本震に引き続いて発生する地震で、本震と同じ破壊域で生じる。	**Aftershocks / Foreshocks** Foreshocks are earthquakes precede a larger earthquake (main shock), and aftershocks are earthquakes that follow a main shock and originate within one rupture zone.
Бедствие Серьезное разрушение, причиненное факторами риска природного и техногенного характера для функционирования сообщества или общества, причиняющее человеческий, материальный, экономический ущербы либо ущерб окружающей среды, которые превышает способность пострадавших сообществ или обществ бороться с ними посредством своих ресурсов.	**災害** コミュニティや社会が持っている資源では対応できない規模であり、広範囲に及ぶ人、物、経済、および環境の損失につながる、自然・人為災害がコミュニティや社会の機能に及ぼす深刻な混乱。	**Disaster** A serious disruption caused by natural or manmade hazards to the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.
Вторичная опасность Бедствия, которые вызваны вследствие одного землетрясения или, которые причинены непосредственными воздействиями землетрясения, такие как пожар, оползень и воздействия на человеческую жизнь или техногенные бедствия.	**二次災害** 地震に引き続いて、または地震による直接的な被害や影響によって起こされる、火災、地すべり、人的被害や技術的ハザードなどの災害。	**Succeeding disasters** Disasters that are generated following earthquake or that are caused by direct damage/impacts by an earthquake, such as fire, landslide and impacts on human life or technological hazards etc.
Географические информационные системы (ГИС) Анализ, который объединяет соответственные базы данных с пространственной интерпретацией и их продуктом, чаще всего, в форме карт. Более разработанным является определение компьютерных программ: захвата, запоминания, проверки, интеграции, анализа и дисплея данных о земле, на которые ссылается с точки зрения пространства. Географические информационные системы постепенно становятся используемыми для составления карты опасности и уязвимости и для их анализа, а также для применения мер управления риском бедствий. Кроме того, ГИС требует не только компьютерных программ и оборудования, но и данные о фундаментальных карт и тематические данные.	**地理情報システム（GIS）** リレーショナルデータベースと空間情報を組みあわせる解析で、通常地図形式で出力される。より詳しい定義では、地球に関する位置決定されたデータの取得、保存、照合、統合、解析、そして表示のためのコンピュータプログラム。 地理情報システムは、ハザードや脆弱性の地図表示や解析、さらには災害リスク管理対策のためにますます広く利用されるようになってきている。また、GIS は、ソフトウェアとハードウェアだけでなく、基図と主題データを必要とする。	**Geographic information systems (GIS)** Analysis that combine relational databases with spatial interpretation and outputs often in form of maps. A more elaborate definition is that of computer programs for capturing, storing, checking, integrating, analyzing and displaying data about the earth that is spatially referenced. Geographical information systems are increasingly being utilized for hazard and vulnerability mapping and analysis, as well as for the application of disaster risk management measures. Also GIS needs not only software and hardware, but also fundamental map data and thematic data.
Геологическая опасность Естественные земные процессы или феномены, которые могут причинить потерю жизни или ушиб, имущественный ущерб, экономический и социальный разрывы, или деградацию окружающей среды. Понятие «геологическая опасность» включает в себя внутренние земные процессы или тектоническое происхождение, такие как землетрясение, геологические разрывы, разжижение грунтов, цунами, вулканическая активность и эмиссия, а также внешние процессы, как движение масс: оползень, обвал, камнепад или снежная лавина, сползание откоса, экспансия земли и селевой или грязевой поток. Геологическая опасность может быть изолированной, последовательной или комбинированной в зависимости от происхождения и воздействий.	**地質ハザード** 生命の損失や負傷、財産の損害、社会経済的混乱や環境悪化を引き起こす自然な地球の過程や現象。 地質ハザードには、地震、断層運動、液状化、津波、火山活動、噴火などの地球内部過程または構造運動起源のものと、岩塊運動（地すべり、岩すべり、岩くずれや地くずれ）、表層崩壊、膨張性土壌、岩砕流や泥流などの外部過程が含まれる。地質ハザードは、その起源と影響が、単独、連続して、または、組み合わさることがある。	**Geological hazard** Natural earth processes or phenomena that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Geological hazard includes internal earth processes or tectonic origin, such as earthquakes, geological fault activity, liquefaction, tsunamis, volcanic activity and emissions as well as external processes such as mass movements: landslides, rockslides, rock falls or avalanches, surfaces collapses, expansive soils and debris or mud flows. Geological hazards can be single, sequential or combined in their origin and effects.
Готовность Деятельность и меры, принятые заранее в целях обеспечить эффективное реагирование на воздействие стихийных бедствий, включая выпуск ранного и эффективного оповещения и осуществление заблаговременного перемещения населения и имущества из места угрозы возникновения чрезвычайной ситуации.	**事前準備** タイムリーで効果的な早期警報発令や脅威のある地点からの人々や財産の事前避難を含む、ハザードの影響に対する効果的な対応を確保するためにあらかじめ行われる活動や対策。	**Preparedness** Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the preventive evacuation of people and property from threatened locations.
Гражданская оборона Системаорганов иобщегосударственных мероприятий, проводимых в мирное и военное время в интересах защиты населения, объектов экономики и территории страны от чрезвычайных ситуаций и применения современных средств поражения.	**民間防衛** 平常時と戦争時に、人々・国家経済基盤・領土を近代兵器の有害要因、自然災害・人為災害による影響から守る、国家管理システムと行政行為。	**Civil defense** A state system of managerial bodies and an aggregate of governmental events carried out in peaceful and war time to protect the people, national economics objects and country's territory from the impac t of damaging factors of modern weapons, natural and manmade disasters.
Допустимый риск Степень ущерба, которую общество либо сообщество считает приемлемым в данной социальной, экономической, политической, культурной, технической и экологической обстановках.	**容認できるリスク** 社会・経済・政策・文化・技術・環境の現在の状況において、社会やコミュニティが容認することができる損失のレベル。	**Acceptable risk** The level of loss which a society or a community considers acceptable in a given existing social, economic, political, cultural, technical and environmental conditions.
Магнитуда Безразмерная величина общей энергии, выпускаемой очагом землетрясения. Имеются разные виды магнитуды, как, например, магнитуда по Рихтеру, моментная магнитуда и т.д.	**マグニチュード** 震源から放出される全エネルギーの無次元の量。表面波マグニチュードやモーメントマグニチュードなどいくつかの種類がある。	**Magnitude** Dimensionless quantity of the total energy released by an earthquake source. There are several types of magnitudes, such as a Surface wave magnitude, Moment magnitude etc.

Меры противодействия / Меры Всякие меры, принятые с целью противодействия и уменьшения бедствий и риска. Они обычно относятся к техническим (структурным) мерам, а также они могут включать в себя неструктурные меры, средства и деятельность человека, разработанные и применяемые для того, чтобы избежать или ограничить неблагоприятные воздействия стихийных бедствий и связанных с ними экологических и техногенных катастроф.	**対策** 災害とリスクに対抗し、またはそれらを軽減するための全ての方策。それらは一般には技術的（構造物的）な対策をさすが、自然災害とそれに関連する環境的、技術的な災害を回避または軽減するための、非構造物的対策、手段、または、行為を含む。	**Countermeasures (Measures)** All measures taken to counter and to reduce disaster and risk. They most commonly refer to engineering (structural) measures but can also include non-structural measures, tools or human activities designed and employed to avoid or limit the adverse impact of natural hazards and related environmental and technological disasters.
Митигация / сокращение Структурные и неструктурные меры, принятые, чтобы ограничить негативные воздействия опасности стихийного и техногенного характера, деградацию окружающей среды.	**軽減／削減** 自然災害の悪影響、環境悪化、および技術的ハザードを制限するための構造物的、非構造物的対策。	**Mitigation / Reduction** Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.
Землетрясение / Сейсмическая опасность / Сейсмический риск Землетрясение представляет собой колебание земли и земной коры, причиненное сбросовым разрывом и тектонической активностью, а сейсмическая опасность характерна для воздействий (интенсивности в баллах), ожидаемых в определенном пункте и вероятности их происхождения за определенный период ожидания. Сейсмический риск — это вероятное число потерь (человеческие жертвы, раненные, имущественный ущерб) в определенной территории в определенной временной рамке из-за потенциальных землетрясений.	**地震／地震災害／地震リスク** 地震とは、断層運動と構造運動によって生じる地面と地殻の揺れであり、地震災害とは、ある地点で予想される影響（震度）と、ある期間において地震が発生する可能性で示される特質である。地震リスクとは、可能性のある地震によって生じる、ある時間フレーム内、ある領域内での被害（死亡者、負傷者、物理的被害）の推定数あるいは損失である。	**Earthquake / Seismic hazard / Seismic risk** Earthquake is shaking of the ground and earth's crust caused by fault rupture and tectonic activities, and seismic hazard is characteristic of impacts (intensity in scores) anticipated in a specific point and probability of their origination over a certain period of anticipation. Seismic risk is probable number of losses (death of people, injured, material damage) on a specific territory over a set timeframe due to potential earthquakes.
Оказание помощи (поиск и спасение) Предоставление поддержки или воздействия во время бедствия или сразу после него, чтобы защитить жизнь населения и соответствовать базовым средствам существования пострадавших. Это может быть экстренным, краткосрочным и долгосрочным.	**救助（捜索と救出）** 災害の最中や災害直後の、生命の保護や被災者の生存のために行う支援や仲介の提供。これには、直後、短期的、長期的なものがある。	**Relief (Search and rescue)** The provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short term, or protracted duration.
Опасность Физическое явление, феномен или деятельность человека, которые могут причинить человеческие жертвы, имущественный ущерб, социальный и экономический разрыв или деградацию окружающей среды. Понятие «опасность» может включать в себя потенциальное состояние, которое может отражать будущую угрозу и может иметь разные происхождения: естественные (геологические, гидрометеорологические и биологические) или причиненные человеческим процессом (деградация окружающей среды и техногенные опасности). Опасности могут быть изолированными, последующими или скомбинированными с точки зрения происхождения и воздействий. Каждую опасность характеризуют локальность, интенсивность, частотность и потенциальность.	**ハザード** 人命の損失や負傷、財産の損害、社会と経済の混乱、または環境悪化を引き起こす可能性のある物理的な出来事、現象、または人間活動。 ハザードは、将来の脅威に関する潜在的な状況を含み、それには自然起源（地質的、水文気象的、そして生物的）または人間の活動起源（環境悪化と技術的なハザード）がある。ハザードは、その起源と影響が、単独、連続して、または組み合わさっている。各ハザードは、場所、強さ、頻度と発生確率で特徴づけられる。	**Hazard** A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity, frequency and probability.
Осведомленность населения Процессы информирования всех слоев населения, повышая степень сознательности о рисках и о том, как люди могут действовать, чтобы уменьшить их подвергание опасностям. Это особенно важно для государственных служащих при выполнении ими обязанностей по спасению жизни и имущества при происхождении бедствий. Деятельность по информированности населения способствуют изменению в поведениях, ведущих к культуре сокращения риска. В этом содержатся информация населению, ее распространение, образование, программы радио или телевидения, печатные СМИ, а также создание информационных центров и сети и поощрение дейтельности на уровне сообществ и с активным участием населения.	**大衆意識向上** リスクに関する自覚のレベルを上げ、さらにハザードにあわないためにどのように行動するかを一般大衆に伝えるプロセス。これは、災害時に生命と財産を守る責任を果たす必要のある公共機関職員にとって大変重要である。 大衆意識向上活動は、リスク削減の文化へと導く行動様式の変化を促す。これには、公開情報、広報、教育、ラジオやテレビの放送、印刷物の使用、さらには情報センター／ネットワークの設立とコミュニティ参加活動が含まれる。	**Public awareness** The processes of informing the general population, increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster. Public awareness activities foster changes in behavior leading towards a culture of risk reduction. This involves public information, dissemination, education, radio or television broadcasts, use of printed media, as well as, the establishment of information centers / networks and community participation actions.
Оценка воздействия на окружающую среду (ОВОС) Исследования, предпринятые с целью оценивать эффект на введение в определенную окружающую среду новых факторов, которые могут опрокинуть текущий экологический баланс.	**環境影響評価（EIA）** 現状の生態学上のバランスを乱すかも知れない新たな環境要素の影響評価のために実施される調査。	**Environmental impact assessment (EIA)** Studies undertaken in order to assess the effect on a specified environment of the introduction of any new factor, which may upset the current ecological balance.
Оценка (анализ) опасности Идентификация, исследование и мониторинг всякого рода опасности с целью определить ее потенциальность, происхождение, характеристику и поведение.	**ハザード評価** その可能性、起源、特徴と影響を決定するための、ハザードの認識、研究とモニタリング。	**Hazard assessment (Hazard analysis)** Identification, studies and monitoring of any hazard to determine its potential, origin, characteristics and behavior.
Оценка (анализ) риска Методология определения характера и степени риска с помощью анализа потенциальной опасности и оценки существующих состояний уязвимости, которые могли бы причинить угрозу и ущерб населению, имуществу, средствам существования и окружающей среде, от которой они зависят.	**リスク評価（リスク解析）** 起こりうるハザードの解析と、人々、財産、生活手段と人々が依存している環境に脅威または危害を引き起こすような現状の脆弱性を評価することによって、リスクの性質と範囲を決める方法。	**Risk assessment (Risk analysis)** A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend.

Оценка ущерба и потери Оценка непосредственного и косвенного ущербов, воздействия либо прекращения функциональности, нанесенных структуре, включая здания, инфраструктуру, жизнеобеспечивающие коммуникации, удобства, а также ущербов людям и обществу как жертвы катастроф, прекращения жизненного цикла и последующего вторичного фактора как пожар. Понятие «оценка потери» включает в себя денежную потерю, моральный ущерб, необходимые реагирования к травме, вредным отходам и т.п.	**被害と損失の評価** 建物、インフラ、ライフライン施設などの構造物の直接・間接被害や機能停止の想定、および、死傷、生活の中断や火災を含む二次被害などの人間や社会への影響の想定。損失の推定には、金銭的な損失、心理的な影響、有害廃棄物への必要な対応などを含む。	**Damage and loss assessment** Estimation of direct and indirect damage, impacts or suspension of functionalities to structures including building, infrastructure, lifeline facilities, and to human or society such as casualties, life suspension, and also succeeding damage such as fire. Loss estimation includes monetary loss, psychological effects, necessary response to injuries hazardous waste, etc.
Планирование землепользования Отрасль физического и социально- экономического планирования, которая определяет средства, а также оценку или ограничения разных вариантов используемых местностей с соответствующими воздействиями на различные слои населения или интересы сообщества, учитываемые при принятии решения. Понятие «планирование землепользования» включает в себя исследования и картирование, анализ данных окружающей среды и опасности, формулирование альтернативных решений по землепользованию и проектирование долгосрочных планов по разным географическим и административным нормам. Планирование землепользования может способствовать ликвидации бедствий и сокращению риска заселения высокой плотности населения и строительства ключевых сооружений в потенциально опасностых местах, контроль плотности населения и ее расширения, и в расположении маршрутов обслуживания для транспорта, электричества, воды, сточных вод и других ключевых удобств.	**土地利用計画** 土地利用の種々の選択肢の意味や、価値や限界の評価を決める、物理的、社会経済的な計画の一部で、結果としてなされる決定のなかで、異なった住民集団やコミュニティの利益に関する影響とともに考慮される。 土地利用計画は、研究と図化、環境とハザードデータの解析、代替の土地利用の策定、および異なった地理的行政的規模での長期計画の設計を含む。 土地利用計画は、ハザードの起こりやすい地域における高密度の住居や重要施設の建設を抑制すること、人口密度と人口の拡大の抑制、および、輸送ルート、電力、水道、下水および重要な施設の立地において災害の軽減とリスクの削減を助けることができる。	**Land-use planning** Branch of physical and socio-economic planning that determines the means and assesses the values or limitations of various options in which land is to be utilized, with the corresponding effects on different segments of the population or interests of a community taken into account in resulting decisions. Land-use planning involves studies and mapping, analysis of environmental and hazard data, formulation of alternative land-use decisions and design of a long range plan for different geographical and administrative scales. Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion, and in the siting of service routes for transport, power, water, sewage and other critical facilities.
Потенциал Комбинация всех сил и ресурсов, доступных в пределах сообщества, общества или организаций, которые способствуют сокращению степени риска или ликвидации последствий (стихийных) бедствий. Понятие «потенциал» может включать в себя физические, институциональные, социальные или экономические средства, такие как квалифицированный персонал или атрибуты коллектива, как лидерство и умение руководить.	**能力** コミュニティ、社会、または組織が持っている、リスクや災害の影響を軽減する全ての力や資源の集合。能力には、物質的、制度的、社会的、または経済的な手段のほか、リーダーシップや管理能力などの熟練した個人的あるいは集団的な性質を含むであろう。	**Capacity (Capability)** A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management.
Предсказание землетрясения / Прогнозирование землетрясения Ограниченное объявление или статистическое предположение о будущем возникновении землетрясения. Включает время, место и силу будущего землетрясения. Считается, что точное предсказание землетрясений на современном научном уровне невозможно. Прогнозирование землетрясения – статистическое предположение о возникновении землетрясения в определённом месте, в определённом разломе и в определённый промежуток времени на основе данных о прошлых землетрясениях и данных о движении коры земли	**地震予知／地震予測** 地震予知とは、将来の地震の発生に関する一定の発表である。これには、将来の地震の発生時期、発生場所と地震の大きさを含む。一般に現代の科学技術では、確実な地震予知は未だ不可能であると考えられている。 地震予測とは、過去の地震履歴や地殻運動などのデータに基づく、ある地域やある断層に関してある期間内における地震発生確率の統計的な想定である。	**Earthquake forecast (Earthquake prediction) / Earthquake estimation** Earthquake forecast is definite statement of the occurrence of a future event of earthquakes. It includes time, location and force of a future seismic phenomenon. It is generally considered that affirmative forecast/prediction is not possible with modern scientific technology. Earthquake estimation is statistical estimation of probability of occurrence of an earthquake in a certain area or for a certain fault for a certain period of time.
Предупреждение Деятельность в целях устранения полностью негативных воздействий бедствия и меры с целью уменьшения связанных с ними бедствий природного, техногенного и биологического характера.	**予防** ハザードの悪影響を回避するための活動、および関連する環境的、技術的、生物的災害を最小化する手段。	**Prevention** Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.
Раннее оповещение Предоставление заблаговременной и эффективной информации через установленные институты, которое позволяет индивида, незащищенного от опасности принимать меры, способствующие предотвращению либо сокращению риска, также подготовке к эффективному реагированию.	**早期警報** ハザードにさらされた個々人がリスクを回避または軽減できるようにするために、また効果的な対応準備ができるようにするために、特定専門機関を通したタイムリーで効果的な情報の提供。	**Early warning** The provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response.
Реабилитация / реконструкция Решения и действия, принятые после стихийного бедствия в целях восстановить или улучшить условия жизни до той степени, когда еще не происходило бедствие, поощряя и способствуя необходимому регулированию для сокращения риска бедствия.	**復旧／復興** 被災コミュニティの回復または災害前の生活状態を改善する観点から、災害のリスクを削減するために必要な調整を奨励、促進しながら、災害の後になされる決定と行動。	**Rehabilitation / Reconstruction** Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.
Реагирование на ЧС Организация и управление ресурсами и ответственностью для того чтобы разобраться со всеми аспектами чрезвычайных ситуаций, в частности, готовностью, оказанием помощи реабилитацией. Понятие «реагирование на ЧС» включает в себя опасность и идентификацию бедствий, поисково-спасательную операцию и т.д.	**緊急対応** すべての緊急事態への対処、特に、事前準備、救援と復旧のための組織、および資源と責任の管理。 緊急管理には、ハザードと災害の把握、捜索、救助などが含まれるであろう。	**Emergency response** The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, relief and rehabilitation. Emergency management may include hazard and disaster identification, search and rescue and so on.

Риск Вероятность вредных последствий, или предполагаемые потери (смерть, ранение, имущественный ущерб, жизненные потери, разрушенные экономические деятельности, поврежденная окружающая среда), которые являются результатом взаимодействий между опасностями природного или техногенного характера и уязвимыми условиями. Риск условно выражается следующим образом: *Риск = Опасность x Уязвимость* Некоторые дисциплины включают в себя понятие возможного подвергания ущербу, упоминающего, в частности, о уязвимости физических аспектов. Кроме того, как выражать вероятность физических повреждений, следует учесть, что риски являются врожденными, иначе говоря, могут быть созданы или существовать в пределах социальных систем. Важно учесть социальные контексты, в которых происходят риски, а также, что люди и потому же необязательно разделяют то же самое восприятие риска и их основных причин.	**リスク** 自然災害、人為災害と脆弱な状態との相互作用によってもたらされる、有害な一連の出来事、または予期される損害（死者、負傷者、所有物の損失、生活手段の損失、経済活動の中断、環境被害）の可能性。 通常、リスクは次のように表現される。 リスク＝ハザード×脆弱性 いくつかの学問分野では、特に脆弱性の物理的な側面において、リスクにさらされるという概念を含む。リスクは物理的な危害の可能性を表現しているだけではなく、リスクとは社会システムの中に固有なもの、またはその中で作り出されるもの、あるいは内在するものであることを理解することが非常に重要である。リスクが発生し、人々が必ずしもリスクとそれを引き起こす原因に対する認識を共有していない社会の背景を考慮することが重要である。	**Risk** The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Conventionally risk is expressed by the notation; *Risk = Hazards x Vulnerability.* Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability. Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.
Сейсмическая интенсивность Существуют разные шкалы интенсивности землетрясения, которые показывают интенсивность трясения, причиненного землетрясением. Приводим пример шкалы интенсивности землетрясения MSK-64: 1 балл — неощутимое землетрясение; 2 балла — едва ощутимое; 3 балла — слабое; 4 балла — заметное сотрясение; 5 баллов (слабое землетрясение) — мелкие трещины на стенной штукатурке; 6 баллов (сильное землетрясение) — испуг; кирпичные и глинобитные дома имеют немного трещин; 7 баллов (очень сильное землетрясение) — кирпичным и глинобитным домам нанесены повреждения; 8 баллов (разрушительное землетрясение) — сильное повреждение зданий, испуг и паника у населения; 9 баллов (уничтожающее землетрясение) — всеобщее повреждение зданий, абсолютное разрушение глинобитных зданий, трещины по всей стене панельных зданий, почвенные трещины до 10 сантиметров, 10 баллов (опустошительное землетрясение) — всеобщее разрушение зданий, отклонение поезда от маршрута, опасное повреждение плотин; 11 баллов: катастрофа, значительная деформация почвы; 12 баллов: глобальная катастрофа, радикальные изменения рельефа.	**震度** 地震によるゆれの影響の大きさを表現する震度階がいくつかある。たとえば、MSK-64 震度階では、震度 1 は人が感じることができない地震、震度 2 は稀に感じることがある地震、震度 3 は弱い地震、震度 4 は感じることができる地震、震度 5（弱震）は建物の壁材に小さな亀裂が生じ、震度 6（強震）は人々が脅え、レンガと石造りの建物はわずかに亀裂が入り、震度 7（とても強い地震）はレンガと石造りの建物が被害を受け、震度 8（破壊的な地震）は建物に大きな被害があり、人々が恐れ、パニックになり、震度 9（壊滅的な地震）は建物全般に被害があり、レンガと石造りの建物は完全に破壊され、パネルの建物は壁を横切る亀裂が生じ、10cm までの地割れが生じ、震度 10（根絶的な地震）は建物の全般的な破壊、電車の脱線、ダムの危険な被害が生じ、震度 11 は大惨事、地盤の重大な変形が生じ、震度 12 は地球的な大惨事、大規模な地形の変化が生じる。	**Seismic intensity** There are various seismic intensity scales that show the impact intensity of shaking caused by an earthquake. An example of Seismic intensity scale MSK-64 – I score – impalpable earthquake; II scores – barely palpable earthquake; III scores – weak earthquake; IV scores – palpable shaking; V scores (weak earthquake) – thin cracks in building's plaster, VI scores (strong earthquake) – people are frightened; bricked and cob buildings are slightly cracked; VII scores (very strong earthquake) – bricked and cob buildings are damaged; VIII scores (destructive earthquake) – major damage of buildings, fear and panic among people; IX scores (devastating earthquake) overall damage of buildings, complete destruction of cob buildings, through-wall cracks in panel buildings, up to 10 cm ground cracks; X scores (exterminating earthquake) – overall destruction of buildings, railway deviation, hazardous damage of dams; XI scores: catastrophe, significant ground deformation; XII scores: global catastrophe, radical relief change.
Сейсмический источник Сейсмический источник является активным действующим сбросом и тектонической структурой, а зона сейсмического источника — это место, где на земной коре выделяющая энергию трещина или множество действующих трещин, движение которых заставляет выпускатьнапряженность внутри коры и вызывает сейсмические волны.	**震源** 多くの地震は活断層や構造帯で発生する。震源域は地殻の中の活発な破壊または多くの活動的な破壊が発生する場所であり、震源域で地殻内の張力が解放されることで地震波が発生する。	**Seismic Sources** Seismic sources are mainly active faults and tectonic structures, and its source zone is the location of energized fracture or a number of active fractures in the earth's crust, movement along which cause intra-crust tension to release and seismic waves to originate.
Сейсмичность Совокупность происхождений землетрясения, характеризованного их местоположением, повторяемостью аварий с разной силой в пределах определенного времени, типов воздействий и деформации, связь фокуса землетрясения с геологическим составом.	**地震活動** 発生場所、繰り返し、被害と変形のタイプと範囲、震源と地質構成との関係によって特徴付けられる、地震発生の集合。	**Seismicity** An aggregate of earthquake originations characterizing by their square location, repetition of events of various force in time, types and square of damages and deformations, connection of earthquake focuses with geological composition.
Сейсмоукрепление Подкрепление структур, чтобы сделать их более прочными и устойчивыми к силам стихийных бедствий. Понятие «модернизация» содержит рассмотрение изменений в массе, крепкости, глушении трясения, пути нагружения и гибкости материалов, а также радикальное изменение, как, например, введение энергопоглощающих амортизаторов и систем виброизоляции основания.	**耐震補強** 地震力に耐える能力と復元力を加えるための構造物の強化。 耐震補強は、部材の質量、剛性、減衰、荷重経路、および柔軟性に関する変更、さらには、振動吸収ダンパーや免震装置の導入などの抜本的な変更を含む。	**Retrofitting (Retrofit) (Seismic retrofitting)** Reinforcement of structures to become more resistant and resilient to the forces of earthquake hazards. *Retrofitting involves consideration of changes in the mass, stiffness, damping, load path and ductility of materials, as well as radical changes such as the introduction of energy absorbing dampers and base isolation systems.*
Создание потенциала Усилия, направленные на развитие навыков человека или развитие социальных инфраструктур в пределах сообщества или организации, нуждающихся в сокращении риска бедствий.	**能力開発** リスクの軽減に必要な、コミュニティや組織の中の個人の技能向上や社会インフラ開発を行おうとする努力。	**Capacity building (Capacity development)** Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk.
Сокращение риска бедствий (Сокращение бедствий) Концептуальная модель элементов, учитываемых с возможностью уменьшить уязвимость и риск бедствия через общество, предотвратить (предупреждение) или уменьшить (митигация и готовность) неблагоприятные последствия риска в пределах широкого контекста устойчивого развития.	**災害リスク削減（減災）** 広い意味での持続的開発における災害の負の影響を回避（抑止）、または制限（軽減や事前準備）するために、社会全体の脆弱性と災害リスクを最小化する可能性とともに考慮される原理の概念的な枠組み。	**Disaster risk reduction (Disaster reduction)** The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context

		of sustainable development.
Стихийные бедствия Природные процессы или явления, происходящие в биосфере, которые могут причинить ущерб. Стихийные бедствия могут классифицироваться по их происхождению, например, геологические, гидро-метеорологические или биологические. Опасные явления могут варьироваться по магнитуде, интенсивности, частоте, длительности, степени, началу скорости, пространственному рассредоточению и временному интервалу.	**自然ハザード** 被害を与える事象を起こすかも知れない、生物圏で起こる自然のプロセスまたは現象。 自然ハザードは、その起源によって、地質的、水文気象的、または生物的と区分することができる。ハザードを起こす事象の、規模または強さ、頻度、継続時間、範囲、到来速度、空間的な広がり、時間間隔は様々である。	**Natural hazards** Natural processes or phenomena occurring in the biosphere that may constitute a damaging event. Natural hazards can be classified by origin namely: geological, hydro-meteorological or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing.
Строительные нормы и правила (СНиП) Законы и правила, регулирующие дизайн, конструкцию, материалы, перестройку и помещения всякого рода структуры, таких как здания, инфраструктуры, жизнеобеспечивающие коммуникации, с целью обеспечения безопасности и благосостояния человека. СНиП включают в себя как техническую, так и функциональную норму.	**建設基準（耐震建築基準）（SNiP）** 人間の安全と福祉を確保するために、建物、インフラ、ライフライン施設などの全ての構造物の設計、建設、材料、改造、保有を規制する法令や規則。建築基準には技術基準と性能基準が含まれる。	**Building codes (Seismic building codes) (SNiP)** Ordinances and regulations controlling the design, construction, materials, alteration and occupancy of any structure such as buildings, infrastructures and lifeline facilities to insure human safety and welfare. Building codes include both technical and functional standards.
Структурные меры / неструктурные меры Структурные меры относятся к любой физической структуре в целях сокращения или предотвращения возможных опасностей, в которую включают инженерные меры, конструкция защитных структур и инфраструктур, стойких к опасностям. Неструктурные меры относятся к политике, осведомленности, развитию знания, вовлеченности населения и методам эксплуатации, включая механизмы общественного участия и предоставление информации, которые могут способствовать сокращению риска и связанных с ним воздействий.	**構造物対策／非構造物対策** 構造物対策は、可能性のあるハザードの影響を減らすまたは回避するためのすべての物理的建設を指す。これには、工学的な対策とハザードに耐えうる保護的な構造物とインフラの建設が含まれる。 非構造物対策は、政策、意識、知識の開発、公約、および、手法と運営の訓練を指す。これには、リスクと関連する影響を削減する参加型メカニズムと情報の提供が含まれる。	**Structural measures / Non-structural measures** Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure. Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts.
Сценарий землетрясения Феномен и то, что произойдет после землетрясения с течением времени, относящиеся к различным повреждениям, реагированию человека на него и т.д. для того, чтобы обдумать, как реагировать должным образом, а также как планировать и осуществлять будущие меры.	**地震シナリオ** どのように適切に対応するか、どのように来るべき対策を計画して実施するかを考えることを目的として、多様な被害、人間の反応などの現象と事態を地震後の時間経過に従って記述したもの。	**Earthquake scenario** Phenomenon and what happen after earthquake occurs along time passes regarding to various damage, human responses and so on in order to consider how to respond properly and how to plan and conduct future measures.
Техногенная катастрофа Опасность, создаваемая техногенным или промышленным авариями, опасными технологическими процессами, инфраструктурными авариями или определенными деятельностями человека, которые могут причинить потерю жизни или ранение, имущественный ущерб, социальный и экономический разрушение или деградацию окружающей среды. Некоторые примеры: промышленное загрязнение, ядерная активность и радиоактивность, токсические отходы, прорыв плотины, транспортный, промышленный или технологический аварии (взрывы, пожары, разливы)	**技術的ハザード** 人命の損失や負傷、財産の被害、社会的経済的な混乱または環境悪化を引き起こすような、技術的、産業的な事故、危険な処置、インフラの破壊、またはある種の人間活動に起因する危険。 例として、工業的な汚染、原子力、放射能、有毒廃棄物、ダムの崩壊、輸送・工業または技術上の事故（爆発、火災、流出）。	**Technological hazards** Danger originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Some examples: industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, industrial or technological accidents (explosions, fires, spills).
Управление риском бедствия Систематический процесс использования административных решений, организации, оперативных навыков и способность осуществлять политику, стратегий, также способность общества и сообществ, справляться с последствиями стихийных рисков и бедствия природного и техногенного характера. Это состоит из всякого рода деятельностей, включая структурные и неструктурные меры с целью предотвратить (предупреждение) или уменьшить (митигация и готовность) неблагоприятные последствия риска.	**災害リスク管理（防災）** 自然災害や関連する環境・技術的な災害の影響を軽減するための、行政判断、組織、政策を実現する運営技能や能力、および社会やコミュニティの政策、戦略や対応力を統合した系統的な方策。 これは、災害の負の影響を回避（抑止）あるいは、制限（軽減や事前準備）するための構造物的・非構造物的対策を含むすべての活動からなる。	**Disaster risk management** The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.
Устойчивое развитие Развитие, которое отвечает требованиям настоящего времени, не подвергая потенциал будущего поколения опасности из-за осуществления требования современников. В него включаются два ключевых понятия: понятие «требование», в частности, существенные требования бедных людей в мире, которым должны уделять преобладающие приоритеты; и понятие «ограничения» технологии и социальных организаций, наложенные штатом на способность окружающей среды ответить настоящим и будущим потребностям. Устойчивое развитие основывается на социально-культурном развитии, политической стабильности и приличии, экономическом росте и защите системы окружающей среды, которые все относятся к сокращению рисков.	**持続的開発** 将来の世代が彼ら自身の要求を実現する能力を弱めることのない、現在の要求に合致した開発のこと。その中には２つのキーコンセプトを含む。その１つは、ニーズのコンセプト、特に、最も優先されるべき世界の貧困層の必要不可欠なニーズ。２つ目は、現在と未来のニーズに合致した環境の受容性における科学技術と社会組織によって課せられる限界の考え方である（Brundland Commission, 1987）。 持続的開発は、社会文化的開発、政治的安定性と礼儀、経済成長と生態系の保護に基づいており、これらは全て災害リスクの削減に関連している。	**Sustainable development** Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs. (Brundtland Commission, 1987). Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction.

