

3 Accumulation and Provision of Information on Natural Disasters and Disaster Reduction

3-3 Cases of Disaster Counter Measures

In order to reinforce disaster reduction measures in the future, it is extremely important to know how disasters in the past were dealt with by victim countries as well as by the international community.

In fiscal 1998, we collected examples of disaster countermeasures on the Internet and those for the Great Hanshin-Awaji Earthquake. During this fiscal year, we have collected examples of disaster measures for the earthquakes which hit Turkey and Taiwan in 1999, as well as the measures which were implemented during unique disasters which struck the countries of the foreign staff at ADRC from Korea, Viet Nam, Nepal, and Indonesia.

3-3-1 Measures Implemented After the Great Turkey Earthquake

1) Outline of the earthquake

- (1) Date and time of earthquake: 3:01 a.m, local time, August 17, 1999
- (2) Magnitude: 7.4 on the Richter scale
- (3) No. of deaths: 15,135
- (4) No. of missing persons: Unknown
- (5) No. of injured: Approx. 24,000 (number treated at hospitals)
- (6) No. of totally destroyed houses: Approx. 24,000
- (7) No. of partially destroyed houses: Approx. 64,000

2) Earthquake-prevention system

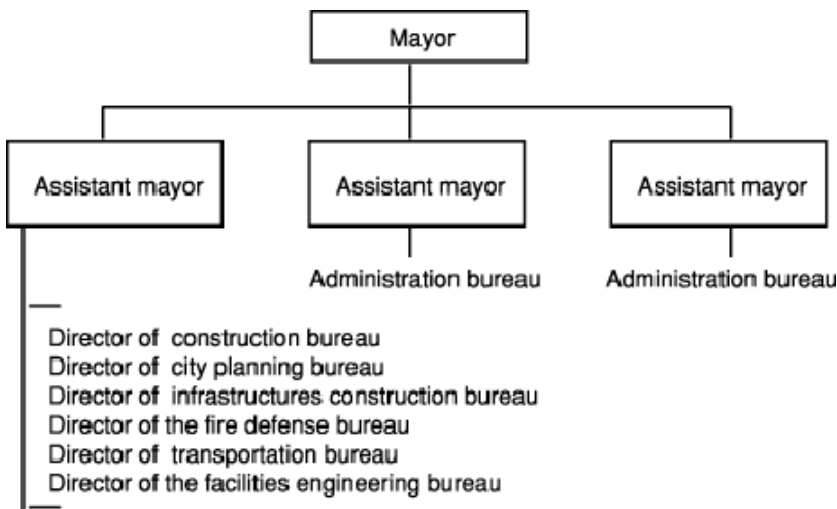
(1) History and experience of earthquake-prevention activities

The Republic of Turkey has a system which ensures that the government provides compensation for damages incurred from natural disasters such as earthquakes, in accordance with the Sultan's official announcement during the survey of damages and recovery phase after the Istanbul Earthquake of 1509, which hit the country under the rule of the Ottoman Empire.

Turkey's disaster reduction measures are implemented mainly by the General Directorate of Disaster Affairs (GDDA), which addresses a wide range of tasks including the establishment of disaster management policies and staff training. The Ministry of Public Works and Housing, mayors, army force, and the Red Crescent Society cooperate with the GDDA in implementing the disaster reduction measures. The GDDA handles earthquake research, emergency transportation, disaster survey, damage assessment, of plans and laws, temporary housing, prefabricated housing production and construction, and disaster funds management and supply. While most of the costs for rehabilitation can be covered by the government's budget, the disaster funds which are provided via various routes is managed by the GDDA. Every year, a certain amount of the government's budget is incorporated into the fund. The GDDA's budget for Fiscal 1998 was about 35 million dollars, with a staff of 1000. Apart from the above activities, GDDA handles the development and revision of earthquake zoning maps and earthquake-resistance standards, earthquake observations, and international cooperation on reducing earthquake damages.