Устойчивость / устойчивый Способность системы, сообщества или общества, подвергнутых опасностям, адаптироваться посредством их противодействия к опасностям или преобразованием, чтобы их функционирование и структура достигали до приемлемого уровня и удержали данный уровень. Это определяется степенью, до которой социальная система сможет повышать свою способность для изучения прошлого, с целью создания более эффективной защиты, а также улучшать меры по сокращению рисков.	**復元力（回復力）** 潜在的にハザードにさらされているシステム、コミュニティ、社会が、機能や構造が許容できるレベルに達して維持するために、耐えたり、変化したりすることによって、適応する能力。 社会システムがより良い未来を守るために過去の災害から学ぶ能力を拡大し、リスク削減対策を改善するために自分自身を体系化する能力のレベルによってこの力は決まる。	**Resilience (Resilient)** The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.
Уязвимость (хрупкость) Состояние, определяемое физическим, социальным, экономическим и экологическим факторами или процессами, которые повышают подверженность сообщества воздействию опасностей. Для позитивного фактора, который повышает способность населения бороться с опасностей, см. дефиницию «потенциал».	**脆弱性** ハザードに対するコミュニティの影響の受けやすさを増大するような、物理的、社会的、経済的、環境的な要因やプロセスによって決められる状態。 ハザードに対処する人々の能力を増す、プラス面の要因に関しては「能力」の項を参照のこと。	**Vulnerability (Fragility)** The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. For positive factors, which increase the ability of people to cope with hazards, see definition of capacity.

Chapter 1
Background

Chapter 1 Background

1.1 Background of the Study

In Almaty City, due to imminence of earthquake occurence and aging of buildings, earthquake disaster risk has been increasing. The Government of the Republic of Kazakhstan (hereinafter referred to as "Kazakhstan"), with the recognition of this situation, has started taking actions to reduce urban vulnerability and earthquake disaster risk. However, the extent of necessary work is so broad that the Kazakh government could not handle alone and sought international cooperation. That being the case, the Government of Kazakhstan requested the Government of Japan for technical cooperation. The Government of Japan decided to implement "The Study on Earthquake Disaster Risk Management for Almaty City in the Republic of Kazakhstan" and instructed the Japan International Cooperation Agency (hereinafter referred to as "JICA"), an official agency responsible for the implementation of technical and international cooperation programs of the Government of Japan, to undertake the Study.

1.2 Objectives

The Study aims to "reduce damage by possible earthquakes that may hit Almaty City" and was conducted for the following objectives.

(1) Prepare an Earthquake Disaster Risk Management Plan based on damage estimation in order to reduce earthquake damage in Almaty City.

(2) Prepare a Community-level Disaster Management Plan through preparation of Disaster Management Maps and conducting Comunity-level disaster management activities in Pilot Areas.

(3) Transfer relevant technologies to the counterpart agencies of Kazakhstan through the implementation of the Study

1.3 Study Area

The area to be covered by the Study (Study Area) extends for approximately 347 km2 as shown in Figure 1.1.

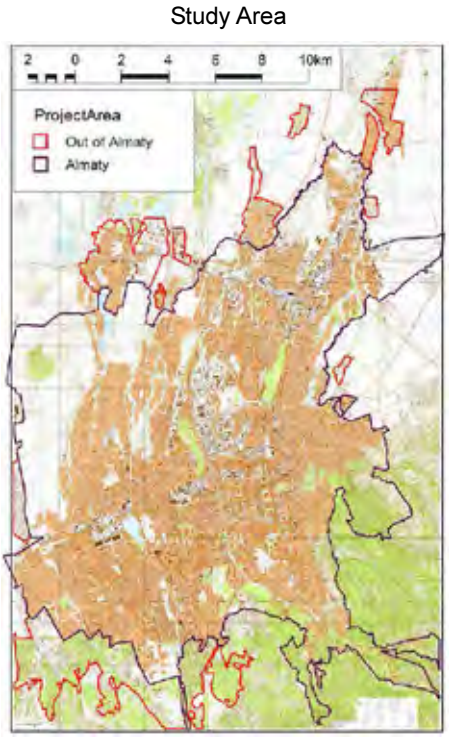


Figure 1.1 Study Area（347km^2）

1.4 Implementing organization

Figure 1.2 illustrates the organization for implementing the Study. The members involved are listed in Table 1.1. Table 1.2 and Figure 1.3 show a schedule and a flow chart for carrying out the Study.

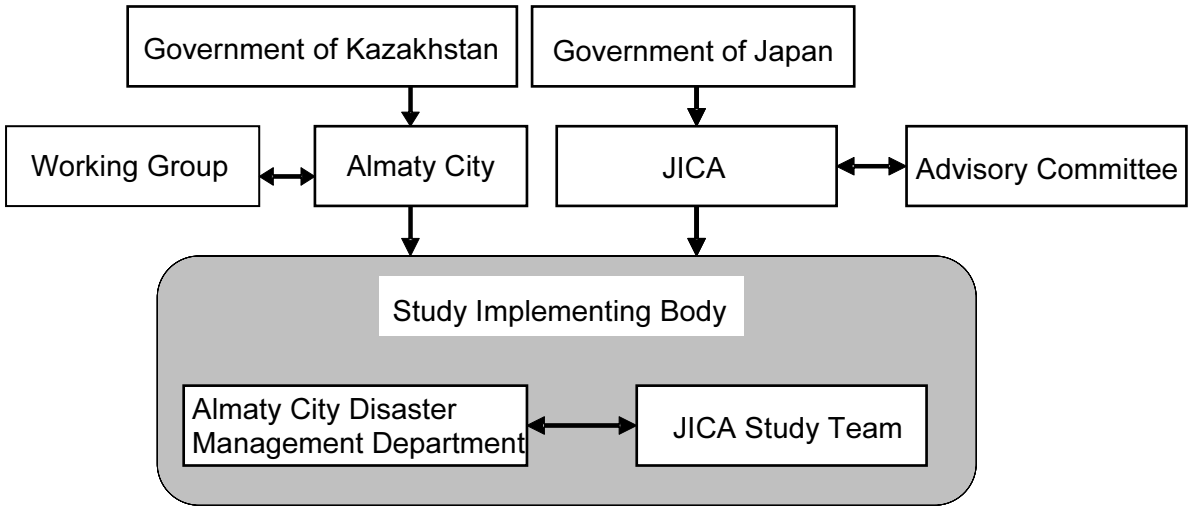


Figure 1.2 Organization for implementing the Study

Table 1.1 Members of the Study

[JICA Study Team]

Name	Affiliation
Osamu NISHII	Team Leader / Disaster Management Administration
Fumio KANEKO	Vice Team Leader / Disaster Management Countermeasures
Kenji YANO	Vice Team Leader / Earthquake Disaster Management Plan / Earthquake Disaster Scenario
Shukyo SEGAWA	Seismic Analysis / Seismic Ground Motion Estimation
Takeshi KUWANO	Geology / Soil of Ground
Akira INOUE	Building Structure / Retrofitting
Juan Rafael MONTANO Tsuyoshi YOSHIDA	Earthquake-resistant Evaluation on Road and Bridges
Kazuya YAMADA	Earthquake-resistant Evaluation on Lifeline Facilities
Takashi HARADA	Mapping
Junko SUGIMORI	GIS / Hazard Map
Tomoko SHAW	Community-based Disaster Risk Management
Hideki SATO	Land Use / Urban Planning
Mahbub REZA	Environment / Social Aspect
Masako MATSUDA Zekria NATALIA Alexey NIKOLAEV	Interpreter (Japanese/Russian)
Hiromi NONAKA	Operational Coordination

[Advisory Committee]

Name	Affiliation
Koji SUZUKI	Chairman Asian Disaster Reduction Center
Toshiaki YOKOI	Chief Research Scientist International Institute of Seismology and Earthquake Engineering Building Research Institute

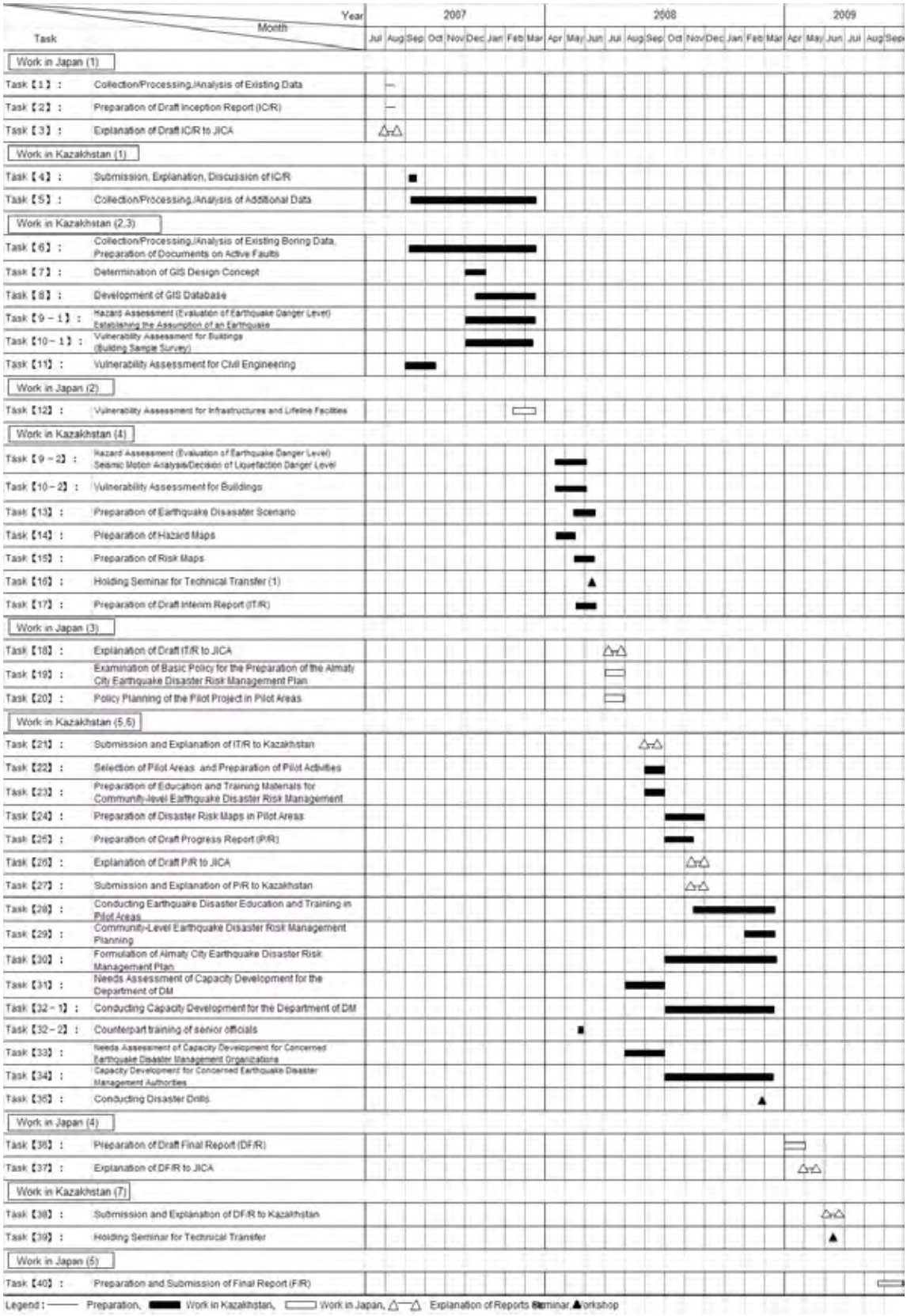
[Counterpart organization (Department of DM)]

Name	Position (No. of staff members)
Baurzhan B. ISKAKOV	Director
Sergei A. KOMAROV	Deputy Director
Seit A. TULBAEV	Planning and Analysis Coordination Division (3)
A. ELMAKHAN	Emergency Mobilization and Civil Defense Division (5)
A. ZHENIGUL	Natural Disaster Prevention Division (4)

[Working Group]

Organization
1st Deputy Akim of Almaty city
Department of Healthcare of Almaty city
Department of Architecture and Town Planning, Almaty city
Department of Economy and Budgetary Planning of Almaty city
Department of Passenger Transportation and Highways of Almaty city
Department of Construction
Department of Energy and Public Utilities of Almaty city
Department of State Architecture and Construction Control of Almaty city
Department of Natural Resources and Environmental Management
Department of Enterprising and Industry
Emergency Department of Almaty, Ministry of Emergency
Institute of Seismology of the Ministry of Education and Science
Kazselezashita (National Organization for Debris-Avalanche Protection Facilities)
Vodakanal (Almaty Water and Sewage Company)
APK (Almaty Electric Power Company)
Almaty Gas Network

Table 1.2 Implementation schedule



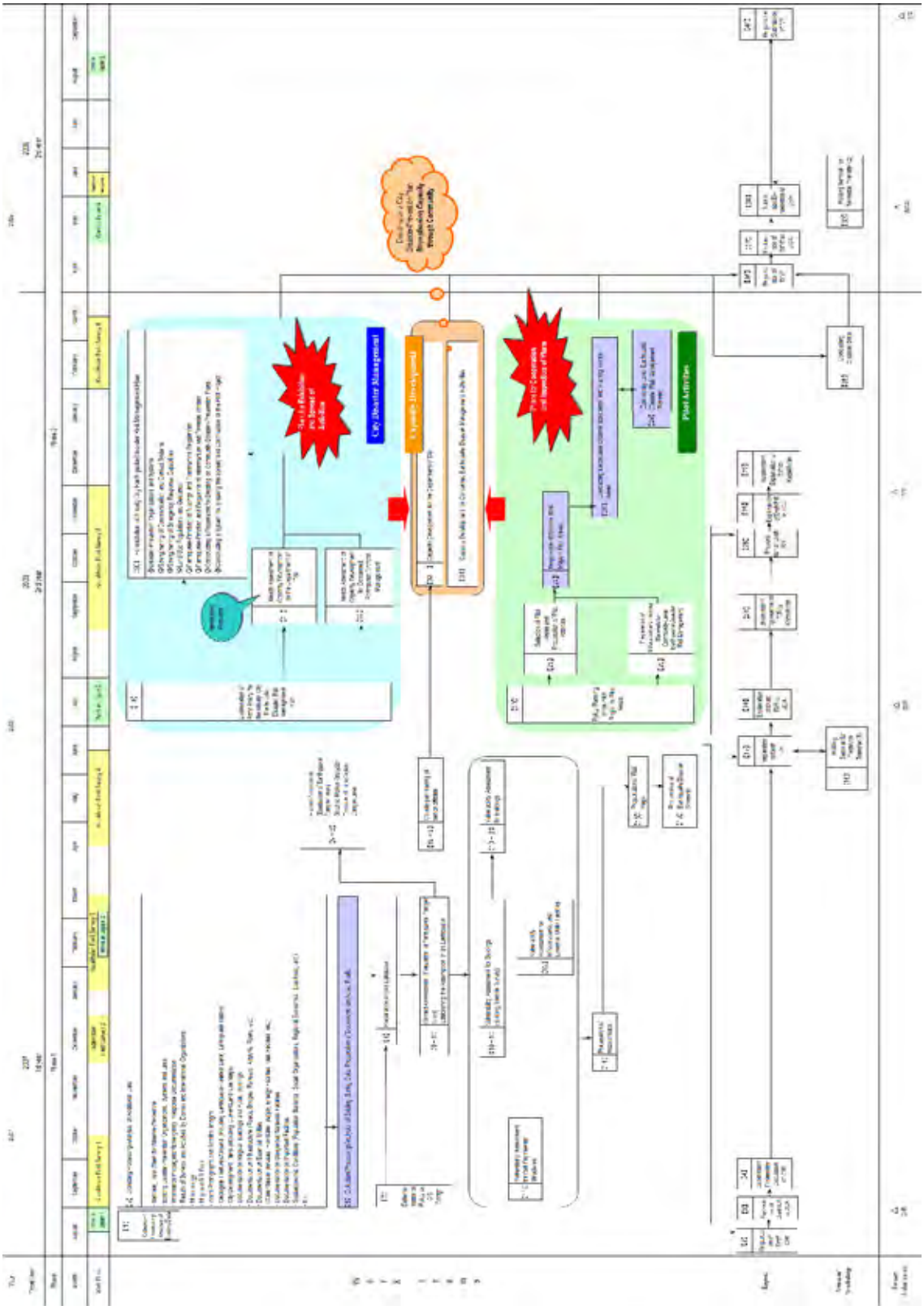


Figure 1.3 Flowchart

Chapter 2
Evaluation of earthquake hazards and risks in Almaty City

Chapter 2 Evaluation of earthquake hazards and risks in Almaty City

2.1 Collection and evaluation of information

Various sorts of information were gathered and evaluated to be used in the implementation of the Study. Table 2.1.1 lists up the materials and data obtained.

Table 2.1.1 List of materials and data obtained

Item	Materials/data
Topographic maps, GIS databases	・QuickBird satellite imagery ・Existing 1:10,000 maps ・Specifications for map symbols
Earthquakes	・Earthquake catalogue issued by the National Institute of Seismology ・GSHAP earthquake catalogue ・Digital strong-motion seismograph monitoring log, waveform data ・Analogue strong-motion seismograph monitoring log ・Data on the faults of the North Tianshan Mountain Ranges ・Record of earthquake damage in the past《History of earthquakes in Almaty》 ・GPS observation records by NASA (1996)
Soil/geology	・Geological maps ・Boring data (542 holes) ・Distribution of groundwater levels
Buildings	・Results of a sampling survey on building types ・Data on registered houses at the real estate center ・Existing GIS data at the Rescue Center ・Building database, a GIS database newly created in the Study ・2007 Almaty City Statistics White Paper
Roads, bridges, other infrastructure components	・ Road network (Polyline) and GIS data on road attributes (name, code number, purpose, width, pavement)(1999) ・Department of DM of Almaty City: Bridge Diagnosis Report (2001 and 2002) ・Design drawings and design reports for the interchange to be constructed ・Locations and code numbers of major bridges ・Railway network ・Networks of buses, trolly busses, and trams ・Almaty City Transportation Plan ・Almaty City Basic Indicators for Passenger Transport Modes (2004-2006 and 2006-2010)
Lifeline	・Statistical data on the lengths of water supply and sewer pipelines ・Statistical data on the length of gas pipeline ・Statistical data on the length of high- and mid-volta peowerlines ・The above network diagrams were downloaded from the City's official website
Demographics, No. of houses	・1999 Census ・2007 Almaty City Statistics White Paper

The classification of buildings by structure and inventory taking are of utmost importance in estimating earthquake damage. In the Study, 350 buildings were surveyed as samples and categorized into nine types based on the results from the sampling survey and the referential data listed in Table 2.1.1. The nine types defined are as follows; the numbers given in parentheses indicate the cateogry numbers.

Collective houses: multi-brick with wooden floor (3), building with flexible ground floor (4), multi-brick with concrete floor (5), RC frame -1988 (6), wooden frame (7), RC frame/monolithic 1989- (8), large panel (9)

Individual residential houses: adobe (1), brick / block (2), wooden frame (7)

Figures 2.1.1 and 2.1.2 show the distribution of each building type.

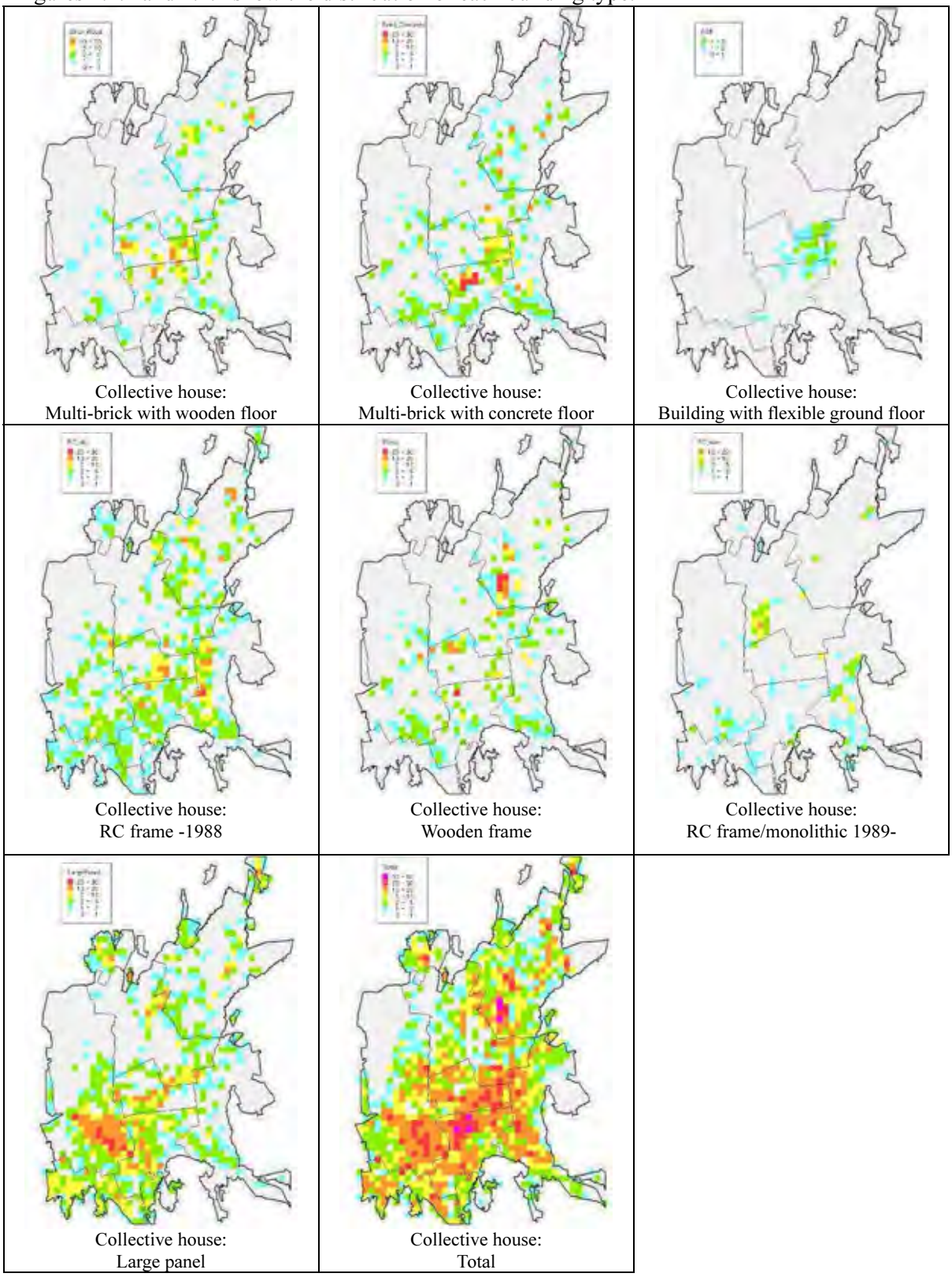


Figure 2.1.1 Distribution of houses according to building type (collective house)

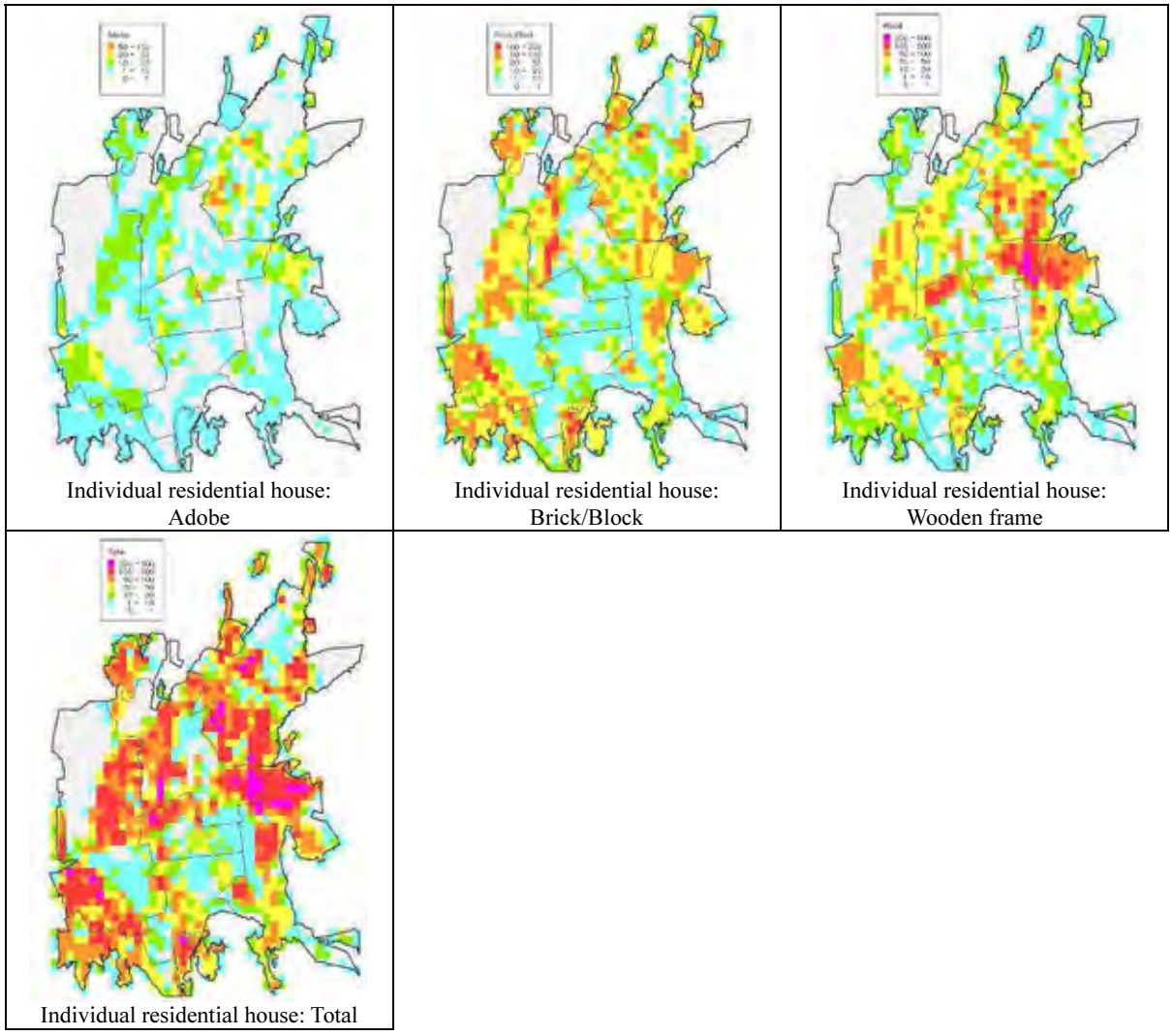


Figure 2.1.2 Distribution of houses according to building type (Individual residential house)

Social conditions essential for estimating earthquake damage include the demographics and the number of households. Table 2.1.2 presents the population and the number of dwelling units estimated in the "2007 Almaty City Statistics White Paper."

Table 2.1.2 Population and No. of households in Almaty City

District	Population (x 1, 000)
Almalinsky	179.1
Auezovsky	329.3
Bostandyksky	285.6
Zhetysusky	167.3
Medeusky	145.3
Turksibsky	180.6
Total	1, 287.2

No. of residential buildings	66, 491
No. of dwelling units (x 1, 000)	379.6

2.2 Digital plotting of existing 1/10,000 topographic maps and development of GIS databases

Topographic map data and GIS databases of Almaty City were prepared so as to serve as the base map for hazard maps and risk maps to be developed in the Study. Mainly, the existing 1/10,000 topographic maps were plotted into digital form. Then, the digitized data were corrected to reflect the chronological changes based on satellite (QuickBird) imagery.

GIS databases were created from the newly-plotted digital maps. Table 2.2.1 provides the specifications for creating the topographic maps. A total of ten topographic map sheets were created.

Table 2.2.1 Specifications for topographic maps

1.	Geodetic reference ellipsoid	WGS84 (World Geodetic System 1984) Semi major axis: 6,378,137.0 m Semi minor axis: 6,356,752.314 245 m 1/f (inverse flattening): 298.257 223 563
2.	Map projection	Gauss-Kruger
3.	Coordinate system	WGS84
4.	Datum of height	Baltic Mean Sea Level
5.	Map scale	1:10,000
6.	Map syle and symbols	National standards of Kazakhstan

GIS databases developed in The Study consist of a geographic database reconstructed from the topographic data and an earthquake disaster risk management database, which bases on the geographic database and contains additional information obtained from the gathered materials. These databases were prepared in order to develop hazard maps and risk maps by estimating possible consequences of an earthquake in the effort to establish countermeasures against and preparedness for earthquake disasters, and to provide basic data for planning post-earthquake reconstruction activities.

Data necessary for risk assessment and disaster risk management planning were extracted from the geographic database, and the following data were added.

(1) Basic data: scope of survey, administrative boundaries, micro regions

(2) Lifeline: water supply, sewerage, gas supply, power

(3) Miscellaneous: roads, bridges, hazardous substances, boring sites

As an example of the GIS databases developed in the Study, Figure 2.2.1 presents a lifeline network diagram.

The database has been already handed over to the Department of DM. In accordance with the agreement with the Department of DM, the Integrated Control Center of Almaty Rescue Service will update the data and use the database.

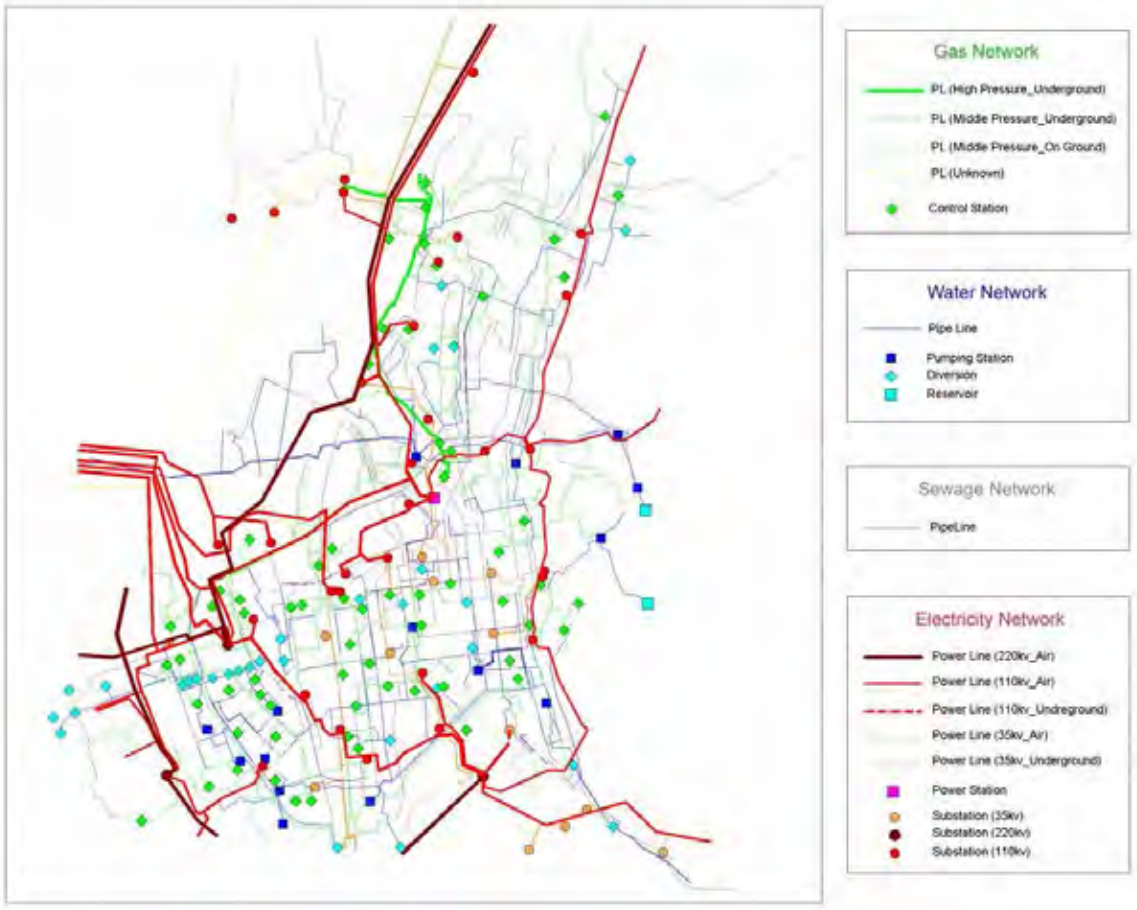


Figure 2.2.1 Lifeline network diagram

2.3 Seismic analysis and development of hazard maps

2.3.1 Setting of scenario earthquakes

In the Study, the following three major earthquakes that inflicted significant damage to Almaty City in the past 150 years were assumed to recur.

1887 (M7.3): Verny Earthquake (Approximately 20 km south of the City. MSK 8-9 and 236 deaths across the city area at that time..)

1889 (M8.3): Chilik Earthquake (Approximately 100 km east northeast of the City. MSK 7-10 and no deaths across the city area at that time.)

1911 (M8.2): Kemin Earthquake (Approximately 40 km south of the City. MSK 8-9 and 44 deaths across the city area at that time.)

Figure 2.3.1 is a fault model and Table 2.3.1 provides the parameters of these scenario earthquakes.

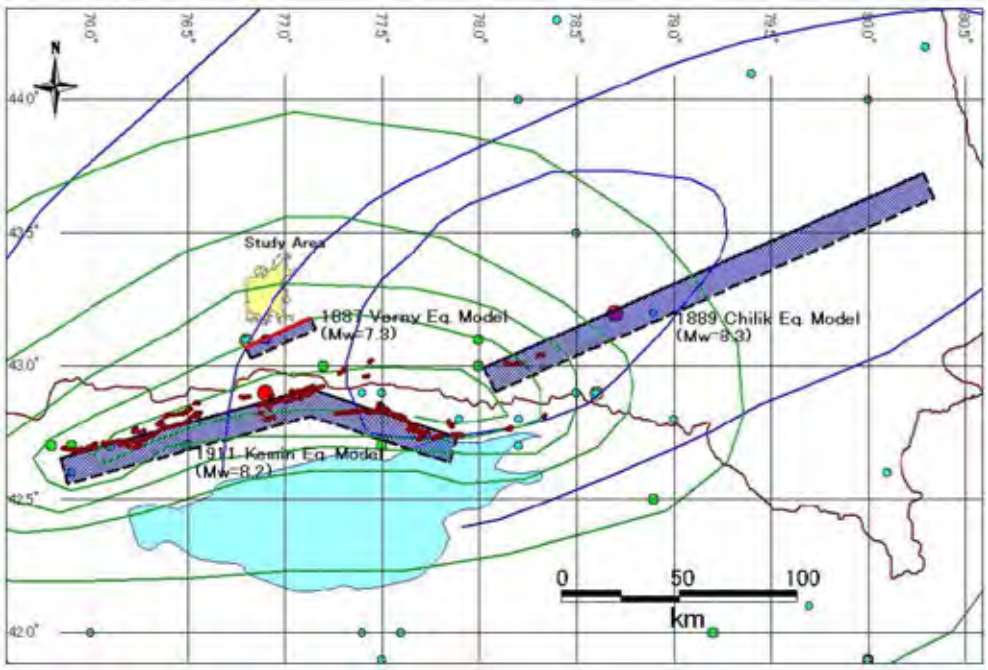


Figure 2.3.1 Fault models for the scenario earthquakes

Table 2.3.1 Parameters of the faults

Parameter	1887 Verny Earthquake scenario	1889 Chilik Earthquake scenario	1911 Kemin Earthquake scenario
Moment magunitude	7.3	8.3	8.2
Length (km)	30	200	175 (110 west, 65 east)
Width (km)	15	32	32
Depth of the top of the fault (km)	2	2	2
Gradient (°)	70 (southward)	70 (southward)	70 (southward)

2.3.2 Estimation of seismic motion

The seismic motion was estimated in two steps: a calculation of seismic motion at the engineering seismic bedrock and an assessment of amplifying characteristics of subsurfaces. The reason for separating the subsurfaceamplification from the calculation process is that amplification greatly varies with the subsurface soil conditions, while seismic motion at bedrock has little variation.

(1) Calculation of earthquake motion at the bedrock

The seismic motion at the engineering seismic bedrock was derived using empirical attenuation relationships. Of existing attenuation relationships, the following two that best fit the strong earthquakes recorded in the Study Area were selected and averaged to be used in the estimation.

- Boore et al. (1997)
- Campbell and Bozorgnia (2006)

Regarding the three scenario earthquakes, the maximum acceleration at the engineering seismic bedrock (secondary wave velocity (Vs) = 600 m/sec) was calculated from the magnitude and the distance between the center of each grid cell and the source fault.

(2) Evaluation of the amplifying characteristics of the subsurface

The seismic motion at the subsurface was calculated by multiplying the seismic at the bedrock with the amplifying characteristics of the subsurface.

In a case where data on the subsurface is limited, one of the methods to evaluate the amplifying characteristics of the subsurface is to use an average secondary wave (S-wave) velocity of the soil between the ground surface and a depth of a few dozens of meters as a parameter. In the Study, an average speed at the soil between the ground surface and a depth of 20 m was estimated based on the gathered data. The relationship between an average S-wave velocity at the subsurface and the amplifying cofficient is not the same across the world; it varies from place to place. Thus, the relationship between the velocity and the coefficient in Almaty City was derived based on experience, i.e., using the actual records of strong eqrthquakes kept by the National Institute of Seismology. The result was used in the evaluation of the amplifying characteristics of the subsurfacein the Study.

For the purpose of the seismic motion analysis and a decision of liquefaction danger levelpotential assessment, a ground model of the 500m grid was developed with the help of the collected materials and data. Based on the boring and indoor test data included therein, the geological types dispersed across Almaty City and their physical properties were identified. Furthermore, in consideration of the results of monitoring the ground conditions in Almaty City, stratum cross sections in the city were produced: 42 sections from north to south and 61 sections from west to east.

These geological sections were used to determine representative geological columns as to all 1,643 grid cells of 500 m each. Then, an S-wave velocity structural model was created per grid cell for calculating the subsurface amplification.

The acceleration at the ground surface was calculated by multiplying the acceleration at the bedrock with the subsurface amplification. The results are given in Figure 2.3.2. In the Verny

Earthquake scenario, the maximum acceleration reached 800 gal or greater in some places. This value marks the highest in all the three scenario earthquakes. In this scenario, the acceleration was at least 300 gal almost everywhere. In the Chilik and Kemin Earthquake scenarios, the values were relatively lower with 100 to 200 gal and 200 to 300 gal, respectively.

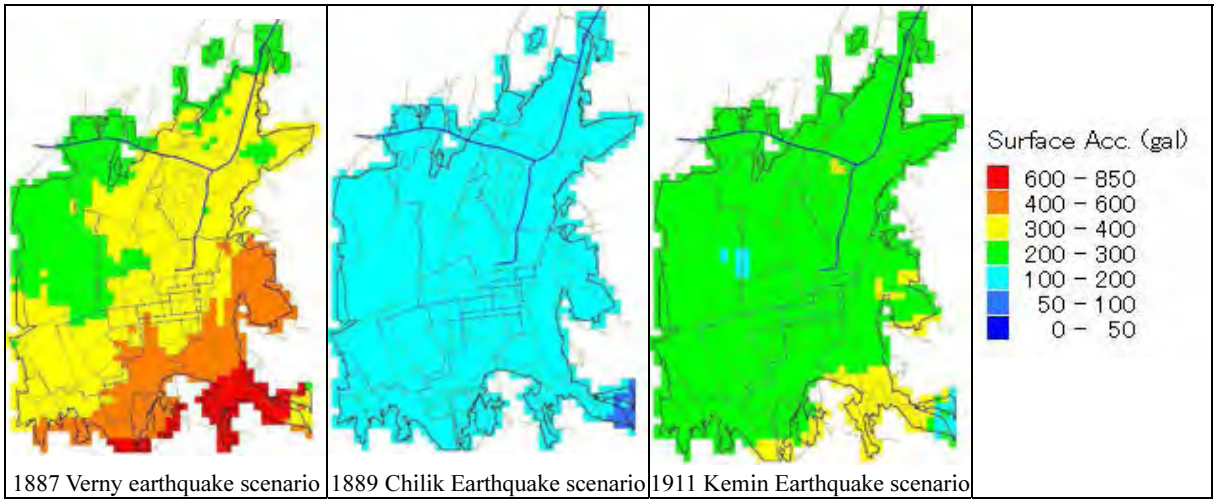


Figure 2.3.2 Distribution of accelerations at the ground surface

In Kazakhstan, the relationship between MSK intensities (MSK-64(K)) and accelerations is defined by the Building Codes (SNiP) 2.03-28-2004. In accordance with the Codes, the accelerations at the ground surface were converted into MSK seismic intensities, as shown in Figure 2.3.3.

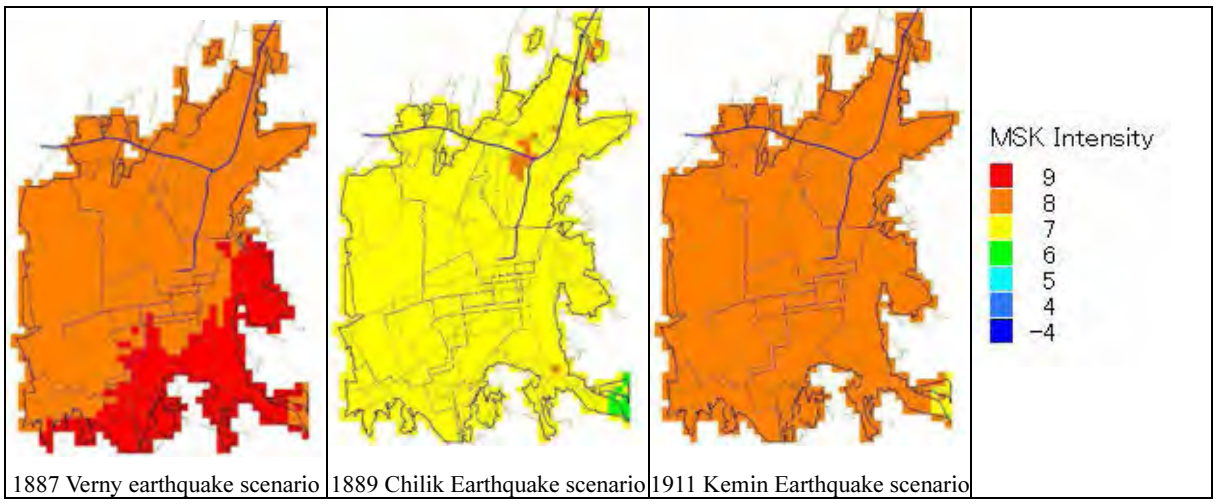


Figure 2.3.3 Distribution of MSK intensities

2.3.3 Evaluation of liquefaction danger level and slopes

(1) Liquefaction danger level

The liquefaction danger level was analyzed by the factor of safety against liquefaction (F_L) and potential of liquefaction (P_L) methods in accordance with the Japanese specifications for roads and brides. These methods allow an assessment based on data uniform across a target area. The analysis results are as follows.

The groundwater levels in the Study Area are generally low; however, the liquefaction danger level is deemed as low.

The liquefaction danger level around Almaty I Station is relatively high. If the groundwater level rises at some point in the future, liquefaction will become a concern.

As any test data on standard intrusion tests and other in-situ experiments were not available, assumed and converted values were widely employed in this evaluation. Accordingly, the credibility of these variables has to be taken into account when using the analysis results. In particular, boring data along rivers where liquefaction is most anticipated is scarce. Thus, liquefaction susceptibility along rivers is undeniable.

(2) Slopes

The risk of slopes within the Study Area was assessed by, first, reviewing the results from a survey on the risk of slopes conducted by the Department of DM, and then conducting supplementary surveys.

A quantitative assessment of the stability of slopes at the time of an earthquake requires reconnaissance of land forms in detail, monitoring of groundwater levels, and determination of geological constants necessary for calculating the stability, such as adhesive force, internal friction angle, and density. In the Study, detailed data needed for the stability calculation were not collected. However, based on a judgement that the risk at the time of an earthquake does not greatly differ from the risk at the present, the risk at the present was assessed in order to determine actions to be taken. The risk assessment included three elements: the scale of an assumed disaster, frequency of disaster, and objects to be protected. The results of the three elements were holistically evaluated in the end.

Table 2.3.2 and Figure 2.3.4 are summaries of the risk assessment results.

Table 2.3.2 Summary of hazardous slopes

Risk level	Major countermeasures	No. of points (places)	
		Big Almaty River	Small Almaty River
High	Surveys, hard measures (mainly construction), monitoring (as necessary)	S4	8
Medium	Where an expansion of damage is concerned: surveys, hard measures to prevent expansion , monitoring Where an expansion of damage is not concerned: monitoring	7	8
Low	Soft measures	5	14

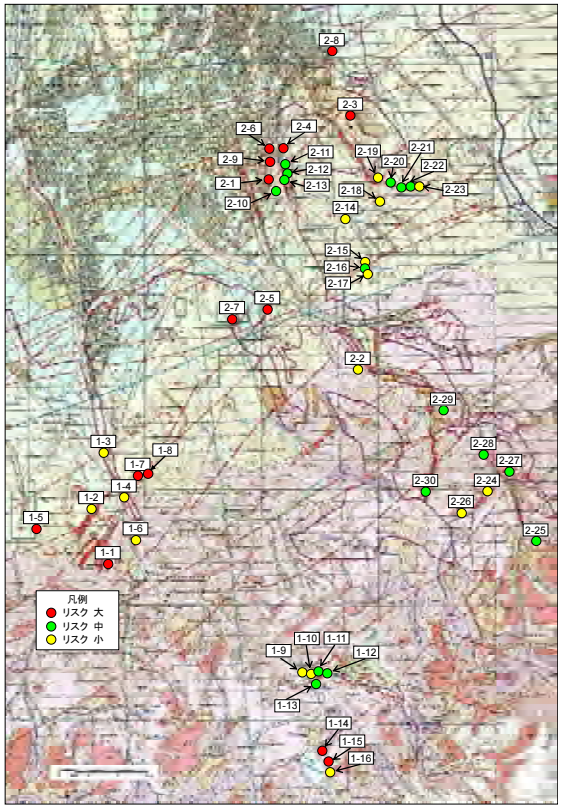


Figure 2.3.4 Results of the risk assessment of hazardous slopes

2.4 Damage estimation and development of Risk Maps

2.4.1 Building damage estimation

Collective houses and individual residential houses were categorized into nine building types. However, actual data on damage by buildindg type in the past earthquake events are very little. Since it is impossible to derive appropriate damage functions without actual damage data, seismic diagnosis was carried out as to representative buildings of each type, followed by the calculation of earthquake resistance indicators and the estimation of distributions of the indicators. Then, damage functions were calculated by relating the level of seismic intensity to the coverage of the indicators that suggest damage incurred is heavy or greater. The resulting building damage functions (vulnerability curves) are provided in Figure 2.4.1. Curves 1, 2, and 7 are for individual residential house, and 3 to 9 are for collective houses. The damage ratio is defined as the sum of the ratios of Damage Grades 4 (heavily-damaged) and 5 (collapse) specified by EMS-98 (MSK-64(K)).

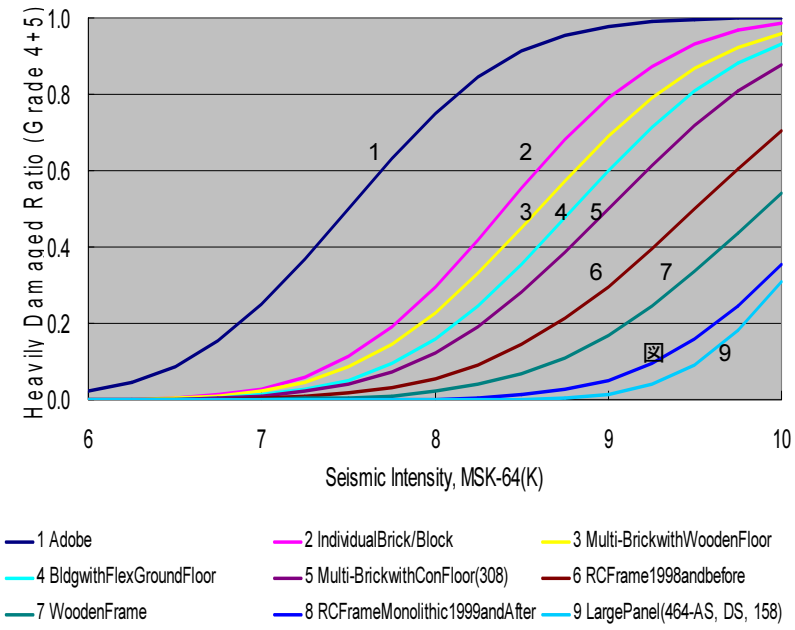


Figure 2.4.1 Building damage functions

Building damage was estimated as to each of the three scenario earthquakes. The estimation results are as follows. Table 2.4.1 and Figure 2.4.2 provide an overview of the results.

In the Verny Earthquake scenario, 990 collective houses, accounting for 11% of all collective houses, and 24,400 individual residential houses, or 33% of all, would be heavily damaged or collapse.

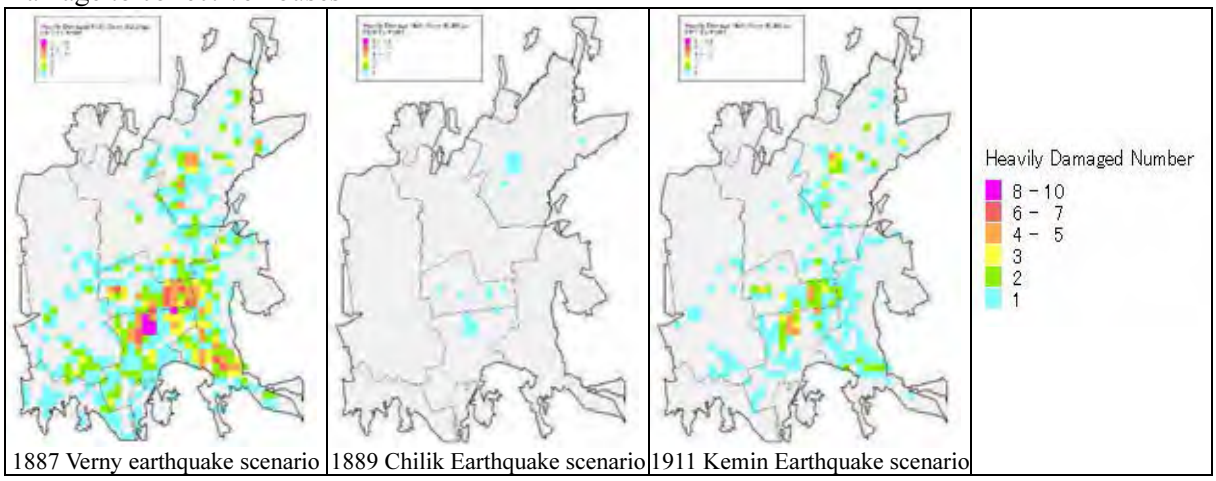
In the Chilik Earthquake scenario, 80 collective houses, or 1% of all collective houses, and 5,200 individual residential houses, or 7%, would be heavily damaged or collapse.

In the Kemin Earthquake scenario, 430 collective houses, or 5% of all collective houses, and 15,200 individual residential houses, or 21%, would be heavily damaged or collapse.

Table 2.4.1 Damage to residential houses

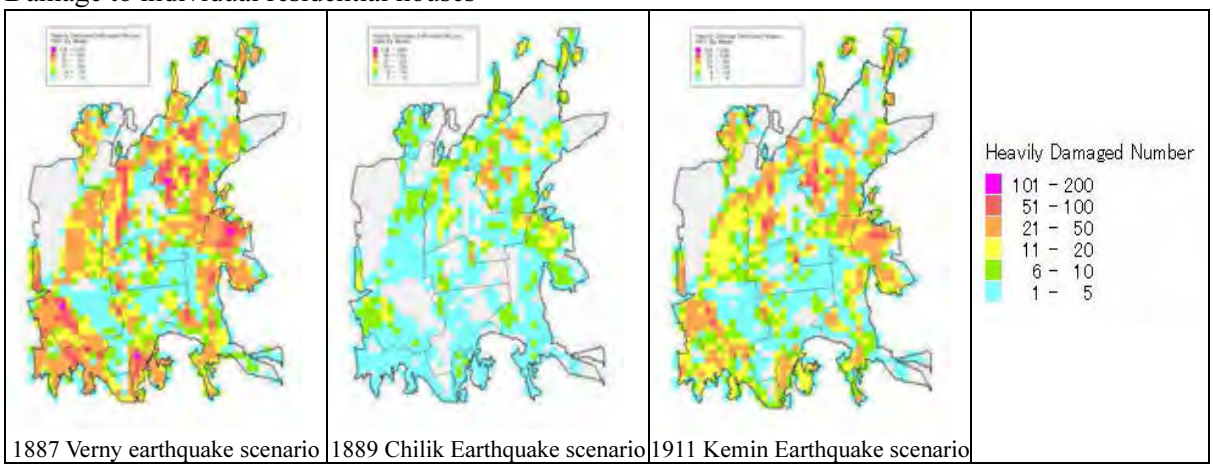
No. of heavily-damaged houses and collapsed houses (x 100 houses), Ratios of heavily-damaged houses and collapsed houses	1887 Verny Earthquake scenario		1889 Chilik Earthquake scenario		1911 Kemin Earthquake scenario	
	Collective	Individual	Collective	Individual	Collective	Individual
Almalinsky	1.4(15%)	7.1(20%)	0.1(1%)	1.5(4%)	0.7(8%)	4.4(13%)
Auezovsky	1.0(6%)	45.6(29%)	0.1(0%)	7.2(5%)	0.4(2%)	27.3(17%)
Bostandyksky	2.3(16%)	10.1(57%)	0.1(1%)	1.3(7%)	0.9(6%)	5.1(29%)
Zhetysusky	0.7(8%)	34.3(28%)	0.1(1%)	8.6(7%)	0.4(4%)	23.7(19%)
Medeusky	2.4(20%)	48.3(38%)	0.2(2%)	8.7(7%)	0.9(7%)	26.8(21%)
Turksibsky	1.5(11%)	45.7(32%)	0.3(2%)	15.5(11%)	0.9(7%)	33.9(23%)
Others	0.6(5%)	52.8(41%)	0.0(0%)	9.3(7%)	0.2(2%)	31.1(24%)
Total	9.9(11%)	244.1(33%)	0.8(1%)	52.0(7%)	4.3(5%)	152.3(21%)

Damage to collective houses



1887 Verny earthquake scenario | 1889 Chilik Earthquake scenario | 1911 Kemin Earthquake scenario

Damage to individual residential houses



1887 Verny earthquake scenario | 1889 Chilik Earthquake scenario | 1911 Kemin Earthquake scenario

Figure 2.4.2 Results of building damage estimation

2.4.2 Human damage estimation

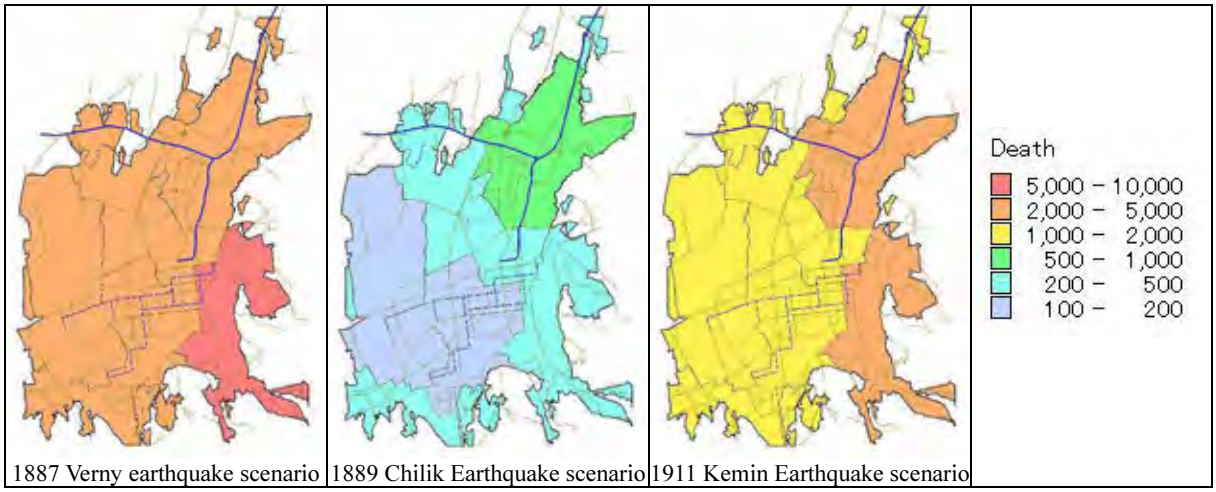
In Almaty City, collapsed buildings and fires are considered the main direct causes of deaths and injuries in an earthquake event. This section discusses human damage resulting from building collapse. Fires will be discussed later in Section 2.4.5.

The relationship between damage to buildings and the number of casualties (damage function) depends on regions and times due to the difference in building structures and living conditions. It is desired, therefore, to develop a damage function in Almaty City based on the seismic hazards experienced in target areas in recent years. However, the City has not undergone any large-scale seismic hazard lately. The damage observed in the 1988 Earthquake in Spitak, Armenia, a country which as similar building and social structures, was taken as a sample. Many of houses in Almaty City are apartments, and the number of dwelling units differs from building to building. Thus, "the number of buidings" is not directly indicative of the number of casualties. Consequently, the damage function in Almaty City was derived as to associate the number of casualties with the number of dwelling units included in the damaged buildings. Human damage in the three scenario earthquakes is estimated as follows.

In the Verny Earthquake scenario, 25,000 would be killed and 31,000 would get injured.
In the Chilik Earthquake scenario, 1,900 would be killed and 2,400 would get injured.
In the Kemin Earthquake scenario, 10,200 would be killed and 12,600 would get injured.

Table 2.4.2 Number of casualties

No. of casualties (x 1, 000), Casualty ratio	1887 Verny Earthquake scenario		1889 Chilik Earthquake scenario		1911 Kemin Earthquake scenario	
	Death	Injury	Death	Injury	Death	Injury
Almalinsky	2.7(1.5%)	3.3(1.9%)	0.1(0.1%)	0.2(0.1%)	1.0(0.6%)	1.3(0.7%)
Auezovsky	3.1(0.9%)	3.8(1.2%)	0.2(0.1%)	0.2(0.1%)	1.3(0.4%)	1.6(0.5%)
Bostandyksky	4.6(1.6%)	5.8(2.9%)	0.2(0.1%)	0.2(0.1%)	1.4(0.5%)	1.8(0.6%)
Zhetysusky	2.0(1.2%)	2.5(1.5%)	0.3(0.2%)	0.3(0.2%)	1.1(0.6%)	1.3(0.8%)
Medeusky	6.5(4.5%)	8.1(5.6%)	0.4(0.2%)	0.4(0.3%)	2.1(1.5%)	2.7(1.8%)
Turksibsky	3.5(1.9%)	4.3(2.4%)	0.6(0.3%)	0.7(0.4%)	2.1(1.1%)	2.6(1.4%)
Outside of 6 district	2.6(1.5%)	3.2(1.8%)	0.2(0.1%)	0.3(0.2%)	1.1(0.6%)	1.4(0.8%)
Total	25.1(1.7%)	31.0(2.1%)	1.9(0.1%)	2.4(0.2%)	10.2(0.7%)	12.6(0.9%)



1887 Verny earthquake scenario | 1889 Chilik Earthquake scenario | 1911 Kemin Earthquake scenario

Figure 2.4.3 Distribution of deaths by districts

2.4.3 Bridge damage estimation

Damage to bridges was assessed targeting 48 major bridges out of 56 fly-overs that the Department of DM of Almaty City recognizes. The bridges excluded from the assessment are mall structures, such as pipe culverts.

The damage estimation was carried out by means of the "Katayama Method". This approach allows a relatively simple assessment and was adopted in similar studies conducted in the past. Therefore, it is suitable in the Study in light of the unavailability of design standards, drawings, and other relevant documents, and the time constraint for conducting field surveys and the assessment within a given time. The "Katayama Method" statistically analyzes the relationship between the degree of damage to bridges in past great earthquakes in Japan and important factors that had great impact on the damage. The method is unique in that earthquake resistance is assessed by an appearance survey, which covers, for example, the distance between supports and structure of supports.

In the field surveys, some signs of deterioration of bridges were observed: seepage of calcium from concrete, corrosion of steel bars and members, cracking of concrete structures, and so on. These defects are attributed to poor construction (deficiency in cement, inadequate vibration, etc.) and chronological changes. Since deterioration is considered as to significantly affect the stability of bridges in an earthquake disaster, some items regarding bridge conditions were added as criteria.

Damage to bridges in the three scenario earthquakes was estimated as follows.

In the Verny Earthquake scenario, 18 bridges are highly likely to collapse.

In the Chilik Earthquake scenario, 6 bridges are highly likely to collapse.

In the Kemin Earthquake scenario, 11 bridges are highly likely to collapse.

Table 2.4.3 Damage to bridges

No. of damaged bridges		1887 Verny Earthquake scenario	1889 Chilik Earthquake scenario	1911 Kemin Earthquake scenario
Damage level A	・High possibility of collapsing ・Occurrence of major displacement ・Unusable for a long term; reconstruction is needed.	18	6	11
Damage level B	・Medium possibility of collapsing ・Occurrence of displacement ・Temporarily unusable; repair/renovation is needed.	0	0	0
Damage level C	・Low possibility of collapsing ・Occurrence of minor displacement ・Basically usable after an inspection	30	42	37

2.4.4 Lifeline damage estimation

Earthquake damage estimation was conducted over four lifeline systems: water supply, sewerage, gas supply, and power.

Lifeline facilities are largely categorized into node facilities and network facilities. Node facilities are independent systems such as power stations, substations, and water purifying plants. Network

facilities include conduits, powerlines, and other supply and distribution lines. The Study focuses on network facilities. Damage to network facilities in Almaty City was estimated by applying a statistical method to past damage cases. On the other hand, such a statistical method is not applicable to damage estimation of node facilities, which requires a detailed examination of each facility. Therefore, node facilities were excluded from the damage estimation.

(1) Estimation of damage to water pipes and sewers

Damage to water supply and sewerage systems was estimated targeting the total length of water pipes, 2,365 km, and that of sewers, 1, 274 km, in the six districts of Almaty City. All the pipelines are buried under the ground.

In the Study, a combination of a standard damage ratio based on damage functions and corrective coefficients that gives the greatest damage ratio was chosen by referring to a number of damage functions that have been proposed recently, and the maximum possible damage was derived. Likewise, a combination that gives an intermediate level of damage ratio was used to calculate an average damage level. The damage ratio used in calculating the greatest damage is the standard damage ratio employed in the HAZUS program, which was derived from the actual damage records in the U.S. and Mexico, while the standard damage ratio adopted by the Tokyo Metropolitan Government, which was derived from the actual damage records of the 1995 South Hyogo Prefecture Earthquake, was used for calculating the average damage. Average damage to water pipes and sewers in the three scenario earthquakes was estimated as follows.

In the Verny Earthquake scenario, approximately 500 locations of the water pipes and approximately 600 locations of the sewers would incur damage.

In the Chilik Earthquake scenario, no water pipe or sewer would incur damage.

In the Kemin Earthquake scenario, approximately 100 locations of the water pipes and approximately 100 locations of the sewers would incur damage.

Table 2.4.4 Damage to water supply and sewerage systems

Water pipes and sewers Ave. No. of points (locations) damaged	1887 Verny Earthquake scenario		1889 Chilik Earthquake scenario		1911 Kemin Earthquake scenario	
	Water	Sewerage	Water	Sewerage	Water	Sewerage
Almalinsky	45	66	0	0	6	9
Auezovsky	49	67	0	0	6	9
Bostandyksky	92	216	0	0	10	24
Zhetysusky	45	52	0	0	12	13
Medeusky	214	180	0	0	30	26
Turksibsky	63	68	0	0	20	22
Total	507	649	0	0	85	103

(2) Estimation of damage to gas pipes

Damage to gas supply facilities was estimated targeting the total length of gas pipes in Almaty City, 2,920 km, consisting of 800 km of buried pipes and 2,120 km above-ground pipes.

With regard to the buried pipes, the greatest damage and the average damage to were calculated by referring to existing damage functions, similarly to the water pipes and sewers.

Almaty City is exceptional in that gas pipes are laid above the ground. Therefore, no report on damage to above-ground pipes in an earthquake disaster was found. Kazakhstan's guidelines assume that above-ground pipes will be completely destroyed (the damage ratio of about 75%) with an MSK intensity of 8 to 9. But it is difficult to verify this information because there is little data on actual damage in past large-scale earthquakes.

In the meantime, above-ground pipes are drawn into buidings through building walls. That is to say the pipes will be subject to the damage to the building. Accordingly, damage to above-ground pipes was estimated by multiplying the length of pipes with the building damage ratio. As a result, damage to gas pipes was estimated as follows.

In the Verny Earthquake scenario, approximately 170 km of buried pipes and approximately 620 km of above-ground pipes would incur damage.

In the Chilik Earthquake scenario, no damage would be inflicted to the buried pipes, while approximately 140 km of above-ground pipes would incur damage.

In the Kemin Earthquake scenario, approximately 30 km of buried pipes and approximately 380 km of above-ground pipes would incur damage.

Table 2.4.5 Damage to gas pipes

Average length of gas pipes damaged (km)	1887 Verny Earthquake scenario		1889 Chilik Earthquake scenario		1911 Kemin Earthquake scenario	
	Buried	Above-ground	Buried	Above-ground	Buried	Above-ground
Almalinsky	16	25	0	5	2	15
Auezovsky	24	120	0	18	3	70
Bostandyksky	54	60	0	6	6	28
Zhetysusky	13	84	0	21	3	58
Medeusky	40	151	0	26	6	82
Turksibsky	17	176	0	60	6	131
Total	165	616	0	136	26	384

(3) Estimation of damage to powerlines

Damage to power supply systems was estimated targeting the main power transmission line of 35 kV or higher, based on a power distribution network map obtained from Almaty Power Consolidated (APK), a power utility in Almaty City. The powerlines consist of 355 km of overhead lines and 8 km of buried lines.

The greatest damage and the average damage to overhead lines were calculated by the use of damage functions of the HAZUS and Saitama Prefecture, Japan (1998), respectively. The damage ratio of buried lines was derived quantitatively with the use of the damage function of Tokyo (1997).

In the Verny Earthquake scenario, approximately 3 km of the main power transmission line would incur damage.

In the Chilik Earthquake scenario, the main power transmission line would incur no damage.

In the Kemin Earthquake scenario, approximately 0.3 km of the main power transmission line would incur damage.

Table 2.4.6 Damage to powerlines

Average length of main power transmission line damaged (km)	1887 Verny Earthquake scenario	1889 Chilik Earthquake scenario	1911 Kemin Earthquake scenario
Almalinsky	0.09	0.00	0.01
Auezovsky	0.32	0.00	0.04
Bostandyksky	0.37	0.00	0.04
Zhetysusky	0.23	0.00	0.07
Medeusky	1.92	0.00	0.09
Turksibsky	0.07	0.00	0.03
Total	2.99	0.00	0.28

2.4.5 Fire damage estimation

The numbers of wooden frame structures in the Study Area are estimated at approximately 1,000 wooden frame apartments and approxmiately 32,000 wooden frame individual residential houses. The spread of fire was examined based on the distribution of wooden frame buildings.

A unique feature of fires resulting from an earthquake is that they occur almost simultaneously. In such a case as the Verny Earthquake scenario, which is expected to turn out to be a catastrophe, fires beyond the capacity (capability) of the fire-fighting unit may occur and the fires may spread faster than extinguishing efforts. The possibility of fire propagation and the ratio of destruction by fire in case of no fire-fighting activity heavily depend on the concentration of buildings and the percentage of wooden frame houses.

The maximum number of buildings to be destructed by fire was calculated based on the following hypotheses.

- Fires occur in all grid cells where a spread of fire is expected.
- No fire-fighting action is taken.
- Fires keep spreading until natural extinction.

The number of deaths due to fire was calculated based on the experience in the 1995 South Hyogo Prefecture Earthquake in Kobe City, Japan.

- Some of the people trapped in wooden frame buildings that collapsed due to the tremor would be killed by fire.
- 15% of the residents of the wooden frame buildings that were damaged heavily or more greatly in the destructed area would be killed by fire.

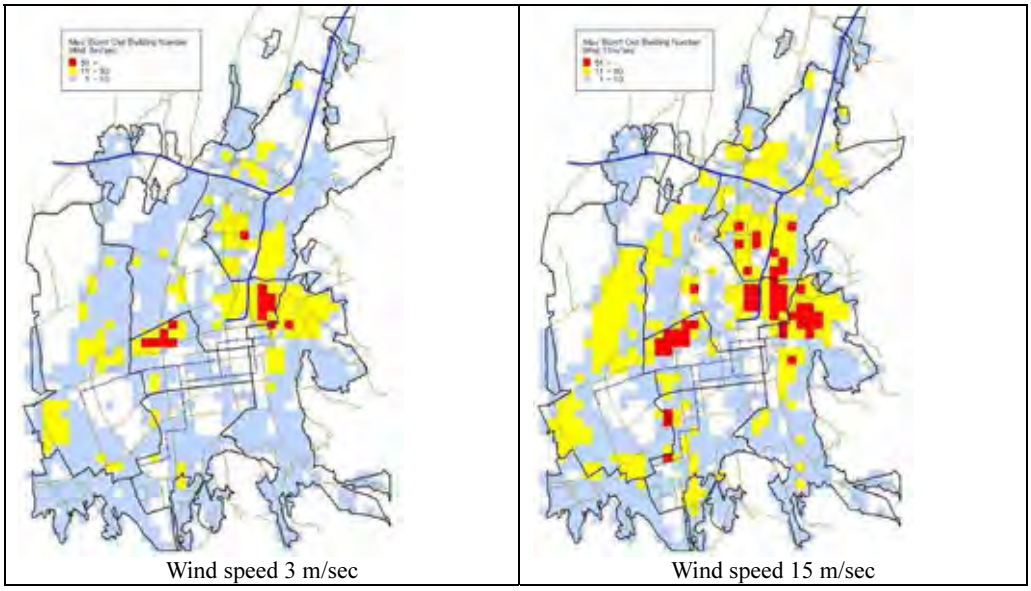
As a result, damage by fires and spreading of fires were estimated as follows.

If fires occur in conjunction with an earthquake and spread without any fire-fighting activity in place, the maximum number of houses destructed by fire would be approximately 6,500 with a wind speed of 3 m/sec (10.8 km/h) or approximately 13,000 with a wind speed of 15 m/sec (54.0 km/h).

The number of deaths by fire was estimated at 500 or fewer even in the worst case. Thus, a majority of casualties in an earthquake disaster in Almaty City would most likely result from the collapse of buildings.

Table 2.4.7 Damage by fire

District	Max. No. of buildings destroyed by fire (x 1, 000 buildings)		Max. No. of deaths in fire					
			1887 Verny Earthquake scenario		1889 Chilik Earthquake scenario		1911 Kemin Earthquake scenario	
	3 m/s	15 m/s	3 m/s	15 m/s	3 m/s	15 m/s	3 m/s	15 m/s
Almalinsky	0.8	1.5	20	50	0	0	10	20
Auezovsky	1.2	2.4	30	60	0	0	10	20
Bostandyksky	0.3	0.5	20	40	0	0	0	10
Zhetysusky	1.4	2.8	40	70	0	0	20	30
Medeusky	1.4	2.8	70	150	0	0	20	40
Turksibsky	1.5	3.0	50	100	0	10	20	50
Total	6.5	13.0	240	470	10	20	80	170



Wind speed 3 m/sec　　Wind speed 15 m/sec

Figure 2.4.4 Distribution of the maximum numbers of buildings destructed by fire

2.5 Assesment of urban vulnerability and preparation of Earthquake Disaster Scenario

2.5.1 Assessment of urban vulnerability

Almaty is a fairly well-developed city. A quick overview of the City gives an impression that the vulnerability is pretty low. However, it might increase in accordance with the rapid urbanization observed in recent years. In view of preparedness for a large-scale earthquake and reinforcement of the seismic resistance of the city, the following vulnerable aspects were identified.

(1) Vulnerability in terms of urban infrastructure

Of the infrastructure of Almaty City, the vulnerability concerning the road deployment and road widths and the area of parks and green space per capita was assessed as follows.

Road deployment and road widths

Roads with a width of 12 m or more are mostly distributed in Almalinsky, a centeral area of the city, and the northern part of Bostandyksky (hereafter collectively referred to as the "city center"). In suburbs, only bypasses and trunk roads connected to bypasses fall thereunder. In suburban areas where low-rise houses are dominant, there are some zones where the percentage of roads with a width of less than 6 m is high. In these zones, post-disaster relief activities would expectedly be difficult and the risk of fire propagation is considered high.

Table 2.5.1 Road width by district

District	Less than 6 m		6 m - less than 12 m		12 m or more		Total	
	Length (m)	Area (m^2)	Length (m)	Area (m^2)	Length (m)	Area (m^2)	Length (m)	Area (m^2)
Almalinsky	33,469	153,876	114,663	852,357	47,916	775,820	196,048	1782,053
Auezovsky	144,375	705,298	122,724	792,752	34,414	660,171	301,513	2, 158,220
Bostandyksky	27,537	131,871	111,677	777,007	34,347	529,268	173,560	1, 438,146
Zhetysusky	67,611	315,677	152,022	935,312	39,175	664,854	258,808	1, 915,843
Medeusky	49,805	234,711	176,076	1, 166,368	49,093	977,669	274,974	2, 378,749
Turksibsky	72,192	356,828	287,595	1, 896,714	29,243	455,038	389,031	2, 708,580
Total	394,989	1,898,269	964,758	64,290,510	234,187	4,062,820	1,593,934	12,381,591

Parks and green space per capita

The area of parks and green space per citizen was calculated based on the current population and found as extremely small. Parks and green space are insufficient both in the city center, where midium- and high-rise residential buildings concentrate, and in suburbs, where most of the buildings are individual residential houses. This means that space for emergency evacuation and fire mitigation is inadequate.

Table 2.5.2 Area of parks and green space by district

District	Area of parks and green space	
	Total area (m^2)	Area per capita (m^2)
Almalinsky	459,885	2.57
Auezovsky	13,701,032	41.61
Bostandyksky	2,856,852	10.00
Zhetysusky	12,094,740	72.29
Medeusky	9,454,659	65.07
Turksibsky	6,599,648	36.54
Total	45,166,815	35.09

The backyards of collective houses could be considered another evacuation space. However, the backyards are usually surrounded by midium- and high-rise buildings, and are highly susceptible to risks of collapse of the surrounding buildings and falling of broken window glass and the like. Thus, they are not suitable as an evacuation space.

(2) Vulnerability in terms of land use (buildings)

The vulnerability by building type was assessed as follows in light of the status quo.

Collective houses

The estimated damage to collective houses is notable in the city center, where old and superannuated buildings concentrate.

Individual residential houses

The estimated damage to individual residential houses is notable in suburbs, where individual residential houses concentrate. Damage from fires caused by a disaster can also be assumed.

(3) Other aspects

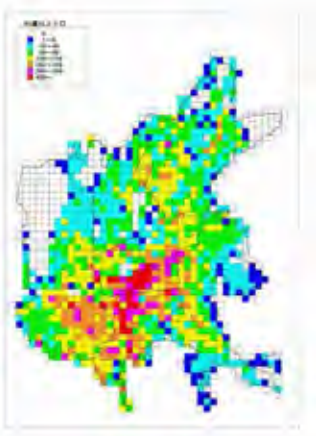
The vulnerability of Almaty City was assessed based on the land use around the rivers running through the City and on future populations.

Land use around the rivers

Many individual residential houses are widely dispersed and the road widths are mainly less than 6 m in the areas along the rivers. Since damage from a large-scale earthquake, debris flow, and fires in these areas is estimated as severe, an improvement effort is called for.

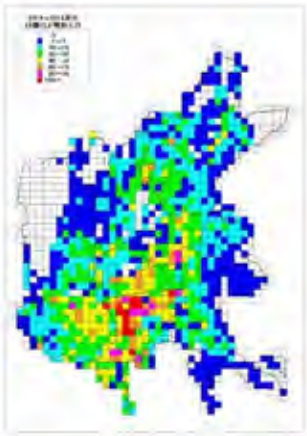
Aging of the population

A simple estimation of the ratio of senior citizens (65 years or above) to the total population of Almaty City has revealed that the municipal population is and continues to be aging in the city center, as shown in Figure 2.5.1. Considering that the damage to collective houses is estimated as severe in the city center and that the ratio of senior citizens to the total number of deaths has proven high in the past seismic hazards, the vulnerability in the city center, where the number of senior citizens is on the rise, is assessed as increasing.



Distribution of senior citizens (65 years or above) as of 2008

A predicted distribution of senior citizens as of 2018



Distribution of estimated increases in the number of senior citizens during the decade

Figure 2.5.1 Results of estimating the increase in the number of senior citizens

2.5.2 Preparation of Earthquake Disaster Scenario

Based on the outcomes from the damage estimation and the urban vulnerability assessment carried out in the Study, an earthquake disaster scenario was formulated, taking into account the present conditions of Almaty City, the results of interview surveys to counterparts, and the experiences and records of the past earthquakes in the world.

The Objective of this scenario is to prepare a reliable source for the formulation of an effective disaster management plan and to provide aid for promoting disaster management activities where possible. From this standpoint, the scenario was arranged in the following form.

(1) Scenario earthquake

The consequence scenario was formulated based on the damage estimation in the Verny scenario earthquake, because it was the most serious damage foreseen among the three scenario earthquakes.

(2) Subjects of the scenario

The consequence scenario was formulated with respect to the following 23 subjects that involve emergency response.

1) Emergency headquarters, 2) Evacuation and shelters, 3) Fire fighting and rescue,
4) Public security, 5) Injured persons and medical treatment, 6) Sanitation, 7) Missing persons,
8) Body recovery, 9) False information and panic, 10) Mental care, 11) Education,
12) Acceptance of assistance, 13) Food, 14) Drinking water, 15) Power supply, 16) Heating line, 17) Gas supply, 18) Telecommunications, 19) Media, 20) Air transportation, 21) Bridges,
22) Roads, 23) Handle of debris

(3) Scenario of each subject

For each subject mentioned above, two scenarios were prepared: a scenario in the worst case and another in an improved case. Then, recommendable measures for the realization of the improved scenario were extracted and added.

(4) Time axis

In order to clearly show the transition of damage and select effective measures accordingly, the scenario was divided into five steps in the time axis: (1) immediately after the earthquake to one hour later, (2) one to twenty four hours later, (3) one to three days later, (4) three to seven days later, and (5) seven days onward.

The Study included the weighting of recommendable measures and the selection of important measures. Then, an effective disaster management plan was prepared for the purpose of promoting the important measures.

These measures are expected to serve as reference in determining specific disaster risk management policies and disaster risk management countermeasures of individual organizations concerned and the city government in the future. In order to keep the disaster management plan up to date reflecting the real situation, the city government needs to update the consequence scenario by conducting additional detailed surveys and continued damage estimation and also to revise the scenario in accordance with the evolution of social, economic, and political situations.

Chapter 3
Disaster Risk Management Plan for Almaty City

Chapter 3 Disaster Risk Management Plan for Almaty City

The Plan was created during the phase II based on the damage assessment and the earthquake consequence scenario created during the phase I. It presented earthquake disaster management, which Almaty City is recommended to implement, and incorporated new disaster management measures along with ongoing measures, which should be continued into the future.

The Department of DM, a counterpart organization of the Study, is expected to use the Plan to promote earthquake disaster management measures for Almaty City and to facilitate implementation of the measures by the citizens / community / related organizations.

As shown by the Earthquake Disaster Risk Management Plan for Almaty City, a subvolume of Volume III of this report (hereafter called the "Subvolume") the Plan consists of five parts, which altogether have 41 chapters (see Table 3.1.1.);

The Subvolume: Part 1 Basic Considerations (Chapter 1 to Chapter 3 of the Subvolume) explains policies, results of damage estimation, and basic responsibilities of disaster risk management entities.

The Subvolume: Part 2 Mitigation Plan (Chapter 4 to Chapter 9 of the Subvolume) explains prior mitigation activities as part of quake-resistant human / community / urban development as major challenges.

The Subvolume:Part 3 Preparedness Plan (Chapter 10 to Chapter 21 of the Subvolume) explains issues including initial response, communication, fire / hazardous materials, rescue / evacuation, transportation, medical care, missing persons, drinking water / food, lifelines etc. and waste materials.

The Subvolume: Part 4 Emergency Response Plan (Chapter 22 to Chapter 35 of the Subvolume) explains actual emergency response activities in time of earthquake.

The Subvolume: Part 5 Rehabilitation / Reconstruction Plan (Chapter 36 to Chapter 40 of the Subvolume) explains a framework of a reconstruction plan formulated for ever-more comfortable, livelier community building, following the emergency response.

The Subvolume: Part 6 Assistance Plan (Chapter 41 of the Subvolume) explains a plan for assistance activities conducted for large earthquake disasters in other areas.

Chapter 3 of this volume (Volume I Summary; hereafter called this "Volume") explains overview of the Plan.

Table 3.1.1 Structures and contents of
The Earthquake Disaster Risk Management Plan for Almaty City

Structures		Contents
Part 1	Basic Considerations	Chapter 1 Basic Considerations Chapter 2 Overview and damage estimation of the city Chapter 3 Basic responsibilities of risk management entities
Part 2	Mitigation Plan	Chapter 4 The city'governance related to implementation of mitigation measures Chapter 5 Quake-resistant human development Chapter 6 Quake-resistant community development Chapter 7 Quake-resistant Urban Development Chapter 8 Enhancing quake resistance of facility structures Chapter 9 Seismic Study / research
Part 3	Preparedness Plan	Chapter 10 Process for preparedness and assistance by the city Chapter 11 Preparedness by the citizens and communities Chapter 12 Preparedness related to initial response Chapter 13 Preparedness related to communication Chapter 14 Preparedness for fire and hazardous materials Chapter 15 Preparedness for rescue and evacuation Chapter 16 Preparedness for emergency transportation Chapter 17 Preparedness for emergency medical care Chapter 18 Preparedness for missing person search / body recovery Chapter 19 Drinking water and food procurement / supply process Chapter 20 Preparedness for rehabilitation of lifeline / communication / mudslide prevention facilities Chapter 21 Preparedness for handling of garbage, human waste, and debris
Part 4	Emergency Response Plan	Chapter 22 Basics of emergency response Chapter 23 Establishing and managing the Emergency Management Headquarters Chapter 24 Collection and offering of information Chapter 25 Security, traffic control, emergency transport Chapter 26 Mutual coordination with disaster risk management bodies Chapter 27 Evacuation and relief Chapter 28 Emergency medical care, sanitation Chapter 29 Search and rescue of missing persons, handling of remains Chapter 30 Fire-fighting, countermeasures against hazardous materials Chapter 31 School measures Chapter 32 Supply of drinking water and food Chapter 33 Emergency rehabilitation of lifelines, telecommunications, traffic, and debris flow protection facilities Chapter 34 Handling of garbage, human waste, and debris Chapter 35 Emergency response to housing and livelihood
Part 5	Rehabilitation / Reconstruction Plan	Chapter 36 Basic ideas for reconstruction Chapter 37 Reconstruction Headquarters Chapter 38 Formulating reconstruction plans Chapter 39 Stability of civilian life Chapter 40 City reconstruction
Part 6	Assistance Plan	Chapter 41 Assistance plan

3.1 Basic Considerations (Part1 of the Subvolume)

3.1.1 Aim of the plan

Under “promotion of comprehensive disaster management” as an overall aim of this earthquake disaster risk management plan, earthquake disaster management activities are promoted from the following perspectives;

(1) Systematic disaster management (activities based on defined ultimate goals)

To mitigate risks related to earthquake disasters, promotion of earthquake disaster management activities is recommended upon definition of ultimate goals, which are 1) Saving human lives, 2) Securing the livelihood of citizens, 3) Maintaining social / economic systems and 4) Maintaining the country’s governance.

(2) Comprehensive disaster management (responsibilities shared under vertical and horizontal organization schemes-coordination, activities by all stakeholders with a sense of ownership)

In order to facilitate earthquake disaster management activities, it is necessary for all organizations/ citizens to clarify their own roles and to engage in activities with a sense of ownership through coordination with one another（See　Figure 3.1.1.）

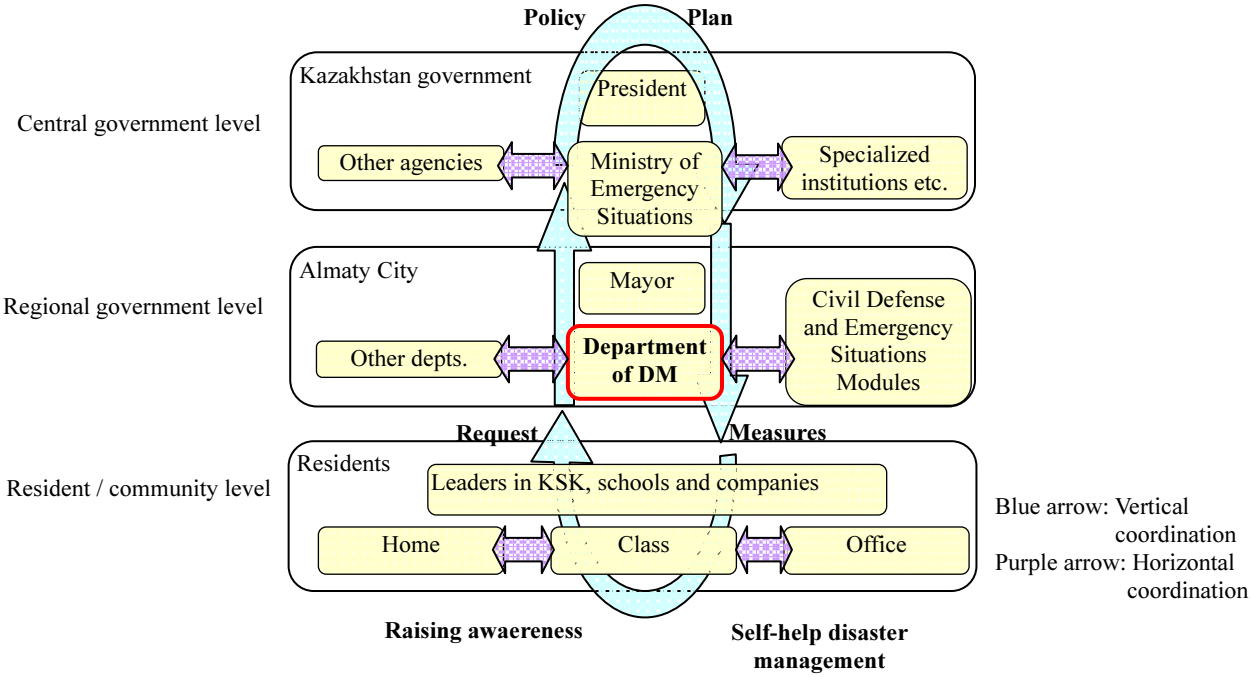


Figure 3.1.1　Coordination of vertical / horizontal organizations

(3) Systematic disaster management (Sequencing activities within the disaster management cycle)

In order to mitigate earthquake disasters, it is important that mitigation activities and emergency response activities are initiated ahead of the occurrence. Emergency response immediately after the occurrence is followed by subsequent rehabilitation / reconstruction activities. Furthermore, the rehabilitation / reconstruction should take a consistent approach for quake-resistant community development by not only recovering to the pre-earthquake state but also linking with disaster mitigation and preparedness for future earthquakes (See Figures 3.1.2 and 3.1.3.)

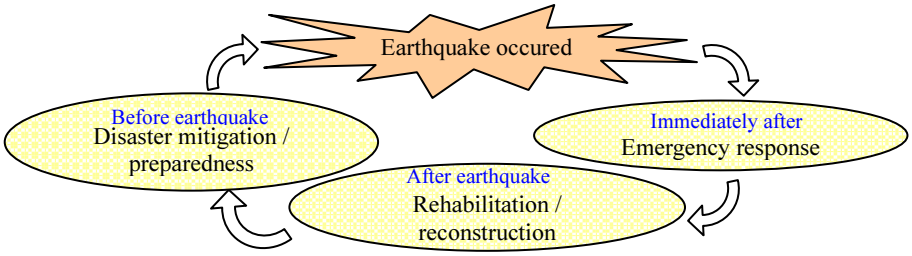


Figure 3.1.2 Concept disaster management cycle

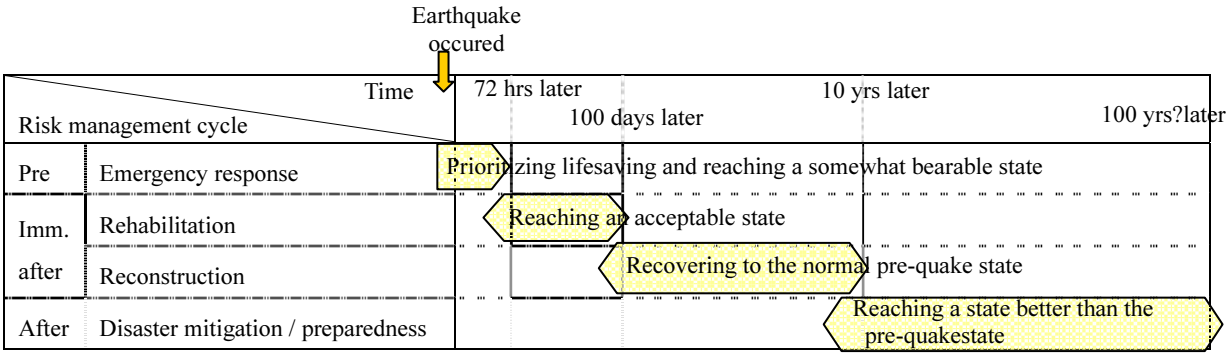


Figure 3.1.3 Activities under the disaster management cycle in chronological order

(4) Specific / efficient disaster management (activities upon risk awareness)

In order to efficiently implement disaster management activities, one needs to, upon learning hazard and vulnerability primarily as well as risks, formulate a disaster management plan and take measures accordingly to mitigate risks selected in consideration of importance, urgency and efficiency of response measures.

(5) Precise and feasible disaster management (activities aligned with one's capacity and accumulation of activities)

In consideration of requests from residents and financial conditions, measures should be taken from feasible ones based on risk assessment at a capable level. It is recommended that these activities be accumulated for risk mitigation and quake-resistant community development.

3.1.2 Policies for planning

The following policies for formulating this plan were defined in conjunction with the issues identified through the study.

a) Utilizing scientific risk assessment and earthquake disaster scenarios

b) Lowering vulnerability by enhancing prior measures that emphasize building reinforcement

c) Improving disaster management awareness of all citizens ranging from administrative officers to residents

d) Formulating a sustainable plan that emphasizes system / budget / governance enhancement through coordination with related organizations and the community

e) Disaster imagination exercise / simulation-based planning for specific conditions

f) Introduction of the pilot area's community activities to other areas and the mechanisms for securing sustainability

3.1.3 Priorities for the plan

The key elements described in the above policies will facilitate mitigation and preparedness activities for earthquake disasters under the priorities below;

a) Organization / governance for disaster management

b) Earthquake protection and regulation on buildings

c) Formulation of community-based disaster management measures

d) Regulation / guide on land usage

e) Earthquake protection and regulation on infrastructure/ lifelines

f) Enhancement of the communication system

g) Enhancement of the emergency response plan

Of these priorities, the first five items, from a) to e), are deemed particularly vital. Thus, the Plan addresses the mitigation and preparedness measures in relation to these priorities, and at the same time, action plans were drawn up so as to smoothly implement measures associated with them. Furthermore, another action plan was prepared concerning the procedure for approving the Plan, as such an approval is indispensable for implementing specific measures in accordance with the Plan (see Table 5.1 and Table 5.2).

3.1.4 Detailed plans

The following departments and organizations need to formulate detailed plans in order to deliver detailed assistance in consideration of conditions of each sector / district and regional characteristics, and to facilitate fulfillment of roles and activities of these organizations through coordination with one another.

All departments of the akim, 16 emergency response bodies, 7 districts of Almaty City, disaster management institutions, and community (community organizations such as KSK, enterprises and schools)

3.1.5 Familiarizing with and modifying the plan

Through annual review, necessary modifications will be made to this plan.

The departments and other disaster management organizations make necessary changes by examining consistency between their detailed plans / measures and this plan. In addition, educational / training activities including ones for informing members of their organizations of their roles will be provided in order to familiarize them with this plan and improve their skills related to earthquake disaster management.

3.1.6 Overview and damage estimation of the city（Chapter 2 of the Subvolume）

Chapter 2 of the Subvolume summarizes natural / social conditions and results of damage estimation, which were used as assumptions for the plan (see this Volume Chapter 2.)

3.1.7 Basic responsibilities of risk management entities（Chapter 3 of the Subvolume）

Mitigation of earthquake damage is based on the following basic concepts;

a) Individual citizens shall engage in self-help activities under the concept of “You should be responsible for protecting your own safety and property”

b) The community (community organizations such as KSK, schools and enterprises) shall engage in mutual-help activities under the awareness of “You should be responsible for protecting your community”.

c) The city and risk management organizations shall engage in public-help activities that assist self-help / mutual-help activities in order “to build quake-resistant Almaty City.”

Based on the above basic concepts, the city / disaster management organizations / communities / citizens shall fulfill respective responsibilities.

3.2 Mitigation Plan (Part 2 of the Subvolume)

3.2.1 The city' governance related to implementation of mitigation measures（Chapter 4 of the Subvolume）

(1) Roles of the city

a) By implementing the mitigation plan presented in this plan, the city shall engage in activities that directly contribute to achieving each of the goals in the plan and assistance activities.

b) The city shall monitor implementation of the planned items, and, when necessary, provide directions / assistance to facilitate implementation of the measures.

c) The city shall evaluate results from implementation of detailed plans at the end of each fiscal year, and input results of the evaluation into planning / goal-setting for the next fiscal year.

(2) The city's governance for execution / assistance

The mitigation plan is implemented based on detailed plans formulated by departments / organizations in charge of the items of the plan.

The Department of DM is expected to function as the administrative body. Hence, the department will assist the Mayor to monitor / review annual planning / on-going measures/ results for the plans implemented by responsible departments and organizations, make necessary modifications and input them into planning / goal-setting for the next fiscal year.

3.2.2 Quake-resistant human development（Chapter 5 of the Subvolume）

Almaty City will promote "quake-resistant human development" by repeating / continuing disaster drills to raise awareness of city officials and citizens.

(1) Roles of citizens

All of the citizens are expected to have accurate understanding of earthquakes and to act calmly in time of earthquake in order 'to be responsible for protecting their own safety and property' from the disaster. To this end, as shown in Table 3.2.1., the citizens shall incorporate disaster mitigation activities and preparedness activities for emergency response into their daily lives.

Table 3.2.1 Mitigation activities by citizens

1.	Forming groups among individual house residents
2.	Securing earthquake / fire protection of dwellings
3.	Preventing fire
4.	Furniture / shelf fall prevention, window glass fall prevention
5.	Safety measures for home exteriors such as wall inspection / repair
6.	Supporting local mutual-support networks created by community organizations such as KSK and schools
7.	Obtaining knowledge and information regarding disaster management

(2) Disaster management education for city officials

In order to fulfill the city's most important responsibility, which is to protect lives, safety and property of its citizens, the city will educate its officials about disaster management as shown in Table 3.2.2, and improve their knowledge of disaster management so that they can acquire skills needed for appropriate decision-making and actions based on these activities.

Table 3.2.2 Contents of earthquake disaster management education for city officials

1.	Basic knowledge of occurrence mechanisms and movement of earthquakes.
2.	Knowledge of earthquake measures currently implemented
3.	Roles fulfilled by the officials in time of disaster
4.	Issues addressed as earthquake measures

(3) Introducing disaster management to citizens

As shown in Table 3.2.3, through coordination with Education Center of the Department of Emergency Situation and the Department of Domestic Policy, the Department of DM will introduce disaster management to citizens to increase their knowledge and awareness shown in Table 3.2.3 through distribution of brochures, lectures and disaster management fairs, and PR on radio / TV.

Table 3.2.3 Contents of earthquake disaster management for citizens

1.	Basic knowledge of occurrence mechanisms and movement of earthquakes.
2.	Knowledge of earthquake measures currently implemented
3.	Daily preparations for earthquakes
4.	Notification of evacuation shelters and evacuation methods in time of earthquake
5.	Road traffic regulations and driving considerations in time of earthquake
6.	Rescue / first aid methods

3.2.3 Quake-resistant community development（Chapter6 of the Subvolume）

(1) Roles of the community

Under the awareness of "You should be responsible for protecting your community", community constituents (community organizations such as KSK, enterprises and schools,) will build a governance scheme for disasters through coordination with one another. In addition, each of the community members will engage in earthquake mitigation activities shown in Table 3.2.4 to improve their awareness and capacity for disaster management.

Table 3.2.4 Community-based mitigation activities and assistance for these activities

Activity item	Assistance
1. Formulation of a community disaster management plan and a manual	Implemented by the city
2. Establishment / enhancement of voluntary disaster management groups	Assisted by district offices of DOES and Red Crescent Societies.
3. Promotion of earthquake protection of buildings and facilities (renovation, rebuilding for protection)	Assisted by the city
4. Promotion of furniture / shelf fall prevention, window glass fall / shatter prevention	Assisted by DOES and managed by the city
5. Creation of disaster management education materials and implementation of disaster management education	Materials are created by the city, and educations implemented by DOES, managed by the cityand assisted by Red Crescent Societies.
6. Fire protection and safety measures for hazardous materials	Assisted by DOES and Red Crescent Societies and managed by the city

(2) Assistant measures for vulnerable people in disasters

Vulnerable people needing assistance in time of disaster include residents of social welfare facilities, inpatients, home care receivers, disabled people, elderly people, expectant mothers, infant / toddlers and foreigners / tourists who do nott understand Kazakh and Russian languages. Assistant measures are taken to secure safety of these vulnerable people with regard to evacuation during a disaster and to stabilize their lives after the disaster.

(3) Assistance for community-based mitigation activities

The community's disaster management activities require assistance by the city and the Department of Emergency Situation. The city and the Department of Emergency Situation will provide the community with assistance highlighted in the right ('Assistance') column of Table 3.2.4.

(4) Coordination between the city and the community

In order to implement community building coordinated between the city and the community, the Department of DM will implement measures shown in Table 3.2.5.

Table 3.2.5 Measures for mutually-coordinated community building

1. Prepare a place for the city, community and NGOs to discuss about mutual assistance
2. Guideline / manual creation and education on mutual coordination among municipalities, community and NGOs
3. Organizing symposiums and lectures regarding quake-resistant community building

(5) Preparation for economic and industry reconstruction

In order to make various preparations for disasters for industrial sectors, the Department of DM and Department of Entrepreneurship and Industry will take measures shown in Table 3.2.6.

Table 3.2.6 Preparatory measures for economic / industry reconstruction

1.	Establishing and organizing Industry Disaster Management Meeting
2.	Creating an enterprise disaster management manual
3.	Studying Industry One-Stop Center

3.2.4 Quake-resistant Urban Development（Chapter 7 of the Subvolume）

Quake-resistant urban development needs the following considerations;

a) Implementing earthquake protection for urban infrastructures built during the Soviet Era.

b) Improving quake resistance of buildings etc. to mitigate damages to citizens and prevent road blocks resulting from building collapses.

c) Fire protection measures for wooden dwellings, particularly individual residential houses

d) Securing open areas for evacuation in time of disaster

e) Improving wide-area road networks

(1) Basic ideas for urban planning

Development and building construction in Almaty City and its neighboring areas need to comply with the city's urban planning standard and its seismic urban planning criteria, SNiP2.03-07-2001. Also, redevelopment projects need to comply with the Almaty City Master Plan.

(2) Promoting redevelopment projects

Redevelopment projects will be promoted in a phased and systematic approach and in compliance with the Almaty City Master Plan. Considering that many of the current private redevelopment projects target high income citizens, public housing and rental housing projects led by the city will be delivered to allow average citizens to continue to live in their places after rebuilding while avoiding competition with private development projects.

(3) Securing open spaces

Due to the low ratio of green coverage of the central urban district, apart from the evacuation shelters designated by Almaty City, large factory sites will be proactively utilized in time of disaster.

Considering that the neighboring areas crowded by individual residential houses have many wooden houses and lack open spaces within the urban areas, countermeasures including buffering functions such as tree planting in private lands and wall setbacks in time of rebuilding will be implemented to prevent fire / fire spread.

(4) Road improvement

Early improvement of the outer beltline, parking regulation in roads used for the designated emergency routes, earthquake protection of electric poles used for power cables for trams and promotion of subway systems will be implemented.

(5) Land use in time of disaster

In order to utilize large factory sites and open spaces (private lands) in time of disaster, the Department of DM, the Department of Land Use Management and the Department of Entrepreneurship and Industry will sign land use agreements with owners beforehand.

3.2.5 Enhancing quake resistance of facility structures（Chapter 8 of the Subvolume）

To make Almaty City a more quake-resistant city, it will secure quake resistance of its structures and facilities including buildings, lifeline facilities, civil engineering structures, communication facilities and disaster management related facilities.

Securing quake resistance includes quake-resistant design for each of the said structures and facilities as well as measures to secure comprehensive system functions by means of alternatives and multiplexing.

(1) Quake-resistance diagnosis / renovation of existing buildings

Further progress is expected with regard to quake-resistance diagnosis / renovation of government agency buildings that are central for emergency response activities such as commands / evacuation instructions / information offering and public buildings including schools and hospitals.

Earthquake protection of private houses / buildings is basically implemented by the owners. The Department of Architecture and Urban Planning and related organizations will engage in introduction / education of quake resistance diagnosis / renovation to the owners and the administrators of the buildings, and promote earthquake protection of important buildings, apartments and the buildings built along roads used for the designated emergency routes. To this end, introduction of case studies of quake-resistance reinforcement plans and law enforcement will be also implemented.

(2) Improvement of quake resistance of new buildings

New buildings must comply with the quake resistance standards during their design phase. In addition, measures for improving the building inspection scheme and enhancing technical skills of inspectors are needed to secure quality during their construction phase.

For compliance of quake resistance criteria and securing of construction quality, penalties will be clearly stated and applied.

(3) Object / furniture fall prevention / elevator safety measures

Through coordination with related departments, the Department of Architecture and Urban Planning, the Department of Energy and Public Utilities will investigate falling objects such as window glasses / displays / billboards that are potentially harmful in time of earthquake, and take safety measures.

To mitigate damages caused by indoor furniture falls in time of earthquake, education and guidance will be provided especially for apartment residents to encourage measures shown in Table 3.2.7.

Table 3.2.7 Measures for mitigating damages caused by indoor furniture falls

1.	Don't place tall furniture in bed rooms
2.	Reduce furniture in rooms used by elderly and disabled people and small children
3.	Lower the center of gravity of furniture by adjusting storage to prevent falls
4.	Fix furniture aginst walls with L-shape mounts
5.	Prevent furniture falls by filling gaps between furniture and ceilings
6.	Prevent falls of home appliances, TVs and pianos

Working with elevator manufacturers and maintenance / management providers, the Department of Energy and Public Utilities and the regional bureau of the Department of Emergency Situation will prevent elevator shutdowns resulting from power outage in time of disaster. Also, a governance scheme will be established for early rescue of people trapped inside an elevator.

(4) Enhancing quake resistance of lifeline facilities

Lifeline facilities will secure the sufficient level of quake resistance in order to maintain their functions in time of disaster and to minimize impacts on urban activities.

Organizations responsible for lifeline facilities including water supply and sewage, electricity, hot-water supply, gas and communication, will formulate detailed plans and implement them accordingly.

These facilities will focus on the measures such as quake-resistance diagnosis and quake-resistance reinforcement / rebuilding resulting from diagnosis and upgrading of emergency power supply. The measures for network facilities will include upgrading of obsolete pipes and wires and looping of networks. Also, underground installation will be implemented for gas pipes and aerial lines.

(5) Enhancing quake resistance of traffic facilities

The Department of Public Transportation and Motor Roads will improve quake resistance of 18 bridges that were evaluated as ‘high-risk’ for disasters under the 1887 Verny scenario earthquake by widening bridge seat edges, girder connection and bridge collapse prevention. New construction and rebuilding of bridges need to incorporate the said quake resistance measures, and to employ rigid frame and continuous girder methods for bridge construction to minimize bridge collapses.

Furthermore, detailed studies are required for comparing different measures to implement permanent quake-resistance reinforcement, and quake resistance criteria need to be revised for reliable seismic design.

(6) Enhancing quake resistance of river facilities

When recognizing obsolescence of concrete retaining walls and back sand discharge, the Department of Natural Resources and Nature Management will conduct repair work to maintain stability and safety of the revetment structures.

The Mudslide Prevention Section of the Department of Emergency Situation, which manages bank structures, will examine safety of banks in time of earthquake and, when necessary, conduct reinforcement work for earthquake protection. Also, it will examine quake resistance and reliability

of effluent outlet / water discharge structures for banks, and conduct reinforcement and repair work if needed.

(7) Preventing collapses of retaining walls and block fences

Design and construction of retaining walls must comply with GOST26815-86 issued on November 4th, 1985. For existing retaining walls, their management organizations will conduct a visual inspection of cracks etc. of the walls, keep a record, and check their quake resistance.

Use of fences such as block fences in residential areas is prohibited in Kazakhstan. In industrial areas, since construction using reinforced concrete is mandatory under Typical Structures, Productions and Joints of Buildings and Structures Series 3.017-3, construction under this plan must also follow this guideline.

(8) Enhancing quake resistance of cultural assets

Enhancement of quake resistance of cultural assets must comply with the Cultural Asset Protection Law issued on July 2nd, 1992 and amended on July 21st 2007.

In time of earthquake, administrators of cultural assets must immediately take protective measures in compliance with the measures defined by the task force meeting summoned by the Department of Emergency Situation. The Department of Culture will formulate a rehabilitation plan / list for damaged cultural assets, submit it to the Ministry of Culture and Information, and rehabilitate cultural assets with the state budget.

(9) Landslide and mudslide protection

Of 46 slopes surveyed by the Department of DM, 12 slopes were evaluated as 'high risk', and 14 slopes were evaluated as 'moderate-risk.' Upon detailed study of these slopes, the department will conduct a countermeasure work categorized by different causes and disaster types to prevent and minimize fragility of the slopes. In parallel, it will also take "soft" measures such as development of laws and regulations, notification of dangerous slopes, monitoring and improvement of information delivery / evacuation scheme.

The Mudslide Prevention Section of the Department of Emergency Situation will conduct a quake resistance diagnosis of mudslide-proof structures, and conduct a quake resistance reinforcement and reconstruction if needed to secure adequate quake resistance of these structures. In parallel, it will also take "soft" measures for defining a risk range of mudslide, notification of danger and improvement of information delivery / evacuation scheme.

3.2.6 Seismic Study / research（Chapter 9 of the Subvolume）

While the Phase I of the study assessed earthquake disasters with information available at the time of the implementation, for the future, assessment will be updated in accordance with changes to social conditions. The assessment method itself will employ the latest science and technology to continue its study / research for more accurate assessment of earthquake disasters.

3.3 Preparedness Plan（Part 3 of the Subvolume）

3.3.1 Process for preparedness and assistance by the city（Chapter 10 of the Subvolume）

(1) Roles of the city

The city will make preparations for emergency response, along with its mitigation measures, to minimize damage and confusion immediately after an earthquake disaster.

The followings are overall roles of the city;

a) The city will manage its implementation of each of the planned items shown from Chapters 11 to 22of the Subvolume. It will assign departments and organizations to implementation of the plan. Then, the assigned departments and organizations will formulate detailed annual plans, secure budget and assign personnel.

b) The city will appoint its staff as emergency response managers, who will monitor the progress of each of the detailed plans and provide instructions and assistance for smooth implementation. Also, it will make necessary coordination / directions based on reports from the managers.

c) Upon receiving reports on the progress of the detailed plans from the emergency response managers, the city will assess the results, and incorporate them into planning and target setting for the next fiscal year.

(2) Process for implementation / assistance process by the city and overview of its activities

The city will make preparednesses within the process, which is similar to the one devised for emergency response. However, the Emergency Management Headquarters and others that are convened after an earthquake will not be included in the preparedness process (see Figure 3.3.1.)

The Mayor will be responsible for execution of this plan, and, as with Section 4.2, the Department of DM will have a role of the secretariat.

The city's Inter-departmental Disaster Management Committee, Almaty City Evacuation Commission, District Mayor / regional Disaster Management Committee / Regional Evacuation Commission will make coordination within the city and districts engaging with implementation. The Civil Defense and Emergency Situations Modules are implementing bodies for items associated with different sectors.

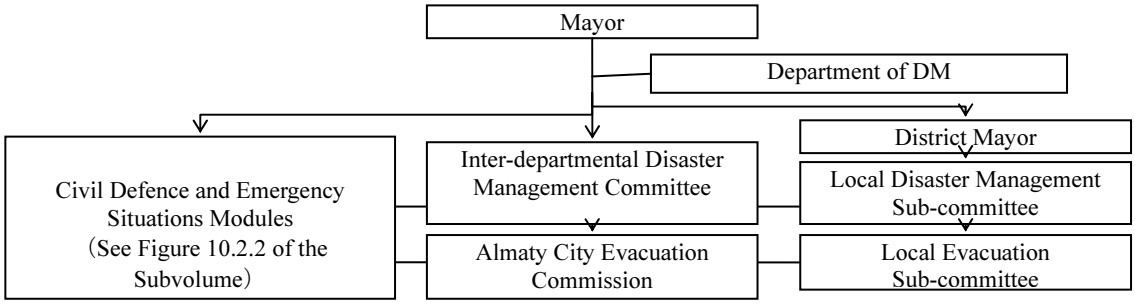


Figure 3.3.1 Almaty city's preparedness process

Since, in general, it is difficult to manage 16 different Civil Defense and Emergency Situations Modules in parallel, a process of overseeing preparedness made by the Civil Defense and Emergency Situations Modules is split into groups / layers as shown in Figure 3.3.2, in consideration of the process of managing activities implemented by the Civil Defense and Emergency Situations Modules during emergency response, and responsible modules will be clarified for steady implementation of the respective detailed plans.

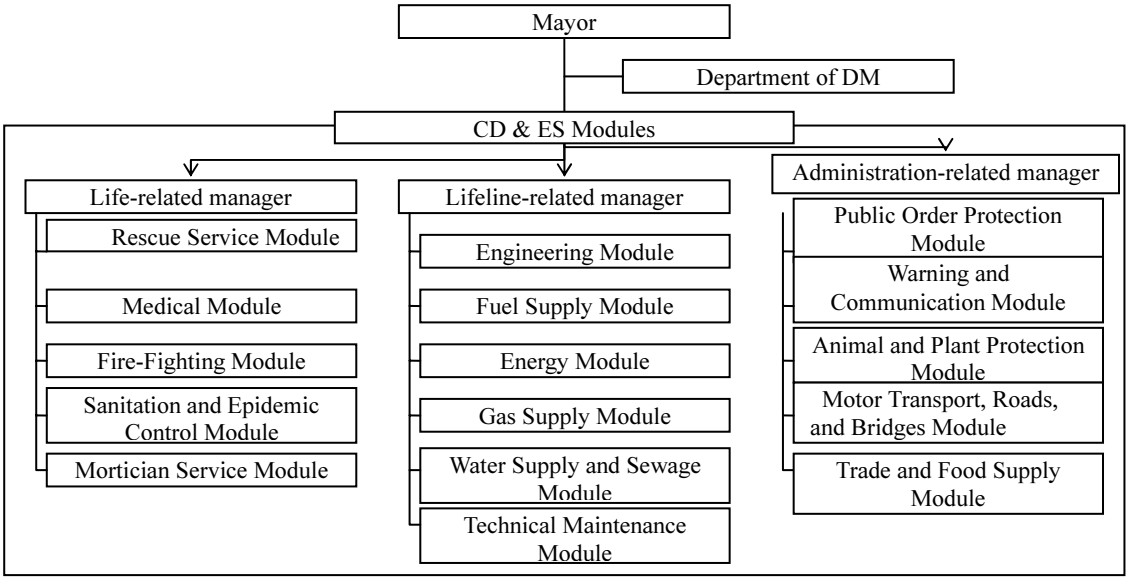


Figure 3.3.2 Preparedness process for the Civil Defense and Emergency Situations Modules

3.3.2 Preparedness by the citizens and communities（Chapter 11 of the Subvolume）

(1) Roles of the citizens

Table 3.3.1 summarizes the citizens' roles for preparedness.

Table 3.3.1 Preparedness by the citizens

1.	Preparing fire extinguishers and extinguishing tools.
2.	Preparing food and water needed for a minimum of three days, mobile radios, torches, emergency belongings including drugs.
3.	Confirming role sharing among family members, evacuation routes / places / methods and a method for communication among family members
4.	Active participation in disaster drills organized by the city and the communities.
5.	Prior notification to community organizations such as KSK by families who have family members needing assistance in time of disaster.

(2) Roles of the communities

Table 3.3.2 summarizes the communities' roles for preparedness

Assistance delivered by the city and DOES are also listed in the table.

Table 3.3.2 Preparedness by the communities and its assistance

Activity items	Assistance
1. Stockpile of water, food and daily necessities, and stockpile / maintenance / regular inspection of disaster management equipment	Assisted by DOES and Red Crescent Societies, and managed by the city.
2. Creating a list of community members (residents, employees, teachers / students,) a list of people needing assistance, a contact list of disaster management organizations.	Assisted by the district offices of DOES and Red Crescent Societies.
3. Creating a disaster management map, preparation and notification of assistance facilities such as evacuation shelters.	DOES creates a disaster management map. Evacuation shelters assisted by Department of DM are introduced by the same dept. These activities are assited by Red Crescent Societies.
4. Preparation for protection/ assistance of community members and residents.	Implemented by Department of DM and DOES, and managed by the city.
5. Improving the response capacity and giving advice on what to do in time of earthquake disaster by disaster drills and seminars.	Assisted by DOES and managed by the city.

(3) Implementation process for the communities

By separating the region by the size of 1 to 2 sq km as a unit, the Department of DM creates a disaster management coordination community consisting of several communities within a unit. In this region, communities including KSK, enterprises and schools work together to formulate a disaster management plan, and conduct joint exercises. The entities in the region work with one another to effectively utilize disaster management resources, and establish a comprehensive secure community building system within the region (see Fig.3.3.3.)

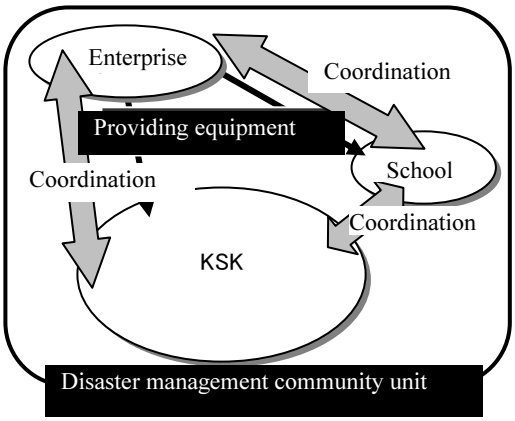


Figure 3.3.3 Disaster management community unit-Concept

In order for a disaster management community unit to deliver assistance for disaster management activities, the Department of Emergency Situations for Almaty City will send a disaster management expert (facilitator) responsible for leading a series of disaster management activities and taking up opinions from the community members to arrange and consolidate them.

(4) Assistance for community preparedness activities

As shown in Table 3.3.2, the Department of DM, the Department of Emergency Situations for Almaty City, the Department of Education, the Department of Energy and Public Utilities and the Department of Entrepreneurship and Industry will provide assistance for preparedness activities conducted by the communities.

(5) Coordination / cooperation with volunteers

The Department of DM, the Department of Emergency Situations for Almaty City, Almaty Rescue Service should initiate prior discussions with NPOs such as Red Crescent Societies so as to effectively accept volunteer activities in time of disaster, and establish “Disaster management volunteer information center” and “Disaster volunteer local assistance center” in the secretariat of the Emergency management headquarters.

3.3.3 Preparedness related to initial response（Chapter 12 of the Subvolume）

(1) Maintenance of functioning city government buildings

The city government buildings, the Crisis Management Center that functions as the Emergency management headquarters and its substituting facilities are the most important facilities as sites that smoothly implement emergency response immediately following an earthquake. The Department of DM will secure quake resistance of these facility buildings while making preparations related to initial response activities such as maintenance of fire extinguishing equipment and emergency power supply of the facilities and stockpile of drinking water and food.

(2) Formation of the Emergency Management Headquarters

The Emergency management headquarters consists of personnel belonging to either the Director Group or the Members Group (see Figure 3.3.4.)

The Director Group includes the Mayor as the Director of the Headquarters, the Director of DOES, three managers of Life-related / Lifeline-related / Administration-related modules of the Civil Defense and Emergency Situations Modules, and administrative staff assigned by the Mayor.

The Members Group includes personnel sent from 16 of the Civil Defense and Emergency Situations Modules, personnel from the city departments who are not appointed as representatives of the Civil Defense and Emergency Situations Modules, personnel from the new seven districts, chief personnel in charge of areas assigned by the Mayor or personnel from these areas.

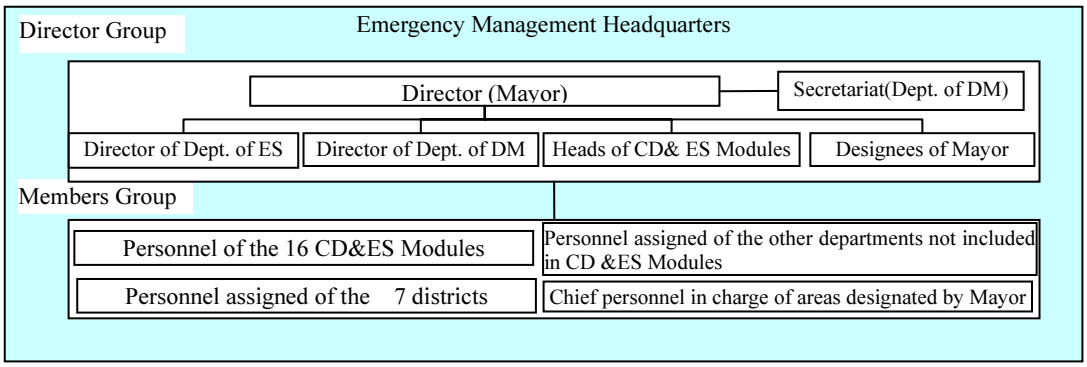


Figure 3.3.4 Formation of the Emergency Management Headquarters

(3) Enhancing the initial response process

Upon sensing an earthquake measuring with seismic intensity of 4 scores or above or learning damage resulting from an earthquake, personnel of the Emergency Management Headquarters will use the emergency communication network to check the status and instructions. Even when there are no instructions given, they gather at the Emergency Management Headquarters, based on their decisions. unless they confirm the fact that the situation is not serious.

In case when members of the Director Group and the Members Group cannot fulfill their roles due to absence in communication, injury or some other reasons, people substituting those members and the order of such substitution will be defined beforehand.

The Integrated Control Center of Almaty Rescue Service will offer a 24-hour operation to receive emergency calls from the citizens. Based on the list of emergency contacts, the Communication Warning Section of the Rescue Service will contact personnel of the Emergency Management Headquarters and top officials of the city and the districts.

(4) Assignment / mobilization plan

An assignment/ mobilization plan will be formulated based on the following basic policies;

a) In principle, all of the city officials and personnel belonging to the Civil Defense and Emergency Situations Modules must mobilize.

b) Mobilization will be categorized into mobilization at the headquarters and places the personnel belong to, field mobilization and immediate mobilization.

c) The mobilization plan will be reviewed every year and updated for submission to the Department of DM, who will then make necessary arrangements and obtain approval from the Mayor.

(5) Enhancing coordination among disaster management organizations

In order to enhance coordination with neighboring areas and enterprises possessing human / material resources needed for emergency response, the Civil Defense and Emergency Situations Modules will reconfirm with their contacts about sufficiency of resources offered and order of accepting assistance beforehand. In addition, prior agreements with private enterprises are made for smooth provision of resources including civil engineering equipment, drivers, drinking water and food during emergency response.

3.3.4 Preparedness related to communication（Chapter 13 of the Subvolume）

To quickly grasp the status of a disaster and to accurately deliver information together with instructions to the related organizations, the civilians and the communities, it is necessary to prepare communication equipment/ devices (hard) usable at any circumstances and the process (soft).

(1) Improving the communication network for disaster management

The Integrated Control Center of Almaty Rescue service and the Crisis Management Center have prepared equipment / devices which are used for communication with 20 related organizations or more through LAN, dedicated short-wave radio and telephones. They will conduct regular inspection of the equipment / devices, and, at the same time, handle the following issues.

a) Upgrading of obsolete equipment

b) Deployment of equipment enabling the call center and emergency vehicles / related organizations to have multiple / two-way communication

c) Deployment of communication devices equipped with a viewer function directly linked to a GPS and operation systems in emergency vehicles

(2) Enhancing the communication / information gathering process

Almaty City's communication / information gathering process is well managed (see Figure 3.3.5.) For further enhancement, it needs to focus on the followings as immediate priorities.

a) Consolidation of emergency contacts separated into Fire (01), Police (02), Emergency (03), Gas (04) and Rescue (051)（Introduction of a unified phone number '112'）

b) Updating / consolidation of database (including map information,) response manuals and forms for emergency response

c) Deployment of operation systems for real-time damage estimation and decision-making assistance for the directors.

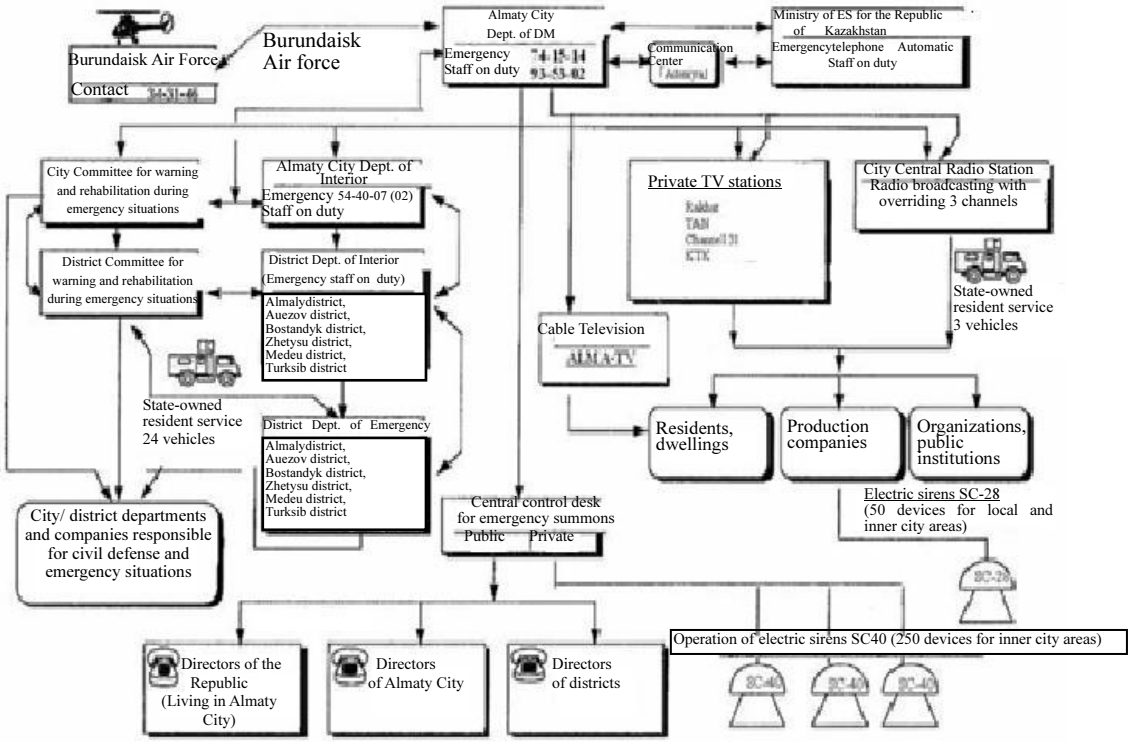


Figure 3.3.5 Emergency communication process Almaty City

(3) Public relations and public hearing activities during normalcy

Public relations activities for disaster management policies formulated by Almaty City and the Kazakhstan government, this plan and detailed disaster management plans created by respective organizations will be conducted during normalcy for the following purposes;

a) To raise awareness of the communities and the citizens and promote voluntary disaster management activities

b) To support enhancement of public assistance measures

c) To encourage mutual cooperation among related organizations

d) To offer reassurance and confidence

On the one hand, the Department of DM will establish a toll free consultation service and information desk to take requests and complaints to incorporate them into the disaster management activities.

3.3.5 Preparedness for fire and hazardous materials（Chapter 14 of the Subvolume）

(1) Enhancing the initial fire-fighting process

The Fire-Fighting Module will enhance its initial fire-fighting process by providing instructions for maintenance of fire-fighting equipment, technical improvement and tests for initial fire-fighting activities and enhancement of the fire-fighting process for the citizens and enterprises.

(2) Prevention of fire spread

The Fire-fighting Module will aim for prevention of fire spread by improving / enhancing the fire-fighting process of the fire-fighting brigade of the Ministry of Emergency Situations, its equipment, the communication process and fire-fighting water supply.

(3) Improving the fire-fighting process

The Fire-fighting Module and the Department of DM will study formulation of a fire defense unit to allow several fire-fighting groups of community-based voluntary disaster management organizations within a disaster management coordination community (see Section 3.3.2 (3) of this Volume) to prepare for fire-fighting activities as 'a fire company.' Also, for each fire company, the Fire-fighting Module will aim for enhancement of its process of providing disaster management guidance for the civilians as well as for deployment of an assistance scheme for preparation of operation sites for fire companies and their fire-fighting equipment.

The Department of DM and the fire brigade of DOES will improve fire-fighting water supply and portable pumps for the fire brigade, and enhance the fire company process in areas where fire-fighting activities are difficult in time of earthquake due to narrow roads and crowded wooden dwellings.

The Fire-fighting Module will work with the Department of Architecture and Urban Planning to eliminate difficulties in fire-fighting in problem areas by presenting its view to disaster management urban development projects from the standpoint of fire-fighting activities thorough understanding / analysis of constraints on fire-fighting activities and based on study results on fire spread.

3.3.6 Preparedness for rescue and evacuation（Chapter 15 of the Subvolume）

(1) Enhancing evacuation plans

According to the result of damage estimation conducted under this study, it estimated that approximately a total of 200,000 people would be forced to evacuate temporarily. Since the current capacity is not able to handle them sufficiently, it is necessary to review the current positioning and designation of evacuation shelters based on the distribution of casualties and evacuees from the estimation.

A plan will be formulated to specify installation / operation of long-term shelters for citizens who lost their homes. Also, utilization of these existing schools and public facilities as long-term evacuation shelters will require earthquake protection, training of personnel needed in these facilities and upgrading of equipment.

The evacuation guide formulated by the existing Almaty city Evacuation Commission will be published, and at the same time field training based on this guide will be regularly provided to identify / improve problems related to the process.

(2) Designation of evacuation shelters used in time of disaster

Evacuation in time of disaster will be implemented in two stages (see Table 3.3.3.) The Department of DM will inspect and confirm evacuation sites / facilities, and, based on this result, make changes or remove from the designation.

Table 3.3.3 Evacuation phases in time of disaster

Stage	Local disaster management site	Category	Estimated usage period
Stage I	Evacuation sites	Temporary evacuation site/ medical aid station / body recovery site	Several hours to 3 days
Stage II	Evacuation shelters	Evacuation assitance base / long-term evacuation shelter / special evaculation shelter	Until evacuees find their permanent dwellings (about 1 year or less)
(Settlement)	(Permanent dwelling)	(Collective/ individual housing; may go through temporary housing)	

(3) Preparing local disaster management sites

To prepare local disaster management sites, the Almaty city Evacuation Commission, the Fire-fighting Module and the Rescue Service Module etc. will take measures shown in Table 3.3.4.

Table 3.3.4 Measures for preparing local disaster management sites

1. Installing signs to inform people of the evacuation site locations.
2. Installing fire protection water tanks for securing fire-fighting water supply for local disaster management sites and neighboring areas.
3. Preparing evacuation roads for safe evacuation
4. Preparing digital mobile radios for rapid and secure information delivery / transmission about evacuation
5. Installing disaster management storage in evacuation facilities to stockpile disaster management equipment, food, water and daily necessities needed for rescue and during evacuation.
6. Implementing earthquake protection for sewage facilities along with construction / renovation of evacuation facilities in order to secure flush toilets in the facilities.
7. Installing helicopter signs in local disaster management sites for smooth rescue activities using helicopters.
8. For each of the temporary evacuation shelters / facilities, establishinga committee for evacuation site operation, which will consist of local residents, the facility and municipalities.

(4) Enhancing the rescue / evacuation process

The Rescue Service Module, the Almaty city Evacuation Commission, the fire brigade of DOES and the Department of DM will take measures shown in Table 3.3.5 for enhancement of their rescue/ evacuation process.

Table 3.3.5 Measures for enhancing the rescue / evacuation process

1. Regular meeting of the Evacuation Commission
2. Implementing evacuation drills / training at each of the disaster management sites for more than once a year.
3. Formulating a plan for transfer of civilians to outside of the city in case when there are capacity shortages in evacuation facilities in the city.
4. Enhancing the rescue / first aid process for the fire brigade of DOES
5. Improving rescue / relief operation capacities of voluntary disaster management organizations and civilians in the communities.
6. Securing large rescue sites

3.3.7 Preparedness for emergency transportation（Chapter 16 of the Subvolume）

(1) Designating and improving emergency transport networks

As shown in Table 3.3.6, the Motor Transport, Roads and Bridges Module will work with related Civil Defense and Emergency Situations Modules to define emergency routes and to secure sufficient traffic volume for delivery of rescue / medical / fire-fighting / emergency resources, personnel and citizens.

Table 3.3.6 Category of designated emergency routes

Category	Purpose
Designated emergency route #1	Connecting between command sites inside Almaty city and outside the city.
Designated emergency route #2	Connecting between rescue / medical / firefighting sites and the designated emergency route #1.
Designated emergency route #3	Connecting between emergency resource transport sites and the designated emergency routes #1 and #2.

For these designated emergency routes, the Motor Transport, Roads and Bridges Module will work with related organizations during normalcy to make preparations for emergency response, which includes parking regulations, clearing of obstacles and reinforcement of road structures.

(2) Designating and improving emergency transport sites

The Motor Transport, Roads and Bridges Module will work with companies that possess / operate track terminals located along highways stretching in the westward and northward directions from Almaty City to ensure its securing of sites and facilities needed in time of emergency. Also, it will work with state companies that possess / operate major train stations and the Almaty Airport to confirm availability of sites and maintenance of facilities needed for transportation during emergency.

Furthermore, for smooth emergency transport to command/ evacuation / medical sites that are related to emergency response, the Motor Transport, Roads and Bridges Module will work with related Civil Defense and Emergency Situations Modules and District Mayor / local disaster management departments to designate local transport sites and to prepare necessary facilities.

(3) Processes for obstacle removal and traffic regulations on the designated emergency routes

The Motor Transport, Roads and Bridges Module will work with the Technical Maintenance Module to formulate a plan for obstacle removal. The Public Order / Protection Module will set up a process of assigning police officers to the crossings between the designated emergency routes and ordinary roads.

(4) Prior request for emergency vehicles and procurement of emergency transport vehicles

Among vehicles shown in Table 3.3.7, emergency vehicles allowed to pass through the designated emergency routes must have a traffic permit.

Table 3.3.7 Vehicles subject to emergency vehicles

Vehicles needed during emergency for fire-fighting, police, gas, rescue (including PR) and military purposes, in addition to ones used during normalcy.
Vehicles needed for inspection and rapid recovery of lifelines including electricity/ hot water/ sewage and other public facilities
Vehicles needed for health/ sanitation such as cleaning and epidemic control
Vehicles needed for emergency transportation
Vehicles needed for other purposes that prevent spread of a disaster

A traffic permit will be preliminarily requested by the Civil Defense and Emergency Situations Modules and issued by the Public Order and Protection Module. The issued permit will be kept by an administrator of the vehicle.

3.3.8 Preparedness for emergency medical care（Chapter 17 of the Subvolume）

The Medical Module will set up a process of gathering / delivery of medical information, initial medical care and transportation of causalities and medical logistics support to implement swift and appropriate emergency medical activities in time of disaster.

(1) Gathering / delivery of medical information

For swift and appropriate gathering / delivery of medical information, the Medical Module will establish “Information Management Center for Emergency Medical Care” within the Medical Module to make the following preparations;

a) Set up a process within the Information Management Center for Emergency Medical Care to centrally manage information on human damage as well as status of damage and activities by medical institutions.

b) Prepare communication devices to enable disaster site hospitals and first-aid stations to quickly contact related organizations.

c) Designate disaster site hospitals and first-aid stations beforehand to notify the citizens.

d) Conduct daily maintenance of announcement cars in case of an earthquake disaster.

(2) Initial medical care

In order to prepare a process of providing emergency medical care immediately after an earthquake, the Medical Module will make preparations shown in Table 3.3.8. Specific measures for the respective items are also explained below;

Table 3.3.8 Items to be prepared under the initial medical care process

Item	Overview
Emergency medical facilities	Role clarification/ designation and maintenance of first-aid stations and disaster site hospitals
Emergency medical functions	Role sharing and coordination/ enhancement of the mobile medical unit
Medical equipement	Enhancement of emergency medical equipment/ stockpile and procurement of medical supplies
Human resource recruitment / development	Recruitment and development of doctors / nurses, volunteers and coorporating individuals

(3) Casualty transport process

People who are seriously injured and cannot be treated in first-aid stations will be transferred to disaster site hospitals. If capacities of the disaster site hospitals inside the city are overwhelmed, then the patients will be transferred to medical institutions outside of the city. The Medical Module will secure and make prior agreements for routes, methods and accepting institutions for the transfer.

The Medical Module will secure transportation means for sending the mobile medical unit and medical support personnel from the neighboring areas.

(4) Medical logistics support process

Upon discussions with the neighboring cities and the republic as well as related organizations, the Medical Module will set up a process for medical logistics support to receive assistance from broad areas and to make it possible for patients who cannot be treated in disaster management site hospitals to be accepted by medical institutions outside of the city.

(5) Prevention of infectious diseases

In order to prevent secondary damage caused by infectious diseases spreading under worsening sanitation during an earthquake disaster, preparations will be made for procurement of disease prevention equipment and vaccination.

(6) Enhancing mental care measures

The Medical Module will work with related organizations to provide research assistance for mental care to relieve stress of disaster victims shocked by the disaster and forced to live as evacuees for a long period of time. It will also offer education opportunities on mental care to recruit and develop mental care personnel who will serve the needs of disaster victims.

3.3.9 Preparedness for missing person search / body recovery（Chapter 18 of the Subvolume）

(1) Missing person search process

The Rescue Service Module will work with related organizations to set up a process for swift and appropriate information gathering, search and rescue activities for missing people during an earthquake disaster, and to maintain / reserve / train necessary material / equipment/ human resources.

(2) Body search / recovery process

The Rescue Service Module and the Mortician Service Module will work together to set up a process for rapid and appropriate discovery, notification, attendance, examination, coffin sealing, identification and delivery, and to reserve and train material / equipment/ human resources.

(3) Burial / cremation process

Taking into consideration results of damage estimation and its capacity required in time of disaster, the Mortician Service Module will sign agreements with related enterprises for cooperation in time of disaster.

3.3.10 Drinking water and food procurement / supply process（Chapter 19 of the Subvolume）

(1) Basic principles for supply of drinking water

a) If water supply facilities are damaged by a disaster, water will be taken from major rivers with pumps etc. and supplied from water storage tanks installed inside the city.

b) Water supply for command / evacuation and medical treatment sites, many of which are more than 2 kilometers away from the water supply sites, will utilize water trucks.

c) Water is delivered to designated temporary water supply sites even within relatively less damaged residential areas in accordance with status of water outage areas and recovery of water facilities.

d) Water supply volume must be set as a minimum of 3 liters per person a day.

e) Water supply for command / evacuation/ medical sites will be implemented by the Water Supply and Sewage Module, and water distribution within these sites is implemented by their administrative organizations.

(2) Preparation of water supply sites

The Water Supply and Sewage Module will install a water storage tank within a 2 kilometer distance. In addition, it will secure quake resistance of the existing water storage tanks to ensure securing of water within these tanks.

(3) Water supply process

The Water Supply and Sewage Module will work with the Civil Defense and Emergency Situations Modules responsible for command/ evacuation and medical care etc., and prepare pumps and diesel power generators to set up a process that will enable immediate water supply after outage, and to develop personnel for smooth water supply activities. Also, upon discussion with related organizations and responsible organizations in other areas, it will formulate a plan to secure and deploy the number of water supply trucks needed.

(4) Basic principles for supply of food and daily necessities

a) Food and daily necessities are supplied to civilians with difficulties of securing them by themselves and to support personnel.

b) Food supply for a period of 3 days after a disaster mainly includes bread or other non-cooking food, and subsequently, food supplied from the outside and cooking food for sites equipped with cooking tools will be supplied.

c) Food and daily necessities must be selected for supply in consideration of infants/ toddlers and elderly people.

d) Food and daily necessities must be also available at fair prices to civilians who can afford to purchase them.

e) The Trade and Food Supply Module will supply food and daily necessities to evacuation and medical sites, and supply of these necessities within / from the sites is done by administrators of the sites.

(5) Process for procurement/ supply of food / daily necessities

In case of emergency, the Trade and Food Supply Module will formulate a stockpile / supply plan. Items and quantity procured / supplied per person will be determined by the Trade and Food Supply Module.

The Trade and Food Supply Module will make preparations for swift deal closures with responsible manufacturers / distributors / sellers immediately after occurrence of an earthquake. Supply of food and daily necessities will utilize vehicles usually used by these companies, and the Trade and Food Supply Module will request registration of these vehicles as emergency vehicles in advance.

3.3.11 Preparedness for rehabilitation of lifeline / communication / mudslide prevention facilities（Chapter 20 of the Subvolume）

In case when all of the communication facilities including network facilities are damaged, preparations shall be made for emergency response to swiftly rehabilitate these facilities.

(1) Criteria for task force / sub-task force formation

When a facility building related to lifeline / transport / communication is damaged by an earthquake, the module responsible for the facility will form a task force/ sub-task force, as shown in Table 3.3.9, as a core entity for rehabilitating the facility.

In principle, a task force is formed, in principle, when an earthquake measuring with seismic intensity of 5 scores or above or when severe damage is caused by an earthquake. However, the criterion of task force formation can be lower to with seismic intensity of 4 scores or above if determined by the Civil Defense and Emergency Situations Modules to be necessary.

Table 3.3.9 Task force / sub-task force formation for lifeline / communication / transport facilities

Facilities	Responsible module	Task force	Task force formation entity	Subb-task force	Sub-task force formation entity
Water supply / sewage facilities	Water Supply and Sewage Module	Water supply and sewage task force	Vodokanal	-	-
Power / hot water supply facilities	Energy Module	Power supply / hot water facility task force	Dept. of Energy and Public Utilities	Power supply facility sub-task force	APK
				Power generation facility sub-task force	Almaty Power Station
				Hot water supply sub-task force	Almaty Commune Energy
Gas facilities	Gas Supply Module	Gas supply facility task force (also serving as Gas pipe facility sub task force)	Almaty Gas Network	Gas supply site facility sub-task force	Almaty Gas
Communication facilities	Warning and Communication Module	Communication facility task force	Almaty Telecom	-	-
Transport facilities	Motor Transport, Roads, and Bridges Module Public Order Protection Module	Transportation task force （also serving as Road facility sub-task force）	Dept. of Public Transportation and Motor Roads (passenger transport and road facilities) Public Order Protection Module (cargo transport)	Railway transport sub-task force	State railway company, Kazakhstan Temir Zholy
				Air transport sub-task force	A joint stock company, Almaty International Airport
Mudslide faciliteis	-	Mudslide facility task force	Kazselezaschita of MOES	-	-

(2) Securing rehabilitation sites

Modules in charge of rehabilitating their facilities will set up rehabilitation sites within or in the vicinity of the facilities. Also, local rehabilitation sites will be set up for rehabilitation of network facilities in accordance with the number of affected locations / severity. To this end, candidate locations will be selected beforehand for smooth setup of these local sites.

(3) Setting up an inspection / damage assessment process

Inspection / damage assessment of facilities will be conducted by personnel of organizations belonging to their respective modules and companies who are conducting inspection / damage assessment during normalcy. Responsible personnel will voluntarily gather at designated meeting locations at the time when they sense an earthquake measuring with seismic intensity of 4 scores or above or when they recognize damage resulting from an earthquake. In principle, inspection / damage assessment of facilities will be conducted in the same facilities. Patrol routes will be predefined for network facilities.

(4) Setting up an information gathering / communication process

A process must be set up for smooth communication among task forces / sub-task forces, rehabilitation units / the Emergency management headquarters/ related organizations without any omission of information. Personnel responsible for inspection and damage assessment will report damage-related information to task forces of affected facilities through internal radio transmission and fixed-line telephones. Each of the task forces will gather damage-related information obtained from the citizens via the Integrated Control Center and the district administrative office by using dedicated radio transmission and fixed-line telephones.

(5) Procurement of rehabilitation materials

In case when the amount of equipment / materials needed for rehabilitation cannot be met by stockpiled materials, each of the modules will formulate a detailed plan for procurement of necessary materials they receive through related organizations across the country.

(6) Priority of rehabilitation

For implementation of specific measures, priority of rehabilitation will be determined in accordance with the level of importance and actual damage to facilities.

(7) Confirmation / agreement on assistance

For personnel and equipment / materials provided by related organizations across the country to rehabilitate affected facilities, the details and quantities must be predefined for prior confirmation and agreement with related organizations, and preparations will be made for rapid and appropriate assistance.

3.3.12 Preparedness for handling of garbage, human waste, and debris （Chapter 21 of the Subvolume）

Scenarios based on certain disasters and problems will be formulated for effective handling of trash, human waste and ruble, and will be used as a basis for planning / studying quantities, collection methods, delivery routes, re-processing processes and procedures and delivery / disposal / landfill of reprocessed materials to formulate a delivery plan. During this process, the city departments and related organizations define their roles, and also consider utilization of external equipment and human resources.

3.4 Emergency Response Plan (Part 4 of the Subvolume)

3.4.1 Basics of emergency response (Chapter 22 of the Subvolume)

(1) Basics of emergency response activities

Emergency response activities consist of two parts: i) those to be carried out for three days (72 hours) or seven days at the longest after the occurrence of the disaster, and ii) those that help shift to the rehabilitation and reconstruction phase as soon and smoothly as possible. These activities shall be carried out along the time axis provided for in the Plan and in accordance with the basics shown below.

a) Save human life first

b) Establish the structure and the foundation for the activities

c) Start the activities as early as possible

d) Shift to the rehabilitation and reconstruction phase

(2) Comprehensive emergency response

Emergency response activities must be carried out intensively in a limited period of time to address needs that far exceed the normal response capacities of individual response organizations. Therefore, a structure where organizations concerned with disaster management can collaborate mutually with each other as well as with citizens and enterprises must be put in place, so that the emergency measures will be implemented in mutual cooperation.

In the event of an earthquake disaster, although everyone is expected to act in accordance with the Plan in principle, the situation may not develop as described therein. Each one involved in emergency response must acquire an ability to take action, which is an integral part of risk management, through repeated training. In an actual case, they need to act based on a recognition that "to be creative in peacetime" and "to be flexible in an emergency" are imperative.

3.4.2 Establishing and managing the Emergency Management Headquarters (Chapter 23 of the Subvolume)

(1) Establishing the Emergency Management Headquarters of Almaty City

The Mayor or the akim’s representative will decide to set up an Emergency Management Headquarters in the Crisis Management Center or an alternative facility if:

a) the Institute of Seismology has announced that an earthquake with a seismic intensity of 5 or greater has occurred or is suspected to occur in the city; or

b) a large-scale disaster has occurred or is suspected to occur in the city in consequence of an earthquake.

When the Mayor decides to set up the Emergency Management Headquarters, the Department of DM shall inform the heads of the Department of Emergency Situations for Almaty City (DOES), Department of DM, and Civil Defense and Emergency Situations Modules (CD & ES Modules), all

directors of other departments of the city, heads of the seven districts, and citizens, of the occurrence or the possibility through the Crisis Management Center, according to the emergency contact network. The director of the Emergency Management Headquarters shall hold a press conference at the Headquarters to declare the establishment of the Headquarters.

(2) Dismissal of the Emergency Management Headquarters

The director of the Emergency Management Headquarters, if the threat of an occurrence of a disaster is resolved or the disaster emergency response phase has come almost to an end, may downsize or dismiss the Headquarters.

When dismissing the Headquarters, the director shall immediately inform relevant bodies and citizens of the dismissal through the Warning and Communication Module.

(3) Emergency Headquarters at the district level

When the Emergency Management Headquarters is established, the heads of the seven districts of the city shall set up their Emergency Headquarters individually. The Headquarters shall be responsible for implementing the measures instructed by the Emergency Management Headquarters and making arrangements and coordination necessary for the implementation.

When the Emergency Management Headquarters is dismissed, the district-level Headquarters will also be dismissed.

(4) Organization and management

The Emergency Management Headquarters will be organized as shown in Figure 3.4.1, similarly to the preparedness structure of the city. The director group and the members group are as described in Section 3.3.3 of this Volume.

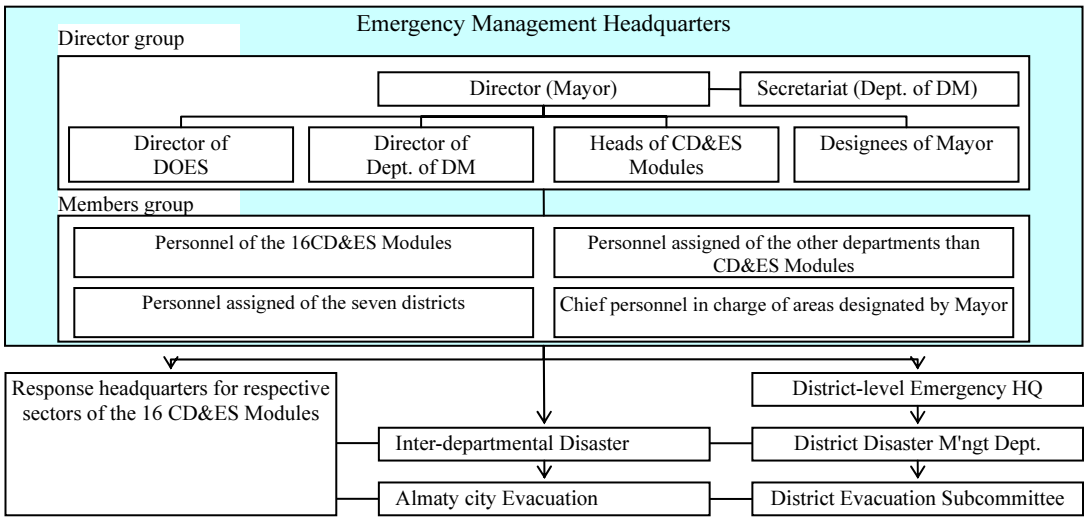


Figure 3.4.1 Structure for emergency response in Almaty City

In such a large-scale disaster that the law on extraordinary situations of natural and technologic phenomena requires the state or the province to take action (See Table 3.4.1), an organization that

maintains the above-described structure will be established for promoting consistent response activities. For example, a person in charge disaster response appointed by the central government assumes the position as the director of the Emergency Management Headquarters, as shown in Figure 3.4.1, and the Mayor acts as the deputy head of the Headquarters with the akim's organs retained.

Table 3.4.1 Classification of emergency situations due to natural disaster
(Source: Almaty City Disaster Risk Management Plan, 2004)

Emergency situation caused by natural disaster	No. of people affected		Extent of damage
	No. of casualties	Loss/damage of vital functions	
Local	10-50	300-500	Limited to the province, city, district, or settlement level
Regional	50-5,000	500-1,000	Limited to a number of provinces
Wide-range	500 or more	1,000 or more	Kazakhstan and neighboring countries

The Emergency Management Headquarters, under the leadership of the director, holds the Headquarters' meetings where the heads of the Headquarters' constituents make reports on their relevant matters, makes decisions on important issues concerning emergency response, and orders the district-level Emergency Headquarters, the CD & ES Modules, and other subordinate organizations with respect to necessary actions.

The district-level Emergency Headquarters, under the leadership of the head of the Headquarters, will ascertain and report to the Emergency Management Headquarters on the situations regarding damage, response, assistance, rehabilitation, and so forth, based on the instructions by the Emergency Management Headquarters. They will take charge of communicating and mutually coordinating with relevant parties and citizens as well as implementing first actions to urgent matters.

(5) Mobilization of staff members

The heads of disaster risk management organizations, also serving as the members of the Emergency Management Headquarters, order their staff members to carry out emergency response activities. If a lack of staff is suspected, they call on the director of the Emergency Management Headquarters for a dispatch of staff members of another organization. The head of the organization that received a request of dispatch shall dispatch necessary personnel to an extent that does not affect the emergency response activities of its own.

(6) Points to be noted in assembling

When called on to assemble in off-hours, the staff shall take the following points, given in Table 3.4.2, into consideration.

Table 3.4.2 Points to be noted in assembling

1. Secure one's own safety and confirm the safety of one's family, house, and neighborhood. 2. Wear appropriate clothing, gloves, and other necessary items to take emergency response. 3. Give hands in human life relief and fire-fighting efforts 4. Gather information on the consequences and the hazards and report on these matters upon arrival.

3.4.3 Collection and offering of information (Chapter 24 of the Subvolume)

(1) Policies on information offering and reception

a) Sort out information provided by disaster risk management bodies and citizens for quick implementation of emergency response measures.

b) Pursue correctness and promptness in emergency response communication.

c) Proactively make use of public relations channels, which are indispensable for putting the mind of the people at ease, facilitating response measures, and carrying out organizational activities, in disasters.

d) Use reliable tools of public relations, such as the use of mass media and issue of PR magazines.

(2) Collection, reporting, and recording of disaster information

The heads of the Department of DM, Warning and Communication Module and CD & ES Modules shall gather information on human damage, fires, and property damage and report to the director of the Emergency Management Headquarters.

The information management section of the Emergency Management Headquarters shall classify the collected disaster information according to urgency and importance, and keep accurate records. At the time of disasters, the Department of DM will shoot photography and videos for implementing emergency measures and securing records and video materials.

(3) Public relations in disasters

Public relations in case of a disaster are designed to

a) Prevent social confusion resulting from anxieties in the mind of the people caused by speculations and false information.

b) Stabilize the livelihood of citizens by providing information on emergency and relief activities.

c) Encourage the reconstruction of lives of the victims.

Immediately after the Emergency Management Headquarters is set up, the director of the Headquarters will hold a press conference to announce the items listed in Table 3.4.3 and call on citizens to behave carefully and considerately.

Table 3.4.3 Items to be included in an announcement by the Emergency Management Headquarters

1.	Call for preventing fires and extinguishing small fires.
2.	Call for refraining from panick and being careful about false information
3.	Call for cooperation in protecting persons in need of assistance and relieving human life
4.	Outline of the consequences from the disaster
5.	Declaration of the establishment of the city's Emergency Management Headquarters and the status of its activities
6.	Advisories/instructions on evacuation.

The Emergency Management Headquarters shall provide all citizens with necessary information by means of the city's PR vehicles, handy microphones, school public address systems, bulletin boards, leaflets, and all other applicable tools. The Secretariat of the Emergency Management Headquarters (Department of DM) shall make arrangements with broadcasters, public and private, in advance with regard to how to obtain emergency information, subjects to be aired, and the procedure, method, and frequency of broadcasting.

(4) Media in disasters

A person in charge of media will be appointed at the Secretariat of the Emergency Management Headquarters (Department of DM.) The person will serve as a unified window for dealing with media firms in time of a disaster. Announcements by the Emergency Management Headquarters will be made by the director of the Emergency Management Headquarters or the person in charge of media at the Secretariat, depending on the severity of information to be announced. When necessary, the "emergency warning system (EWS)" will be used to convey emergency messages to citizens and / or disaster risk management bodies via broadcast stations.

(5) Public hearing activities

The Secretariat of the Emergency Management Headquarters will strive to resolve the anxieties of the victims, reconstruct their livelihood, and encourage their self-help reconstruction efforts. To this end, the Secretariat will open provisional counselling rooms for citizens and address consultations and requests of citizens. When the situation settles down to a certain level, professional counsellors will start consultation work on their own fields.

The district-level Emergency Headquarters will deal with public hearing information so far as they can afford to support. If not, they will request the Secretariat of the Emergency Management Headquarters for adequate response.

(6) Prevention of information disorders

In order to prevent panics and other major disorders at public facilities and spaces where the general public gathers, such as department stores, movie theatres, downtowns, and shopping streets, the Emergency Management Headquarters will take precautions against information disorders by means of PR activities.

3.4.4 Security, traffic control, emergency transport (Chapter 25 of the Subvolume)

The Public Order Protection Module and the Motor Transport, Roads, and Bridges Module will establish security and emergency transport mechanisms as quickly as possible, in time of a disaster. They will take charge of security, traffic control, and emergency transport, as their committment matter, in a proper and prompt manner to:

a) protect life, body, and property of citizens,

b) prevent and control crimes,

c) maintain traffic order, and

d) secure public order.

(1) Security

In the event of an earthquake disaster, the Public Order Protection Module will set up a Security Headquarters, build a structure for implementing emergency response activities as well as collaborative and cooperative relationships with related parties, and carry out the activities listed in Table 3.4.4.

Table 3.4.4 Security activities in earthquake disasters

1.	Collection and communication of information
2.	Dispatch of security corps and coordination on security scopes
3.	Guidance in evacuation, etc.
4.	Prevention of succeeding disasters
5.	Maintaining social order
6.	Supporting voluntary security activities
7.	Transfer of infomation related to security to the affected people and citizens

(2) Traffic control

The Security Headquarters will put the measures listed in Table 3.4.5 in place at an early stage of emergency response immediately after the occurrence of an earthquake, in order to carry out relief, assistance, fire-fighting, and medical activities in a prompt manner. The purpose of these activities is to secure smooth traffic of emergency vehicles and safe evacuation routes for citizens.

Table 3.4.5 Measures concerning traffic in earthquake disasters

1.	Prohibit general vehicles from entering emergency roads depending on the range and degree of damage
2.	Contol traffic, as necessary, on general roads
3.	Indicate dangerous locations and detours
4.	Collect and provide traffic information
5.	Publicly call for refraining from the use of vehicles

(3) Emergency transport

In the event of an earthquake disaseter, the Motor Transport, Roads, and Bridges Module, in charge of transporting personnel, and the Public Order Protection Module, in charge of transporting goods and materials, will set up a Transport Headquarters. In the meantime, Kazkhstan Temir Zholy, the state-owned railway company, and Almaty International Airport, a joint-stock company, will set up

a railway transport office and an air transportation office, respectively, to secure routes and modes for the Headquarters' transportation.

The Transport Headquarters shall engage in transport activities with consideration given to the safety of human life, a top priority, followed by prevention of damage spread and smooth implementation of other emergency measures. More concretely, they will secure transport vehicles and fuels and control access by vehicles other than certified emergency vehicles.

3.4.5 Mutual coordination with disaster risk management bodies (Chapter 26 of the Subvolume)

(1) Request for a dispatch to the central government

The director of the Emergency Management Headquarters will promptly collect information on the number of victims and other consequences from the disaster, as required by applicable regulations to determine the situation as an emergency. The director will then submit the collected information to the emergency task force to be established by Kazakhstan.

The Headquarters will consolidate requests from the CD & ES Modules and seek assistance from the task force established by the Government of Kazakhstan. In the meantime, they will prepare for accepting assistance in the aspects listed in Table 3.4.6.

Table 3.4.6 Preparations for accepting assistance at the Emergency Management Headquarters

1. Communicate and share information with the assistance units
2. Dispatch a liaison group
3. Eliminate competition and overlapping with other supporting organizations
4. Give directions to dispatched disaster units
5. Provide heliports
6. Provide equipment and materials necessary for the work of the assistance units
7. Provide accommodation or camping sites for the assistance units

(2) Seeking assistance of neighboring municipalities

The director of the Emergency Management Headquarters, if it is deemed difficult to implement emergency disaster relief or disaster rehabilitation activities with the personnel, equipment and materials, stocks, and other resources of the Headquarters' alone, will request the emergency task force established by the Government of Kazakhstan to command other municipalities and disaster risk management bodies to provide assistance.

(3) Accepting assistance from overseas

The director of the Emergency Management Headquarters will seek international assistance through the emergency task force established by the Government of Kazakhstan. When receiving such assistance, the entities in charge of relevant sectors shall bear the responsibility for the procedure, communication, and coordination for accepting the assistance. Also, they will ensure an efficient distribution of the assistance. The director of the Emergency Management Headquarters will cooperate with the Government of Kazakhstan in simplifying the customes clearance, national border inspection, and visa procedures.

(4) Accepting volunteers

The Secretariat of the Emergency Management Headquarters and the Department of Health of the city will ensure an effective acceptance of volunteers, in case of an earthquake disaster, by setting up two organs within the Secretariat: "Information Center for Disaster Volunteers" and "Field Assistance Center for Disaster Volunteers."

The "Information Center for Disaster Volunteers" will be responsible for communicating and coordinating with nationwide assistance organizations and volunteer groups and requesting them to dispatch volunteers. The Center will construct functions to serve as a base for consolidating, sending, and receiving information related to volunteers.

The "Field Assistance Center for Disaster Volunteers" will communicate with the district-level Emergency Headquarters to secure footholds for volunteer activities and necessary equipment and materials depending on the damage situation. The Center will also request and secure administrative staff.

3.4.6 Evacuation and relief (Chapter 27 of the Subvolume)

In a case where any situation accompanied by increasing life-threatening risks has emerged, Almaty City Evacuation Commission and the District Evacuation Subcomissions will establish the Evacuation Headquarters, and the Rescue Service Module the Relief Headquarters. The Headquarters shall engage in evacuation and relief activities in a safe and prompt manner, in accordance with the outline shown in Figure 3.4.2.

Organization	Occurrence of disaster 1 hour	24 hours	72 hours
	Initial response phase	Emergency response phase	Rehabilitation/reconstruction phase
Evacuation HQ	○ Establishment of HQ, summoning of staff members	○ Selection and establishment of evacuation centers (additional) ○ Management of evacuation centers, designation of alert areas ○ Directing in evacuation, acceptance of victims ○ Assisting the livelihood of evacuees	
Relief HQ	○ Establishment of HQ, summoning of staff members	○Relief and rescue activities	

Figure 3.4.2 Outline of evacuation and relief activities

(1) Evacuation advisories and instructions

In the event of a disaster, the director of the Emergency Management Headquarters, when deemed necessary, will issue evacuation advisories and instructions, in order to protect the lives and bodies of citizens from imminent dangers and prevent disaster spread.

The director of the Emergency Management Headquarters and other relevant organizations will order agencies in charge of executing evacuation advisories and instructions to ensure a safe and prompt evacuation by clearly showing the reason, target areas, destinations, and routes of evacuation together with cautions to be taken.

When the advisories and instructions are executed, the director of the Emergency Management Headquarters, upon a reception of reports from the head of the Evacuation Headquarters and other responsible parties on the execution, will immediately report to the Government of Kazakhstan on the contents of advisories and instructions.

The director of the Emergency Management Headquarters, when evacuation is no longer necessary, will so announce publicly and on the city's website in a prompt manner. Likewise, the director will so report to the Government of Kazakhstan.

(2) Establishing and managing evacuation centers

When evacuation advisories and instructions are issued, the 165 places in the city that have been designated as temporary evacuation centers shall accept evacuees.

When an earthquake with an MSK intensity of 4 scores or greater has occurred or evacuation advisories and instructions are issued, the Evacuation Headquarters will implement measures necessary for accepting evacuees. These measures include a dispatch of personnel of the Regional Evacuation Subcomission who have been preassigned to the evacuation task to temporary evacuation centers. The dispatched personnel will report to the Evacuation Headquarters regarding the number of evacuees, any injured or diseased persons, and other important matters in relation to their evacuation centers. The Evacuation Headquarters will consolidate the reports from the centers and report to the director of the Emergency Management Headquarters.

The Evacuation Headquarters will strive to direct evacuating citizens in a systematized manner so that all citizens can evacuate safely and promptly. The Regional Evacuation Subcomission will receive necessary information relevant to the living conditions of stricken people and evacuees, such as provision of drinking water and food, securement of toilets, and health conditions of evacuees. Based on the reported information, the subcomission will immediately communicate and coordinate with the parties concerned in order to provide necessary assistance.

(3) Evacuation and relief of persons in need of assistance

It is imperative to accurately and promptly ascertain the consequence of the vulnerable people in disasters and persons in need of assistance, such as the elderly and the disabled, and to implement measures needed, including evacuation direction, rescue and aid, and provision of necessary welfare and medical care services.

Citizens and voluntary disaster management groups shall make concerted efforts as a community to protect persons in need of assistance from an earthquake disaster. To do so, they will, in cooperation with committees for evacuation site operation, the Evacuation Headquarters, and other related bodies, ascertain the safety of the vulnerable people in disasters and whether any of them is missing, based on a list of persons in need of assistance prepared in advance, and put appropriate measures in place.

The Evacuation Headquarters will ascertain the situation of persons in need of assistance via reports from the personnel dispatched to evacuation centers, and provide necessary assistance in a prompt manner. The Headquarters will strive to secure an environment for the stricken people to stay by accepting elderlies and disabled persons in the municipal welfare institutions, providing

public housing, coordinating homestays, and so forth. In the meantime, the Headquarters will examine and implement the financing for life and welfare, the provision of assistance in procuring daily necessities, and other necessary assistance activities.

(4) Relief activities

The Relief Headquarters will ensure the safety of human lives by mobilizing human resources, equipment and materials necessary for relief and first aid.

Personnel, equipment and materials are not unlimited; the Relief Headquarters will cooperate and coordinate closely with the Emergency Management Headquarters, police, and fire stations, in appropriately deciding resources distribution and relief priorities for the most effective results possible.

3.4.7 Emergency medical care, sanitation (Chapter 28 of the Subvolume)

To implement emergency medical care activities, which are essential emergency response activities in case of an earthquake disaster, in an appropriate and prompt manner, the Medical Module and the Sanitation and Epidemic Control Module will set up the Medical Care Headquarters. Figure 3.4.3 outlines the activities to be carried out by the Medical Care Headquarters.

Organization	Occurrence of disaster 1 hour	24 hours	72 hours
	Initial response phase	Emergency response phase	Rehabilitation/reconstruction phase
Medical Care HQ	○ Gathering information on the injured ○ Setting up of emergency medical care facilities ○ Transport of medical staff	○ Transport of the injured ○ Implementation of emergency medical care activities ○ Provision of medical supplies ○ Implementation of mental care ○ Requesting assistance from other areas ○ Implmentation of environmental health ○ Acceptance of assistance	

Figure 3.4.3 Outline of emergency medical care activities

(1) Setting up of emergency medical facilities

The Medical Care Headquarters will gather information on casualties, affected medical institutions, conditions and capacities of operational medical institutions for accepting casualties, and so forth, via medical information collection and transfer systems, led by the Information Management Center for Emergency Medical Care. Based on the collected information, the Headquarters will set up emergency medical facilities (central hospitals in the affected areas and emergency medical stations) for providing medical care in the affected areas in order of urgency.

The Medical Care Headquarters will occasionally report to the Emergency Management Headquarters on how emergency medical facilities have been established. They will set up new emergency medical facilities if ordered by the Emergency Management Headquarters.

(2) Medical care activities

The Medical Care Headquarters will mobilize ambulances in areas with substantial damage and transfer casualties to emergency medical facilities (primary transfer.) The Information Management Center for Emergency Medical Care shall consolidate the information on the operational status of ambulances. The Headquarters will transfer the casualties beyond the city's capacity to hospitals outside the city, as necessary (secondary transfer.)

The Headquarters will, upon receiving reports from the staff dispatched to prepare for opening emergency medical facilities on the safety and the like, will immediately take necessary actions to accept casualties at the facilities.

Medicines and medical supplies and devices stockpiled at the Medical Module shall first be used at the facilities in case of an earthquake disaster. If they are not sufficient, the Headquarters will utilize the backup medical system, put in place beforehand, to ensure the supply.

(3) Mental care

The Medical Care Headquarters will strive for mental care of victims by dispatching trained and educated mental-care experts, and requesting Rescue Service and the like to dispatch experts.

In order to allay the stress of disaster sufferers and prevent the development of mental diseases, the Medical Care Headquarters will set up mental care hotlines whereby the sufferers can freely call to consult with and be advised by professionals and nurses on their problems.

(4) Environmental health activities

The Medical Care Headquarters will implement measures to prevent infectious diseases and food poisoning among citizens and to attain the safety of civil life in the affected areas and evacuation centers. These measures include public relations on environmental health, securement of drinking water and food, and sanitary control at evacuation centers.

3.4.8 Search and rescue of missing persons, handling of bodies (Chapter 29 of the Subvolume)

The Rescue Service Module will set up the Relief Headquarters to conduct search and rescue of the missing. Figure 3.4.4 outlines the relief activities to be carried out by the Headquarters and main activities associated with the handling of human bodies to be led by the Police and the Mortician Service Module.

Organization	Occurrence of disaster 1 hour	24 hours	72 hours
	Initial response phase	Emergency response phase	Rehabilitation/reconstruction phase
Relief HQ	○ Establishment of HQ, summoning of staff members ○ Search for the missing ○ Rescue of the missing, logistical support		
Police, Mortician Service Module, etc.		○ Setting up of mortuaries ○ Disposal of human bodies (initial evaluation, postmortem, placing in coffin, identity check, ○ Temporary burial	○ Burial

Figure 3.4.4 Outline of activities to rescue the missing and handle human remains

(1) Search and rescue of missing persons

The Relief Headquarters will set up a counter for reporting missing persons to be rescued. The personnel at the counter will hear out and record the name, address, age, sex, height, clothing, and other necessary items for searching the missing. The Headquarters will strive to collect and offer accurate information in close cooperation with other relevant organizations.

The Relief Headquarters will take initiative among and collaborate closely with the Regional Evacuation Subcomission, fire brigades of the DOES, police, military forces, and other relevant organizations in search and rescue of missing persons. Each party involved shall fulfill its mission in a prompt manner.

The district-level Emergency Headquarters will be responsible for coordinating backup activities necessary for search and rescue, such as security, traffic control, and public relations. The director of the Emergency Management Headquarters will provide necessary assistance, such as requesting cooperation in accordance with agreements, based the information obtained with respect to search and rescue activities and backup support.

(2) Handling of human bodies

The Mortician Service Module will dispatch personnel in charge of handling human bodies, based on discussion with the district-level Emergency Headquarters and competent police stations. At the 30 places predesignated by the city, the dispatched personnel will open mortuaries and procure coffins and other necessary items.

The district-level Emergency Headquarters will consolidate and notify the police of information on human bodies found. The police, when notified, will dispatch police officers to the spot and conduct initial evaluation and postmortems of the remains. The examination and certification of death will be carried out by medical examiners, forensics experts, and cooperative surgeons of the police.

The district-level Emergency Headquarters will transport human bodies found as a result of search to the mortuaries. The personnel at the mortuary will fill in a "mortuary treatment form" and "burial registry" before placing them in a coffin. As for an anonymous death, the bodies and belongings will be photographed and the characteristics of the face, belongings, and other necessary information recorded. The photograph and the record will be stored together with the belongings.

The police will hand over the human bodies to the bereaved family, when the initial evaluation, postmortem, and examination are completed. If there is no taker of the corpse or the bereaved family has a difficulty in incinerating or burying the bodies, the responsible personnel at the district-level Emergency Headquarters will request the Mortician Service Module to temporarily keep the bodies.

The Mortician Service Module will bury the human bodies transferred from the district-level Emergency Headquarters and the families of the deceased. The Module will check the operational status of funeral halls and cemeteries, and strive to secure and retain their functions.

3.4.9 Fire-fighting, countermeasures against hazardous materials (Chapter 30 of the Subvolume)

(1) Structure for initial response

The personnel in charge of human life at the CD & ES Modules or the head of the Fire-Fighting Module will, if fires occur or situations needing relief and aid emerge as a result of an earthquake and it is deemed necessary, immediately set up the Fire-fighting Headquarters. The Headquarters will order the staff or members of the Fire-Fighting Module to start emergency fire-fighting activities, in accordance with deployment and mobilization plans.

The Fire-fighting Headquarters will collect information on the items listed in Table 3.4.7, which are necessary for initial response, and summarize it according to the area, extent, scale, and type. They will also gather information essential for disaster relief activities, including information on the human resources within the fire departments, and information needed for securing the safety of civil life.

Table 3.4.7 Information to be collected for initial response of fire fighters

1.	Location and objects where a fire occured
2.	Scale of damage
3.	Risk of spread of damage and necessity for additional corps
4.	Incidence and the number of casualties by sex and age

(2) Fire-fighting activities

The pattern and number of fires arising out of an earthquake greatly vary with the seismic intensity, season and time of the occurrence, and other conditions; in fire-fighting activities, it is necessary to take flexible actions depending on the actual situation of the fire. At the initial response stage, the Headquarters will take on fire-fighting activities by leveraging their maximum organizational power, and enhance the effects of their activities by sharing roles and coordinating with citizens and voluntary disaster management groups. Table 3.4.8 lists up policies concerning fire-fighting activities.

Table 3.4.8 Policies concerning fire control activities

1.	When and where a fire has been descerned at an early stage, carry out fire control activities roundly.
2.	When and where a fire is spreading, deploy effectivewater-discharge arrangements to contain the fire within the city block.
3.	When and where a fire is spreading over the urban area, implement intensive fire control activities along the fire blocking lines.
4.	When it is confirmed that there is no threat to human life, implement destructive fire-fighting activities to stop the fire from spreading.
5.	Leave the control of the limited spread of fire and embers at the stage of fire extinction to the community fire-fighting bodies and residents in the vicinity.
6.	If the fire is not fully suppressed, give top priority to the safety of human life and prioritize fire control activities for the evacuation of residents.
7.	When multiple fires are discerned concurrently, prioritize fire control in important areas to be protected.
8.	Request cooperation of community fire-fighting bodies, in order to maximize the fire-fighting capacity effectively.

(3) Emergency measures at hazardous materials facilities

The Fire-fighting Headquarters will instruct the operators and administrators of storages or handling facilities for oil and other hazardous materials, explosions, and chemicals to implement emergency inspections, preventive measures against fires and leak of the substances, and safety measures to protect their employees and residents in the vicinity, depending on the damage situation.

3.4.10 School measures (Chapter 31 of the Subvolume)

The emergency response at school will be discussed in Community-based Earthquake Disaster Risk Management Plan, a subvolume of this Volume; this section explains security of students, emergency education, and resumption of school, from the perspective that school is an education environment.

(1) Security of students

If students are at school in time of a disaster, the headmaster will instruct teachers and school staff to direct students in the evacuation to the playground, confirm the safety of each student, and report on the results to the Department of Education of the city. When it is deemed safe to send students home, the teachers and school staff will give directions and turn students over to their parents or guardians.

If deciding to close the school while students are at home, the headmaster will so report to the Department of Education. At the same time, the headmaster will notify the students of the closure through the information arms of voluntary disaster management groups.

(2) Emergency education

If the damage to the facilities is minor, the headmaster will immediately implement emergency measures and conduct classes. If the facilities are completely unusable, the school will restart teaching at a nearby school or public institution in a safe condition, in cooperation with the Department of Education. If it is difficult to find such an alternative place, the school and the Department will work together to build temporary classrooms and restart lessons. The headmaster will provide students, who lost educational materials in the disaster, with necessary supplies in order to prevent any hindrance to learning, in cooperation with the Department of Education.

(3) Restarting school

The Department of Education will promptly ascertain the need for repair, renovation, and reconstruction of educational facilities and the construction period and cost required, to formulate school reconstruction plans. Based on the plan, the Department will implement measures associated with educational facilities, such as construction of temporary schoolhouses, use of alternative buildings, and repair and renovation of the facilities.

The teachers and school staff will, under the supervision of the headmaster, strive to ascertain the consequences to the students and secure classrooms. Prior to restarting lessons, they will ensure the safety of the rooms and set up rooms as necessary.

3.4.11 Supply of drinking water and food (Chapter 32 of the Subvolume)

The Water Supply and Sewerage Module will set up the Water Supply and Wastewater Headquarters within Vodokanal, to provide drinking water to the citizens and facilities with no access to the water . The Trade and Food Supply Module will set up the Food and Commodity Supply Headquarters inside the Department of Entrepreneurship and Industry to provide food and daily commodities to the citizens and facilities with no access to them (See Figure 3.4.5.)

Organization	Occurrence of disaster 1 hour	24 hours	72 hours
	Initial response phase	Emergency response phase	Rehabilitation/reconstruction phase
Water Supply and Wastewater HQ	○Setting up of the Headquarters, summoning of staff members ○Inspection and investigation on damage to water supply centers and water tanks ○ Installation of pumps to water supply centers and water tanks ○ Water supply from the water supply centers and water tanks ○ Requesting assistance from other areas ○ Acceptance of assistance from other areas, water supply		
Food and Commodity Supply HQ	○ Setting up of the Headquarters, summoning of staff members ○ Ascertainment of the consequences to warehouses of food providers in the jurisdiction ○ Requesting procurement of food to food providers in the jurisdiction ○Provision of ready food by food providers in the jurisdication ○Requesting assistance from other areas ○ Setting up of food bases at wide-area transport bases ○ Acceptance of assistance from other areas and supply of the provided food ○ Supply of uncooked food and daily commodities by vendors		

Figure 3.4.5 Outline of activities to provide drinking water, food and commodities

(1) Water supply activities

The Water Supply and Wastewater Headquarters are comprised of two groups: the emergency inspection and repair group, which is responsible for inspecting and rehabilitating water and wastewater facilities, and the emergency water supply group, responsible for supplying drinking water in an emergency.

The inspection and repair group will conduct inspections on water supply facilities and investigations on the consequence to those facilities, while inspections and investigations of water tanks will be carried out by the personnel in the closest vicinity. If the damage is so severe that the facility requires repair by experts, the inspector or investigator will so report to the Water Supply and Wastewater Headquarters. If the damage is at such a level that the personnel of the group can deal with, they will immediately perform emergency repair. When there is no damage or the emergency repair work is completed, the inspector or investigator will prepare for restarting water supply, confirm the feasibility, and resume water supply.

If there are not sufficient pumps and water wagons for supplying water, the Water Supply and Wastewater Headquarters will request assistance of other areas through the director of the Emergency Management Headquarters. The Water Supply and Wastewater Headquarters will act as a unified window for gathering, analyzing, and managing information, in order to ensure prompt and appropriate water supply in an emergency.

(2) Supply of food and daily commodities

The Food and Commodity Supply Headquarters will investigate the consequence to the warehouses and sales stores of food and daily commodity vendors within its jurisdiction and confirm the feasibility for procuring food and the amount of available food. The Headquarters will then request the vendors, based on requests from the command, evacuation, and medical centers, to provide food. The vendors, when requested, shall start serving the designated centers or organizations.

When food and daily commodities are not sufficiently available, the Food and Commodity Supply Headquarters will request assistance of other areas through the director of the Emergency Management Headquarters. The Headquarters will act as a unified window for gathering, analyzing and managing information, as shown in Table 3.4.9, in order to ensure prompt and appropriate food supply in an emergency.

Table 3.4.9 Information concerning food and daily commodities

1.	Request for food and daily commoditie from command, evacuation, and medical centers, other emergency response bodies, and citizens
2.	Consequences to the warehouses and sales stores of vendors engaged in production, distribution, and retailing of food and daily commodities; and the quantities available
3.	Status of supply of food and daily commodities
4.	Status of inputs of assistance of food and daily commodities from other areas

3.4.12 Emergency rehabilitation of lifelines, telecommunications, traffic, and mudslide prevention facilities (Chapter 33 of the Plan)

The CD & ES Modules concerned with lifelines and other infrastructure facilities will set up the relevant response headquarters, as shown in Table 3.3.9 of this volume, and carry out the activities shown in Figure 3.4.6 below.

Organization	Occurrence of disaster 1 hour	24 hours	72 hours
	Initial response phase	Emergency response phase	Rehabilitation/reconstruction phase
・Water Supply and Wastewater HQ ・Power and Hot Water Supply HQ ・Gas Supply Facilities HQ ・Telecommunication Facilities HQ ・Transport HQ ・Mudslide Facilities HQ	○ Setting up of the Headquarters, summoning of staff members ○ Inspection and investigation on damage to the facilities ○ Information collection and offering ○ Emergency rehabilitation activities ○ Media and PR activities ○ Requesting assistance from other areas ○ Setting up storages for equipment and materials ○ Acceptance of assistance from other areas		

Figure 3.4.6 Outline of activities associated with emergency rehabilitation of lifelines, etc.

(1) Emergency rehabilitation activities

The establishment of response headquarters and branch posts, summoning of personnel of the headquarters and inspectors and investigators, inspection of facilities and investigation on the consequences, and information gathering and offering will be promptly carried out in accordance with the matters determined and familiarized at the preparedness stage (See Section 3.3.11 of this Volume.)

Incidentally, the emergency rehabilitation activities must be carried out with consideration given to the following matters.

a) Give top priority to damage concerning human life in fixing an order of facilities to be rehabilitated.

b) Then, set priorities according to the degree of damage to the facility, difficulty of rehabilitation work, impact on command, evacuation, and medical centers, and the scale of effects, such as impact on civil life.

c) While emergency rehabilitation work must be carried out as immediately as possible, make sure to prevent any succeeding disasters from happening and a repetition and redoing of the same work in permanent rehabilitation work.

(2) Media and PR activities

To ensure that citizens will restore their lives with their self-help and to mitigate confusion and anxiety among citizens, individual response headquarters will publicly release information related to the consequence of the disaster and the facility rehabilitation status through the Warning and Communication Module and the Emergency Management Headquarters. They will also raise awareness on necessary cautions, through PR activities, in order to prevent any succeeding disasters in conjunction with the resumption of power and gas supply, and so forth.

(3) Requesting and accepting assistance from other areas

When personnel or equipment and materials needed for rehabilitating facilities are predicted or ascertained as insufficient, individual response headquarters will seek assistance from related

parties in the other parts of the country, through the director of the Emergency Management Headquarters, in accordance with the assistance-related details confirmed and agreed in advance.

To accept assistance of personnel or equipment and materials from other parties in the countries, individual response headquarters will secure space for storing the equipment and materials and for dispatched personnel to stay at wide-range transport bases arranged in advance. When an assistance unit arrives, they will give due instructions on the details and targets of work to be carried out, in consideration of the situation in the affected area, the progress of rehabilitation work, the priority of rehabilitation, and other important matters.

3.4.13 Handling of garbage, human waste, and debris (Chapter 34 of the Subvolume)

Garbage, human waste, debris, and the like must immediately be handled of in order to eliminate adverse effects on the sanitary environment in the affected area after the occurrence of an earthquake, and to ensure a smooth implementation of post-disaster rehabilitation and reconstruction efforts. To this end, the Transport Headquarters and the Medical Care Headquarters will set up the Waste Disposal Headquarters as a subordinate unit of the Secretariat of Emergency Management Headquarters (Department of DM.) The Waste Disposal Headquarters, as a working organization of the parties concerned, will establish a waste collection group and a waste handling group in each district and implement handling work in a phased manner after the occurrence of the disaster.

In order to make sure prompt and effective handling of wastes in large quantity, the Waste Disposal Headquarters will request cooperation of enterprises and neighboring municipalities with whom the city have signed mutual agreements.

The Waste Disposal Headquarters will make known to citizens how to collect, sort, and handle of various kinds of wastes generated as a result of the earthquake disaster immediately after its occurrence through the Warning and Communication Module and the mass media.

(1) Basic considerations

The following defines the basic philosophy for handling of garbage, human waste, and debris.

a) Prompt response and handling

b) Planned response and handling

c) Sorting out and reuse of debris

d) Handling in consideration of sanitation and environment

e) Security of safety of work

(2) Handling of garbage, human waste, and debris

The Headquarters will estimate the amounts of wastes discharged and secure temporary storage places, if necessary. They will collect and transport the wastes in cooperation with the Transport Headquarters. When handling of the wastes, the Headquarters will sort them out for possible reutilization of resources.

(3) Indisposable waste

Indisposable wastes include liquids, such as paints and oil, thick metal products, equipment with a content of chlorofluorocarbon (CFC), and any waste containing hazardous substances, such as asbestos. The discharger of indisposable waste shall be responsible for disposing of the waste with due consideration given to the environment and the safety and sanitation in the working environment, by bringing in to an adequate and available disposer or other means.

3.4.14 Emergency response to housing and livelihood (Chapter 35 of the Subvolume)

In addition to evacuation and relief efforts and assistance in supplying medical services, water, and food, the activities shown in Figure 3.4.7 will be carried out in order to secure housing and livelihood of the affected people.

Subject	Occurrence of disaster / 1 hour / 24 hours / 72 hours		
	Initial response phase	Emergency response phase	Rehabilitation/reconstruction phase
Securing housing		○ Investigation on the consequence to buildings	○ Emergency repair of affected houses ○ Provision of temporary housing ○ Procurement of construction materials
Securing livelihood		○ Consultation concerning daily life	○ Employment services ○ Extension, reduction, and exemption of taxes and duties ○ Other welfare public assistance
Emergency financing		○ Stable supply of paper currency ○ Securement of salesforces of financial institutions	
Securement of labor		○ Initiation of assistance systems ○ Accepting assistance from overseas	○ Employment of temporary workers
Request for and distribution of international assistance		○ Procedure for requesting and distributing international assistance ○ Simplification of customs clearance and visa procedures	

Figure 3.4.7 Outline of activities associated with emergency response to housing and livelihood

(1) Emergency investigation on damage to buildings

The owner of a damaged building shall bear the utmost responsibility for securing the safety of the building. A adamaged building, if used or uncontrolled, may expose citizens to threats of succeeding disasters, such as collapse due to aftershocks. To avoid such a danger, the Emergency Management Headquarters and the Department of Architecture and Urban Planning will play a central role in conducting emergency investigations on damage to buildings by experts.

An emergency investigation on damage to buildings will be carried out, based on a request, by an investigators' organization, led by structural design engineers who have design qualifications in the damaged area of the country. The investigators will indicate the investigation results with three kinds of stickers, "danger," "caution," and "investigated," in place where people can easily notice.

The members of the investigation team will also submit the results to the Department of Architecture and Urban Planning. The Department will consolidate these results and create and submit to the Emergency Management Headquarters a report on emergency investigation on the buildings damaged in the disaster. The investigation should desirably be completed in some parts of the damaged area within seven days and in all parts within 14 days from the occurrence.

(2) Emergency repair of damaged houses

For emergency repair of damaged houses, the Department of Architecture and Urban Planning will create and submit to the Secretariat of Emergency Management Headquarters a notification of damage incurred, based on the reports from the owners or administrators of the damaged buildings. Furthermore, the Department will take necessary steps to utilize the government's subsidies for emergency repair, through the Emergency Management Headquarters, in accordance with the Kazakh standards proclaimed on 18 September, 2008 (No.860.) The houses which the prime minister has approved will be repaired in the following manner.

a) The Department of Architecture and Urban Planning shall entrust subcontractors with repair work on essential parts for daily life, such as the roof, living room, kitchen, and toilet.

b) The Department of Architecture and Urban Planning shall determine the expenses per household and the number of houses to be repaired and refer to these in actual repair work.

c) The repair work is expected to be completed within one month from the occurrence of the earthquake.

(3) Provision of temporary housing

The stricken people who lost their houses will apply to the Department of Architecture and Urban Planning within one week from the occurrence of the disaster, based on the Kazakh standards (No 860,) and reside in temporary housing provided by the government. Temporary housing shall be provided free of charge to sufferers, if it is found difficult for them to secure housing on their own as a result of investigations on the assets and other factors of applicants.

(4) Procurement of construction equipment and materials

The Emergency Management Headquarters will request the central government for provision of materials necessary for provision of emergency temporary housing and emergency repair of affected houses, depending on the degree of damage. The Emergency Management Headquarters will instruct the Department of Architecture and Urban Planning to distribute the materials supplied by the central government based on appropriate planning.

(5) Security of livelihood

The city will carry out response activities concerning the livelihood of residents: daily life consultations, employment services, extension, reduction and exemption of taxes and duties, and other measures necessary for securing the livelihood of residents.

(6) Emergency financing

If paper money is short as a result of burning and loss of notes and withdrawal of deposited money, the Emergency Management Headquarters will request the National Bank of Kazakhstan to supply paper money as a makeshift measure. Additionally, to ensure uninterrupted withdrawal of deposited money, the Headquarters will request financial institutions to be open on Saturdays, Sundays, and holidays, through the Government of Kazakhstan.

(7) Securement of labor

In a case where an earthquake hits Almaty City, police forces, human resources, and vehicles needed for reconstruction will be mobilized and dispatched from all over the country to the (seven) districts. If the labor is still insufficient, the Emergency Management Headquarters will request the central government to seek assistance from overseas.

If the disaster reconstruction work is prolonged, the Department of Employment and Social Programs will hire workers needed for the reconstruction work as provisional city staff, based on the information on unemployed citizens ascertained via the disaster notifications and other sources, and entrust them with rehabilitation work.

(8) Distribution of relief money and goods

All kinds of international assistance rendered by other countries shall be distributed based on a plan prepared by the Emergency Management Headquarters and determined by the central government, in accordance with the Kazakh laws (No.271 of 4 March, 2004, etc.)

To ensure a smooth reception of provided goods or acceptance of the personnel, equipment, and materials in association with assistance activities, the city will simplify the procedures for customs clearance, border control, and issue of visas, and exempt the temporarily carried-in goods to be used in the assistance activities from taxes and duties.

The Security Headquarters and the Transport Headquarters will issue provisional pass permits for the assistance vehicles, and throw in transportation modes to transport personnel, equipment, and materials, so that the assistance personnel can arrive in the affected area in the shortest possible time.

3.5 A rehabilitation / reconstruction plan （Part 5 of the Subvolume）

3.5.1 Basic ideas for reconstruction（Chapter 36 of the Subvolume）

When a large earthquake occurs in Almaty City, rapid and appropriate emergency response / rehabilitation activities will be implemented, and, in parallel, reconstruction policies will be formulated to devise measures.

Reconstruction measures aim for rapid recovery and resumption of urban functions / activities including core functions of Kazakhstan's economy and banking systems as well as international urban functions. They also aim for further development of Almaty City after reconstruction as a more attractive city than its pre-quake state.

Apart from housing and lifelines, the reconstruction measures will also include areas such as employment, health, medical care and welfare for comprehensive and systematic implementation to offer more robust earthquake protection for the city and a more comfortable environment for all of the citizens.

Disaster reconstruction of Almaty City will incorporate life reconstruction and urban reconstruction under its basic goal of "ever-more comfortable, livelier community building" through role sharing and coordination.

3.5.2 Reconstruction Headquarters（Chapter 37 of the Subvolume）

The Reconstruction Headquarters is an organization for swift, systematic and appropriate implementation of disaster reconstruction measures from long-term perspectives, and will be established as a temporary organization differentiated from other administrative organizations operating during normalcy.

(1) Formation and roles of the Reconstruction Headquarters

When the Mayor concludes that damage resulting from an earthquake is widespread throughout Almaty City, and that it will take a considerable amount of time for reconstruction from the disaster, the Reconstruction Headquarters will be formed as relatively early as one week from the disaster.

Since emergency response measures and earthquake disaster reconstruction measures should be essentially implemented in sequence, any urgent administrative tasks and projects under the control of the Emergency Management Headquarters that are related / continued to disaster reconstruction and considered significant within emergency measures or reconstruction measures, will be implemented through close coordination between the both headquarters.

(2) Organizations related to reconstruction and their roles

Members of the Reconstruction Headquarters consist of the Mayor as Director of the Headquarters, the Deputy-mayor as Deputy-director and their staff.

The staff consists of heads of city departments shown in the organization diagram as administrative organizations for the city as well as heads of state organizations / companies, which are based in the city as head offices or branch offices and are designated by the Director as important organizations.

The Reconstruction Headquarters will execute the following missions under the initiatives of city departments led by the above headquarter staff (heads of city departments;)

a) Formulation of basic reconstruction policies

b) Formulation of reconstruction plans

c) Arrangement, study, process setup and implementation of measures for reconstruction projects

d) Formulation of individual reconstruction plans for specific areas in accordance with the necessity (see Section 40.3)

The Directorate General for Reconstruction will be established for adjustment and planning of measures implemented for project planning, human resource / organizational planning, urban reconstruction planning, budget / financial planning and handling of the press for reconstruction, if determined by the Director of the Reconstruction Headquarters to be necessary.

3.5.3 Formulating reconstruction plans（Chapter 38 of the Subvolume）

The Director of the Reconstruction Headquarters (the Mayor) is responsible for formulation of basic policies related to reconstruction, formulation / implementation of reconstruction plans primarily indicating measures, which are implemented intensively within 6 months from formulation of the plan, and formulation / implementation of reconstruction plans with relatively long-term targets in specific fields.

(1) Formulation of reconstruction policies

To clarify the states in which post-reconstruction civilian life and urban development should be as well as basic strategies for such realization, the Director of the Reconstruction Headquarters will formulate and issue basic reconstruction policies within two weeks from the earthquake in consideration of the following items.

a) Swift implementation of reconstruction and recovery to normal life

b) Creation of a safer and more comfortable living environment

c) Job security, resumption of business and creation of industries that correspond to the new era

d) Rapid recovery of the state’s core financial and economic functions and solid foundation for their further growth

(2) Formulation of a reconstruction plan

Based on basic reconstruction policies, the Director of the Reconstruction Headquarters will formulate a comprehensive reconstruction plan as the city’s highest-level reconstruction plan, in which targets of reconstruction and a scheme of reconstruction projects implemented by the city will be clarified.

The following considerations must be taken into account for target setting;

a) Targets in the reconstruction plan should be achieved within six months from the formulation.

b) Basic policies must be clarified.

c) The size of future population / urban areas must be set as a future frame for reconstruction.

d) Including reconstruction of urban infrastructure, reconstruction by industry, housing reconstruction and commercial district reconstruction, areas subject to formulation of specific area reconstruction plans should be presented, and the scope of each of specific area reconstruction plans should be clarified.

e) Taking into consideration areas such as infrastructure and housing, the period required for target achievement for specific area reconstruction plans should be set as briefly as 2 years, 5 years or 10 years, etc.

f) The overall targets and outline targets for planned fields and items including specific areas should be quantified for effective evaluation upon completion of their terms.

During implementation of the plans, monitoring of the status as well as validation should be conducted for adjustment / modification to their methods in accordance with necessity. Also, at the end of the implementation period, results will be evaluated through comparison between targets quantified during planning and the level of their achievements. If determined necessary, additional reconstruction plans and enhanced specific area plans will be formulated for implementation of additional reconstruction measures.

3.5.4 Stability of civilian life （Chapter 39 of the Subvolume）

After an earthquake disaster, Almaty City shall aim to build an environment where its citizens can actively engage in reconstruction efforts as a main player of reconstruction without worries about their immediate lives. To this end, the following items need to be satisfied;

a) Welfare for disaster victims (activities needed for life, such as health, medical care, job, education, consumption etc.)

b) Benefits / loans for livelihood support (for living expenses, home purchase, home rebuilding etc.)

c) Housing (securing a living space, technical assistance for repair, renovation and rebuilding)

d) Waste treatment

3.5.5 City reconstruction（Chapter 40 of the Subvolume）

City reconstruction is based on the followings;

a) Swiftly formulate a reconstruction plan including city planning.

b) Based on the plan, restrict land use and construction activities.

c) Propose a financial plan that integrates foreign assistance and Kazakhstan's reconstruction budget.

d) Draw a city reconstruction scenario to identify priorities.

e) Ensure steady implementation of the reconstruction plan

f) Assess progress of the reconstruction plan (effects, population and income of the citizens,) and make corrections and changes to the plan with flexibility.

3.6 Assistance plan（Part 6, Chapter 41 of the Subvolume）

When damage from an earthquake occurring in the other city / region of Kazakhstan affects a wide area, Almaty City and its organizations related to disaster management will deliver assistance for the affected city / region in accordance with predefined tasks.

(1) Basics for disaster assistance

Under the following circumstances, the Mayor will follow a command from the Government of Kazakhstan or a request made by the city / region affected by the disaster, or, based on the extent of damage, determine necessity of disaster assistance without any command / request for assistance, and establish the Almaty City Earthquake Disaster Maanagement Assistance Headquarters. Also, when the necessity of disaster assistance activities no longer exists, the Almaty City Earthquake Disaster Management Assistance Headquarters will end its mission.

a) When a disaster occurring outside of the city due to an earthquake with seismic intensity of 5 scores or above,

b) When there is a risk of a large earthquake disaster outside of the city,

Formation of the Almaty City Earthquake Disaster Maanagement Assistance Headquarters is based on the following principles;

a) Members of the Almaty City Earthquake Disaster Management Assistance Headquarters consist of the Mayor as Director of the Headquarters, the deputy Mayor as Deputy-director and heads of related departments as headquarter personnel.

b) If determined necessary, the Director of the Headquarters is able to add heads of disaster management organizations to the personnel.

c) The Director of the Headquarters will convene the Almaty City Earthquake Disaster Management Assistance Headquarters, and the Department of DM will serve as a secretariat for the Headquarters.

d) When the Almaty City Earthquake Disaster Assistance Management Headquarters is established, the Headquarter will inform the Department of Emergency Situations for Almaty City, heads of city departments and District Mayors and disaster management organizations of its establishment, and also make public announcement through media.

Formation and operation of the Almaty City Earthquake Disaster Management Assistance Headquarters will follow the guideline for formation of the Almaty City Earthquake Disaster Management Assistance Headquarters, which will be separately formulated.

(2) Mutual assistance agreement

While there is a process, under which Almaty City delivers assistance to the city / region affected by a disaster under the command of the government of Kazakhstan, in order to deliver vigorous assistance in the event of an earthquake disaster in particular, it will establish a new process, which enables itself to deliver rapid and efficient assistance by signing ‘Mutual assistance agreement for

earthquake disaster management" with the neighboring cities and major cities of Kazakhstan in advance.

While the city previously signed an agreement for cooperation in time of earthquake disaster to obtain support from various related groups and enterprises in time of earthquake disaster, the above agreement will expand the current scope of cooperation. The city will hold prior discussions to allow itself to obtain support from these groups when it delivers assistance to other cities / regions.

(3) Earthquake disaster assistance activities

The followings are earthquake disaster assistance activities conducted by the city;

a) Gathering of information on earthquake disaster

b) Preparation for earthquake disaster assistance activities

c) Dispatch of its fire brigade etc.

d) Dispatch of its medical unit

e) Transfer of assistance materials

f) Public relations of its disaster assistance activities

g) Collection of donations

h) Dispatch of its staff

i) Assistance for administrative duties

Chapter 4
Formulation of a Community Based Earthquake Disaster Risk Management Plan

Chapter 4 Formulation of a Community Based Earthquake Disaster Risk Management Plan

4.1 Outline of the Plan

4.1.1 Objective and Contents

The Almaty City Community Based Earthquake Disaster Risk Management Plan is prepared to increase the resilience of citizens and the local communities, based on the basic principle that you are responsible for your own safety.

The objective of preparing this Plan is described as below.

■ Objective of Preparing this Plan

(1) As the first objective, “Almaty City Community Based Earthquake Disaster Risk Management Plan” is a part of the Almaty City Earthquake Disaster Risk Management Plan, and clarifies who implements what, what activities to implement, and how to implement them.

(2) As the second objective, the Department of DM of Almaty City and other related public organizations, when conducting community- based disaster management activities, implement these based on the Plan and increase the disaster management of Almaty City.

■ Contents of this Plan

(1) The first chapter explains the overall framework of the Community Based Disaster Risk Management Plan.

(2) The second chapter describes Action Plans for the Community Disaster Management Activities.

(3) The third chapter shows the proposed contents to be included in the Community Disaster Risk Management Plan for each constituent of the community.

(4) In the Reference, concrete samples of Earthquake Disaster Management Plan for three community constituents are attached, so that they can refer while preparing their own Plan.

4.1.2 Constituents of the Community

The constituents of the Community indicated in the Almaty City Community Based Earthquake Disaster Risk Management Plan are the three actors, namely community organizations such as KSK or other associations of individual houses, schools, and enterprises.

4.1.3 Basic Idea of the Community Based Earthquake Disaster Risk Management Plan

There have been three earthquakes having caused damage during the period 1887 to 1911, and past earthquakes occurred approximately once a century. The last earthquake occurred in Almaty about hundred years ago. Thus, although most Almaty Citizens know that earthquakes are due to recur, their disaster awareness and preparedness remains insufficient.

However, the probability of earthquakes is increasing and, not only administrative organizations such as Disaster Management Organizations, but local communities consisting of community organizations such as KSK, schools and enterprises, and each family must also themselves prepare. In other words, there is a need for a basic attitude such as “You should be responsible for protecting your community” and “You should be responsible for protecting your own safety and property”. In particular, administrative organizations specializing in disaster management find it difficult soon after disasters to provide enough assistance for all the citizens. Thus means it is important for all community members to understand their roles and duties, become aware of earthquakes, and start preparing whatever they can do for earthquake disasters. Accordingly, this community- based disaster risk management plan is prepared in order to define activities, procedures, implementing and supporting organizations, the time of implementation, and target figures, so that that the importance of communities’ responsibilities are widely recognized and the holding of community based disaster risk management activities is targeted at community organizations, schools, and enterprises.

4.1.4 Target of the Community Based Earthquake Disaster Management Plan

The target of the Community Based Earthquake Disaster Management Plan is “You should be responsible for protecting your community”.

■ Target of the Community Based Earthquake Disaster Management Plan
You should be responsible for protecting your community.

4.1.5 System of the Community Based Disaster Management Plan

The system of the community based earthquake disaster risk management plan is shown as Figure 4.5.1. The plans are categorized into three, namely the preparatory stage of activities, activities at the community, and activities for emergencies.

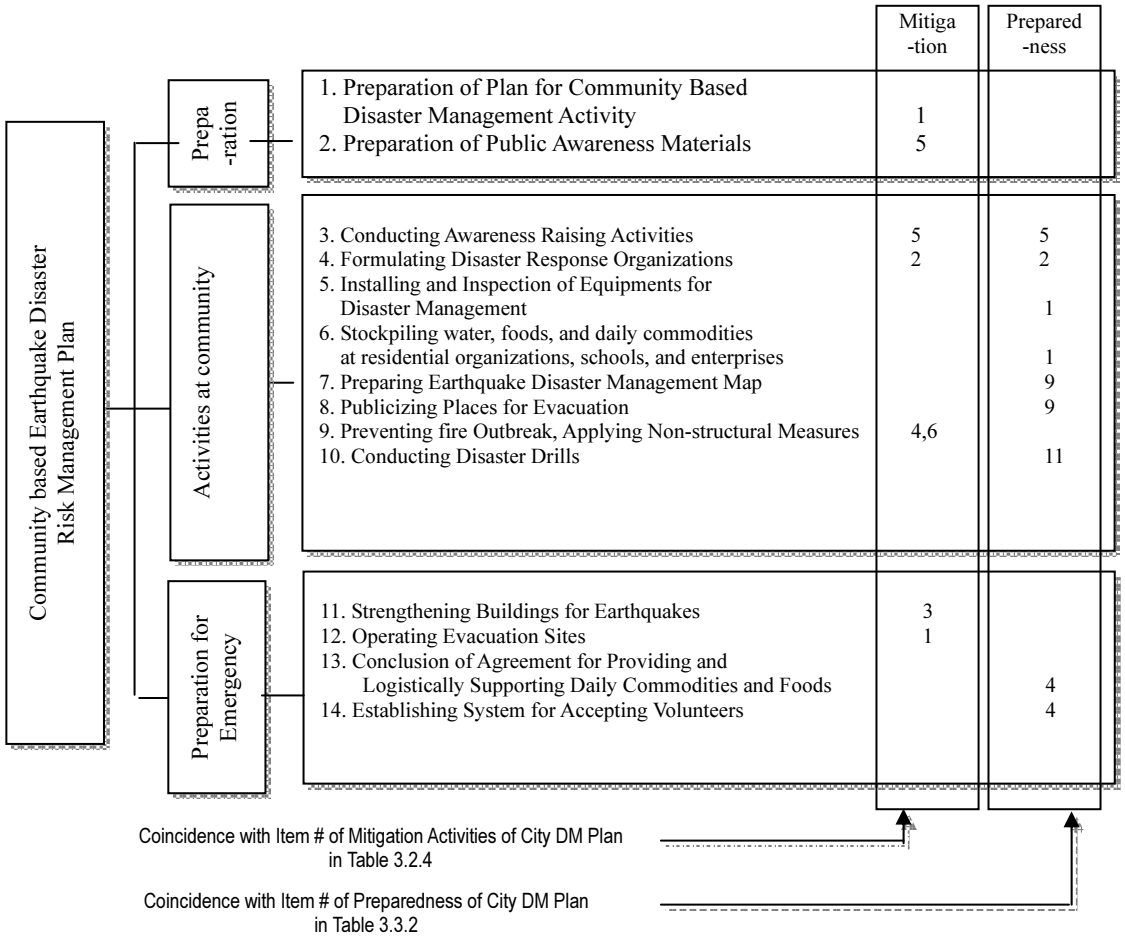


Figure 4.5.1 System of Community Based Earthquake Disaster Risk Management Plan

4.1.6 Promotional Structure

The promotional structure for implementing the community based earthquake disaster plan will be shown in Figure 4.6.1:

a) Dep. of Disaster Management prepares plans, a framework of activities, and educational materials.

b) Based on the plans, framework of activities, and educational materials, seven district offices of the Dep. of Emergency guide residential organizations, schools, and enterprises to prepare community based earthquake disaster management activities, community based disaster management plans and conduct disaster management drills.

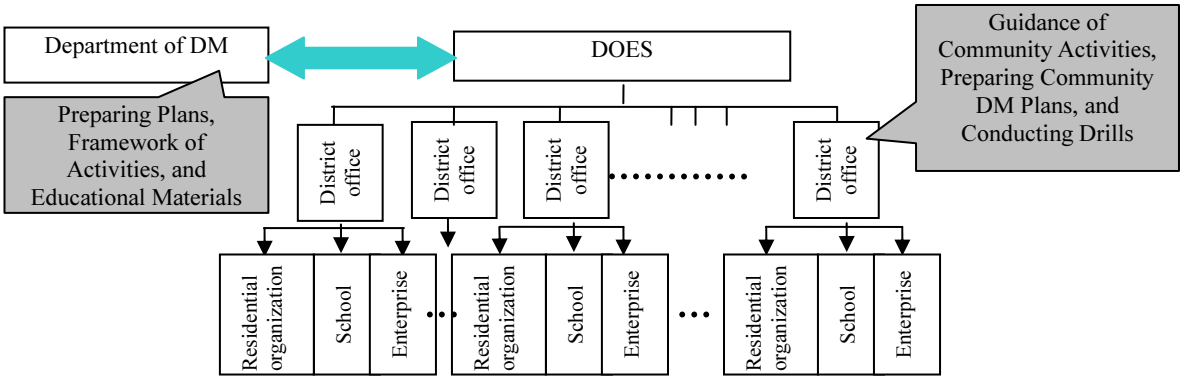


Figure 4.6.1 Promoting Structure of Implementing Community Based Earthquake Disaster Risk Management Activities

4.1.7 Activity Flow

Community Activities are categorized into the following three steps (See Figure 4.7.1):

(1) Recognizing Disasters

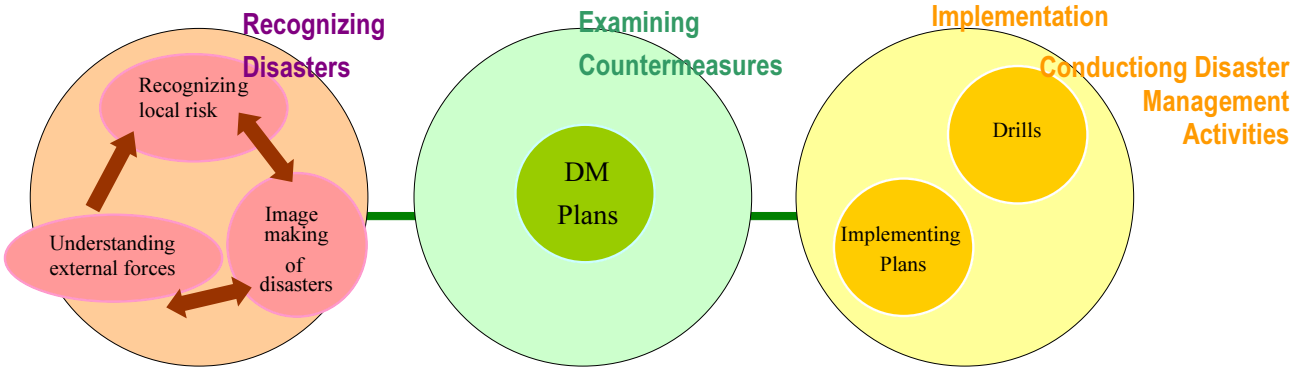
By explaining the results of damage estimation, showing damage photos and visual images, and conducting table- top exercises, external force can be understood and disaster images are created. Furthermore, by engaging in town observation and preparing disaster management maps, local risks are recognized.

(2) Considering Countermeasures

While imagining disaster scenarios, countermeasures are considered and compiled as disaster risk management plan, which also include drill plans.

(3) Conducting Disaster Management Activities

The disaster management organizations defined in the plan are enacted, and drills of evacuation, registration of evacuees, fire extinguishing, first- aid, community kitchen, and notice boarding are practiced. Through such activities, improvements are sought and the plan is revised.



- **Understanding External Forces**
  Results of damage estimation
- **Image Making of Disasters**
  Understanding past damage situations
  (Visual image, photo)
  Visualizing disasters (DIG)
- **Recognition of Local Risks**
  Town watching
  Preparing DM maps

- **Preparing DM Plan**
  Plan for formulating DM organizations,
  Plan for preparing DM equipments
  Plan for conducting Drills

- **Implementing Plans**
  Establishing DM organizations
  Stabilizing furniture
  Preparing emergency kit bag
  Furnishing DM equipments
  Awareness raising activities
- **Drills**
  Evacuation, rescue, fire extinguish , community kitchen, registration of evacuees, notice boarding

Figure 4.7.1 Activity Flow

Flow of workshops and activities for Residential organizations, schools, and enterprises are shown in Table 4.7.1.

Table 4.7.1 Workshop Flow and Activities (Model plan)

# of Meetings	First Session	Second Session	Third Session	Forth Session	Fifth Session
Title	Knowing Disasters	Town observation Mapping	Plan 1	Plan 2	Drill
Target	- Understanding the results of damage estimation - Image making of disaster	- Understanding risks and resources with respect to DM - Preparation of a DM map	- Preparing a DM plan	- Preparing a DM plan (continued)	- Verifying the code of actions, roles - Acquiring emergency response skills
Products	- None	- Diagnosis map - DM map	- DM plan	- DM plan	- Revised DM plan
Contents	- Explanation of damage photos and damage situations - Explaining results of damage estimation - Q & A	- Grasping local risks and resources by Town observation - Writing the results of town observation in a map (including evacuation sites)	- Confirming the code of conduct in an emergency, preparation by each person and organization - Preparing a DM plan in the planning sheets by introducing past disasters and lessons	- Preparing a DM plan in the planning sheets by introducing past disasters and lessons	- Participants make decisions and respond to incidents after signs of an earthquake without knowing the scenario
Tools	- Results of damage estimation - Visual images, photos	- Town observation - Mapping	- Disaster Imagination Game（DIG）	- Disaster Imagination Game（DIG）	- Disaster Response Type Drill
Time	60 mins	150 mins	150 mins	150 mins	150 mins

4.1.8 Expansion of Activities

Regarding the implementation of community activities, the method of expansion is shown in Figure 4.8.1 :

a) As the primary step, under the guidance of DOES, facilitators who assist in conducting disaster management workshops are trained as trainers.

b) As the second step, teachers are trained to enhance the capacity of teaching disaster management education by DOES. After such preparatory steps, community activities are launched.

c) In 2010, which is the first year in which community activities are conducted, one residential organization, one school and one enterprise will be selected to conduct activities in all seven districts, making a total of 21 places in all seven districts. After the second year, 10 places are selected in each district, and activities conducted for a further 14 years till 2025. In each district, the number of community organizations differs, but within 15 years, all the residential organizations, schools and enterprises will be covered.

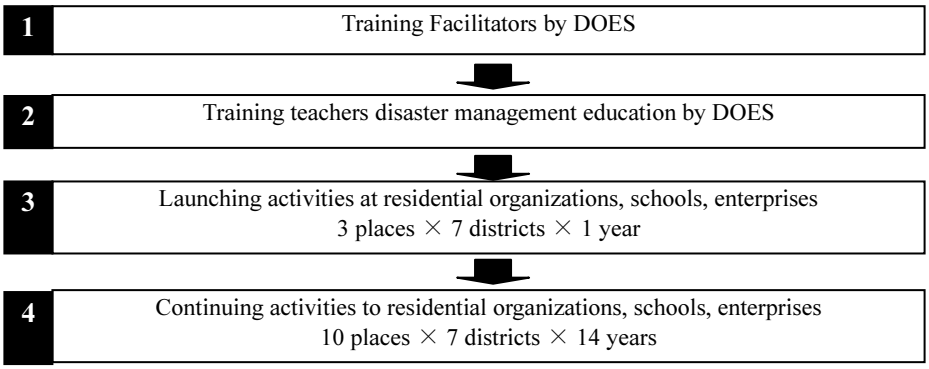


Figure 4.8.1 Expansion of Activities

The numbers of residential organizations, schools, and enterprises are shown in Table 4.8.1.

Table 4.8.1 Number of Residential Organization, Schools, and Enterprises

District	Residential Organizations KSK)	School (including Univ.)	Enterprises	Total
Almalinski	125	45	4	174
Avezofski	250	36	3	289
Bostandiski	66	55	10	131
Zetsuski	33	20	4	57
Medeuski	106	30	10	146
Turkshibski	64	28	16	108
Atalauski	68	17	12	97
Total	712	231	59	1002

(N.B.: Based on the data by DOES, counted enterprises are based on sales volumes.)

4.2 Community based Earthquake Disaster Risk Management Plan

4.2.1 Premise of the Plan

Preparation for disasters depends on not only “public help” by administrative organizations, but “self help” by each one of the citizens and enterprises, and “mutual help” by various groups, thus mutual cooperation among all individuals is vital. (See Figure 4.9.1)Furthermore, in order to protect lives, bodies and property throughout all societies, enhancing the awareness of each individual, preparation at homes and offices, and increasing social resilience are necessary. Not only by fixing furniture and equipment, and stockpiling food and water, but also concrete actions such as strengthening buildings for earthquakes, understanding the contents of disaster management maps, a disaster management plan, including business continuity, and creating a smooth environment for disaster management volunteers, etc., need to be implemented.

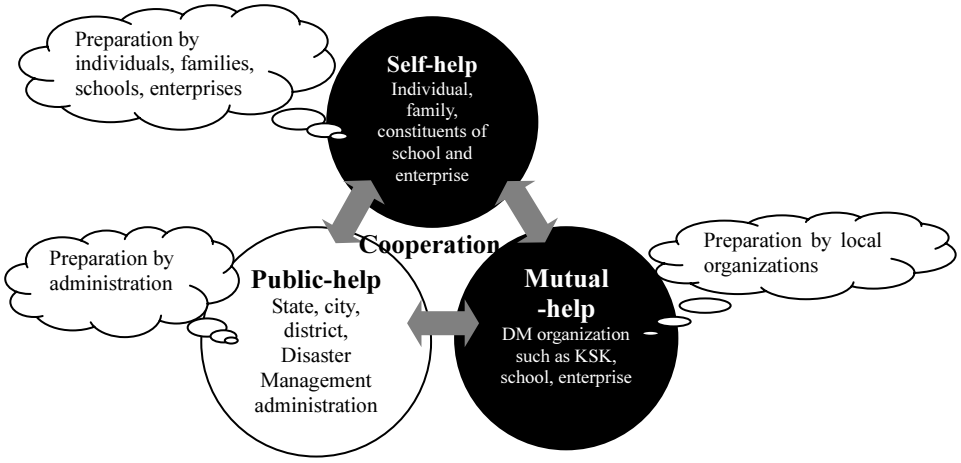


Figure 4.9.1 Image of Self-help, Mutual-help, and Public-Help

4.2.2 Setting Targets for the Plan

In addition, the start and end times of the execution were clearly stated in the plan, and a target index of execution was also set, to ensure matters could be grasped as quantitatively as possible.

■ Features of the Plan

○ Clearly stating the start and end years of execution

○ Setting the target index of execution to be as quantitative as possible

4.2.3 Plan of Implementing Time

The implementing time is categorized into three: short term from 2010 to 2012, mid-term from 2010 to 2017, and long term from 2010 to 2025. Concerning community activities, based on the fact that 3 groups are conducted in the first year, and 10 groups are continually conducted after the 2nd year, in each district, this means that all groups of communities will be completed by the year 2025 in the Plan.

■ Standard Implementation Time for the Plan

○ Short Term 2010-2012（3 years after start）

○ Mid Term 2010-2017（8 years after start）

○ Long Term 2010-2024（15 years after start）

4.2.4 Contents of Measures

The Community Based Earthquake Disaster Risk Management Plan is arranged systematically by considering above. The contents of the fourteen measures of the Plan are shown in Table 4.9.1.

Table 4.9.1 Measures for Community Based Disaster Management (1/2)

Category	Contents	Short	Mid	Long	Managing body	Implementing body	Supporting body	System	Budget
Preparation of Plan for Community Based Disaster Risk Management Activity	Setting targets, preparing short, mid, long term plans, annual plan	■			-	Dep. of DM	—	defining in law and DM plan	City
	Securing Budgets	■	■	■	-		—		
Preparation of Public Awareness Materials	Preparing educational materials for disaster management	■			-	Dep. of DM	District	defining in law and DM plan, training of staffs	Materials, Printing by Dep. of ES
	Preparing education materials, visual materials, and experience study materials of disaster management for citizens	■			-		Press Center		
	Preparing education materials, visual materials, and experience study materials of disaster management for students	■			-		—		
	Preparing education materials, visual materials, and experience study materials of disaster management for enterprises	■			-		—		
	Preparing guidance for disaster management plan for citizens	■			-		District		
	Preparing guidance for disaster management plan for schools	■			-		Dep. of Education		
	Preparing guidance for disaster management plan for enterprises	■			-		—		
	Preparing educational contents for disaster management training center	■			-		none		
Conducting Awareness Raising Activities	Conducting events of disaster management	■	■	■	City	Dep. of ES	District	defining in law and DM plan, training of trainers at training center	Instruction, Materials, Printing by Dep. of ES
	Training of workshop facilitators for citizens	■			City	Dep. of ES	District		
	Training of school teachers	■			City	Dep. of ES	Dep. of Education		
	Training of workshop facilitators for enterprises	■			City	Dep. of ES	—		
	Preparing disaster risk management plan for residential organizations, schools, and enterprises	■	■	■	City	Residential Organizations, Schools, Enterprises	Dep. of ES		
	Conducting joint disaster manage drills at community （KSKs, schools, enterprises）	■	■	■	City	Dep. of ES	—		
	Public Information by radio and TV programs	■	■	■	-	Dep. of ES Dep. of DM	Press Center	defining in law and DM plan	Materials, Printing by Dep. of DM
	Awareness raising activities at Disaster Management Training Center (for citizens, students, and enterprises)	■	■	■	-	Dep. of ES Dep. of DM	—		
Formulating Disaster Management Organizations	Formulation of disaster response organizations, clarifying and announcing responsibilities	■	■	■	Dep. of ES (instruction)	Residential Organizations, Schools, Enterprises	District offices Dep. of ES	defining in law and DM plan, training of trainers at training center	Dep. of ES
	Preparing member lists	■	■	■					
	Conducting onsite drills	■	■	■				subsiding the all costs	
Installing and Inspection of Equipments for Disaster Management	Preparing lists of equipments for Disaster Management, deciding places for storing, and managers for the equipments	■	■	■	Dep. of ES	Residential Organizations, Schools, Enterprises	Dep. of ES	training of trainers	Costs by residential organizations, schools, enterprises Instruction by District offices of Dep. of ES
	Purchasing equipments for disaster management	■	■	■				No subsidies	
	Training method of handling equipments (at drills)	■	■	■				Training of Trainers	
	Inspection of equipments for disaster management	■	■	■					
Stockpiling water, foods, daily commodities at residential organizations, schools, and enterprises	Preparing lists of stockpiling, deciding stock place, person in charge	■	■	■	City	Residential Organizations, Schools, Enterprises	Dep. of ES	Training of Trainers	Residential Organizations, Schools, Enterprises
	Purchasing water, foods, daily commodities	■	■	■				Residential Organizations, Schools, Enterprises bear costs	
	Announcing places for stockpiling	■	■	■				Training of Trainers	
	Periodical inspection and renewal	■	■	■					
Preparing Earthquake Disaster Management Maps	Setting boundary of disaster management unit	■			City	Dep. of ES	Dep. of DM	defining in DM plan	Dep. of ES
	Conducting town watching (compiling risk and resources)	■	■	■		Dep. of ES, Residential Organizations, Schools, Enterprises		defining in law and DM plan, training of trainers	Instruction, Materials by Dep. of ES
	Preparation of diagnosis maps, disaster management maps by community participation	■	■	■					
	Compiling disaster management registers	■	■	■		Dep. of ES		defining in DM plan	Printing by Dep. of ES (This is not included in the existing 3 year plan till 2011, but positive about implementation)
	Distributing disaster management maps to all households, schools, enterprises	■	■	■					
Publicizing Places for Evacuation	Preparing information boards	■	■		-	Dep. of DM	—	defining in DM plan	Materials, Setting by Dep. of DM
	Installing information boards	■	■		-		—		
Preventing Fire Outbreaks, Applying Non-structural Measures	Inspection of hazardous materials	■	■	■	City	Residential Organizations, Schools, Enterprises	Dep. of ES	defining in DM plan	Instruction by Dep. of ES
	Implementing countermeasures	■	■	■	City		Dep. of ES		Residential Organizations, Schools, Enterprises

Table 4.9.2 Measures for Community Based Disaster Management (2/2)

Category	Contents	Short	Mid	Long	Managing body	Implementing body	Supporting body	System	Budget
Conducting Disaster Dills	Planning drills, preparing implementing plans				City	Residential Organizations, Schools, Enterprises	Dep. of ES	Training of trainers, defining in annual plan	Instruction by Dep. of ES
	Publicizing events						—		Residential Organizations, Schools, Enterprises
	Implementing joint drills for disaster management						Dep. of ES		Dep. of ES
	Evaluation, revising plans						Dep. of ES		Instruction by Dep. of ES
Strengthening Buildings for Earthquakes	Establishing system of promoting earthquake resistant				City	Dep. of building and urban planning City	Dep. of DM	law of promoting earthquake resistance, subsidy system, low interest rate loan, providing temporary houses or subsidies when rebuilding, tax favorable system for enterprises, no charge system for diagnosing earthquake resistance	Dep. of building and urban planning City
	Building diagnosis of earthquake resistance					KazNISSA	None		State Subsidies
	Agreement formation					Residential Organizations, Private Houses, Enterprises	Dep. of building and urban planning City		-
	Implementing earthquake retrofitting						None		Partial State Subsidies
Operating Evacuation Sites	Designating indoor evacuation sites				City	Dep. of ES	None	defining in DM plan	Dep. of ES
	Preparing manuals for opening and operating evacuation centers				None	Dep. of DM	—		Dep. of DM
	Informing responsibilities of the concerned				City	Dep. of ES	Dep. of ES		Printing by Dep. of ES
	Conducting onsite drills				City	Residential Organizations, Schools, Enterprises	—		Instruction and Materials by Dep. of ES
Conclusion of Agreement for Providing and Logistically Supporting Daily Commodities and Foods	Compilation of agreement with private company				City	Dep. of DM	Assoc. Of Trade and Manufacturing	defining in DM plan, commendation system	Materials by City
	Conclusion of Agreement with private companies				City	Dep. of DM	Assoc. Of Trade and Manufacturing		
Establishing System for Accepting Volunteers	Deciding method of procedure for volunteers, allocating activity areas for volunteers				-	Dep. of ES	RCS	defining in DM plan, commendation system	Dep. of ES
	Regular information exchange with volunteer groups, reviewing plans				-				
	Drills				City		Dep. of DM		

- Management entity: an entity that an implementing entity assumes obligation for reporting, or that acquires budgets for activities and coordinates the activities with related organizations other than the implementing entity
- Implementing entity: an entity implementing each measure as a central role
- Support entity: an entity supporting the implementing entity by implementing duties beyond responsibilities of the implementing entity which conducts each measure as a core party, and by providing the entity with advice and instruction

Chapter 5
Earthquake Disaster Risk Management Action Plan

Chapter 5 Earthquake Disaster Risk Management Action Plan

The priorities presented in the aim of the Plan (See Section 3.1.1) and the policies for planning (See Section 3.1.2) are to facilitate mitigation and preparedness activities. Action plans were drawn up so as to smoothly carry forward specific measures with priority given to the predefined priorities in promoting the Plan (See Section 3.1.3.) Tables 5.1 and 5.2 below outline the action plans and each component thereof.

Talbe 5.1 Outline of the Action Plans and the Components Thereof (1/2)

Action Plan 0 Approval on the Disaster Management Plan for Almaty City
Component 0 Approval on the Disaster Management Plan for Almaty City Purpose: Securely implement the measures specified in the Plan. Method: Approval by Almaty City Actionees: Mayor, Working Group, personnel in charge of disaster management in the seven districts, Department of DM Time: July 2009 − October 2009 Cost: None
Action Plan 1 Capacity building of organizations/structures relevant to disaster management
Component 1-1 Clarification of the actionees and time frames for individual items in the Plan Purpose: Securely implement the mitigation and preparedness plans through clarification of the responsible organizations. Method: Explicitly include the execution of relevant plan items in the scope of responsibility of the respective departments or organizations in charge. Actionees: Department of DM, departments or organizations in charge of respective items in the Plan (45) Time: August 2009- Cost: First year: 300,000 Tenge, Second year onward: 90,000 Tenge
Component 1-2 Formulation of detailed plans, monitoring on the implementation, and evaluation of the results Purpose: Securely implement the mitigation and preparedness plans through improvement in the operational aspect. Method: Formulation of detailed plans, monitoring on the execution, summarizing, reviews, and adjustments Actionees: Department of DM, departments or organizations in charge of respective items in the Plan (45) Time: Every year (throughout the year) Cost: 880,000 Tenge per annum
Component 1-3 Reinforcement of the management system of CD & ES Modules (grouping/ hierarchization) Purposes: - Securely implement every item in the Plan by clarifying the person in charge of executing the measures concerned. - Reinforce the management system of CD & ES Modules in responding to emergencies. Method: Group the resources into 16 CD & ES Modules and install a director in each group. Actionees: Mayor, Department of DM, DOES, 16 CD & ES Modules Time: August 2009 − mid-September 2009 Cost: None
Action Plan 2 Earthquake protection and regulation on buildings
Component 2-1 Quake-resistance measures for existing collective houses Purpose: Prevent collapse of existing buildings at the time of an earthquake Method: Establish a legal system for reinforcing the quake-resistance of existing collective houses, and carry out necessary quake-resistance works based on the laws. Actionees: Department of Architecture and Urban Planning, Department of Finance (planning), KazNIISSA (design), Department of Construction (implementation) Time: 2010 - 2030 Cost: 110 million Tenge (including staff personnel costs) + 263.6 billion Tenge (diagnosis, design, subsidy)
Component 2-2 Improving quake-resistance of newly-constructed buildings Purpose: Prevent collapse of newly-constructed buildings at the time of an earthquake Method: Improve the systems for comlying with the quake-resistance standards. Actionees: Department of Architecture and Urban Planning (planning), KazNIISSA (revising the quake-resistance standards), GASK (enforcement) Time: 2010 - 2014 Cost: 6.4 million Tenge (including staff personnel costs)＋320 million Tenge (for entrusting works, etc.)
Component 2-3 Earthquake protection on buildings along emergency transport roads Purpose: Prevent any closure of emergency transport roads as a result of collapse of buildings at the time of an earthquake Method: Implement earthquake protection works on vulnerable buildings along emergency transport roads. Actionees: Department of Architecture and Urban Planning, KazNIISSA (design), Department of Construction (implementation) Time: 2010 - 2022 Cost: 4.2 million Tenge (including staff personnel costs)＋7,045 million Tenge (for entrusting works and carrying out projects)

Table 5.2 Outline of the Action Plans and the Components Thereof (2/2)

Action Plan 3 Forumulation of community-based disaster management measures
Component 3-1 Mitigation activities Purpose: Mitigate disaster risks by promoting community-based mitigation activities. Method: Implement community-based mitigation activities one by one. Actionees: Department of DM, DOES, KazNISSA, Department of Architecture and Urban Planning, Department of Education, individual districts Time: 2009 - 2024 Cost: 482 million Tenge
Component 3-2 Preparedness activities Purpose: Improve preparedness for the occurrence of a disaster by promoting community-based preparedness activities Method: Implement community-based preparedness activities one by one. Actionees: Department of DM, DOES, Association of Traders and Manufactures, Red Crescent Time: 2009 - 2024 Cost: 89.07 million Tenge
Action Plan 4 Regulations and guidance on land use
Component 4-1 Project for land reallocation in vulnerable areas along rivers. Purpose: Improve the safety of citizens by alleviating vulnerability to floods and mudflows resulting from an earthquake. Method: Relocate houses as part of a land reallocation project. Actionees: Department of Architecture and Urban Planning, Almaty Zher State Agency Time: 2010 - 2030 Cost: 3.3 million Tenge (including staff personnel costs)＋1.8 billion Tenge (for compensation)
Component 4-2 Introduction of housing measures Purpose: Reduce urban vulnerability by rebuilding decrepit houses into new houses. Method: Provde new houses and encourage house buying Actionees: Department of Architecture and Urban Planning, Almaty Zher State Agency, Department of Finance Time: 2010 - 2030 Cost: 2.25 million Tenge (including staff personnel costs)＋15 billion Tenge (for construction and other project costs to be borne by the administration)
Component 4-3 Designation and development of emergency routes Purpose: Assure road transportation for rescue, medica, firefighting and other services necessary for responding to emergencies in case of an earthquake. Method: Designate, approve, and develop emergency routes Actionees: Department of Public Transportation and Motor Roads, Department of DM Time: 2009 - 2012 Cost: 2.9 million Tenge (including staff personnel costs)＋4 billion Tenge (for development works)
Action Plan 5 Earthquake protection and regulation on infrastructure/ lifelines
Component 5-1 Enhancement of quake-resistance of existing bridges Purpose: Assure road transportation in case of an emergency by preventing bridge collapses at the time of an earthquake Method: Rebuild and reinforce the 16 bridges in accordance with the results from the survey on bridge damage Actionees: Department of Public Transportation and Motor Roads (management), Department of Construction (implementation) Time: 2009 - 2014 Cost: 1,745 million Tenge (including staff personnel costs and project costs)
Component 5-2 Enhancement of quake-resistance of water supply and sewerage systems Purpose: Assure water supply at the time of an earthquake (alleviating damage to water supply conduits at the time of an earthquake) Method: Replace superannuated main water supply pipes (with a diameter of 400 mm or greater for a length of 250 km) Actionees: Department of Construction (management), Vodakanal (implementation) Time: 2009 - 2015 Cost: 27,500 million Tenge (including staff personnel costs and project costs)