(2) Administrative Organization

Figure 3-3-1-1 Disaster-management system in Turkey



3) Disaster response achievement by government (central and local)

(1) Emergency measures

Emergency measures and concerned authorities prescribed in accordance with Disaster Reconstruction Law are as follows;

1. Drawing up of plans and establishment of rescue organization (jointly with ministries concerned such as Internal Affairs Ministry). The following items are included:

- Rescue plans
- Treatment for injured
- Temporary housing
- Fire-fighting
- Removal of debris
- Distribution of food supplies

Competent authorities: GDDA, Ministry of Interior, Ministry of Health, Ministry of Agriculture , Ministry of Forestry and Local Affairs

2. Implementation of emergency measures

- Implementation of rescue plans (1)
- Assignment of service and requisition for vehicles
- Requests to army forcemilitary

Competent authority: Governors

3. Determination of Emergency Risk Assessment

- Competent authority: Ministry of Public Works and Housing

It is specified that all emergency measures, excluding emergency risk assessment are to be planned by central government and implemented by each governor. It is also provided that military troops can take action without instructions from the military head when ordered by governor.

(Articles 7 to 11 of the Disaster Reconstruction Law)

While participation of each ministry is essential in the drawing up of rescue plans, the rescue committee directly responsible to the prime minister has served as the coordinator until now. The government took the following measures in this earthquake:

<Responses by the government>

Aftermath (Day 17)

Set up a crisis management center in the Prime Minister's office to supervise the overall rescue activities of armed force, Red Crescent Society, and civilian volunteers.

Day 18

Set up a crisis management center in all administrative offices of prefectures affected by the disaster.

Day 19

The government dispatched numerous rescue troops in addition to civilian defense troops and the Red Crescent Society.

Day 22

The government announced the following personnel assignments and measures:

The Minister of State, was appointed the head of the crisis management center at Izmit; the Minister of Education, the head of the crisis management center at Adapazari; and the Minister of Labor, the head of the crisis management center at Yalova.

All public and private facilities and possessions (equipment, supplies) were used for rescue.

To accommodate victims at all public and private facilities, governors were instructed to vacate all of the designated facilities by the evening of the 22nd.

Day 23

Tourist boats were used for transporting victims from the 23rd.

The military opened all camps in the Marmara region to victims.

The Red Crescent Society was entrusted with collecting and distributing rescue supplies.

At each crisis management center, the following two committees were established:

- *Temporary housing committee for victims headed by the Minister of Reconstruction
- *Long-term restoration committee (prepared by the GDDA)

Day 24

The prime minister announced the complete restoration of roads to the disaster affected areas and railroads between Ankara and Istanbul.

The Turkish air force started air transport services between the disaster areas (Yalova, Kocaeli, Sakarya) and Ataturk Airport in Istanbul. In addition, the government also planned air transportation from the air force's airports at Yalova and Jankistpel.

Minister of Reconstruction, announced that plans were being made to build a total of 30,000 temporary housings, 15,000 of those by winter as the first step.

Day 25

Deputy Prime Minister, announced that they will complete the 15,000 housings that are currently being constructed by the Housing Development Bureau in one month for the victims.

Day 26

Crisis Management Center of Prime Minister's Office decided that they would build tent villages, provide 71 national railway train cars, another 150 temporary housings (Gokceada Island, Canakkale), and the training centers (Izmir) owned by Ministry of Health to the victims.

The Minister of State in charge of housing development administration, announced that they were negotiating within the government to complete housings under construction in the seven areas hit by the earthquake within one to two months.

They also announced that they would provide 4,500 housing stocks to the victims.

Day 27

The government announced that they were planning to build 100,000 to 120,000 housings within the next twelve months.

The Ministry of Forestry and Local Affairs dispatched 1,931 construction machines and 3,295 operators to the disaster areas.

Wireless communication systems were built in the tent villages to convey the latest news to victims.

Most power generation and transmission problems were restored, but water system construction was still being conducted.

Day 29

A temporary housing construction company in Ankara with experience in providing temporary housing to the UN announced that they would be able to build 60,000 housings within 3 months.

Costs for the temporary housings were estimated at 120 to 130 US dollars per square meter.

The Prime Minister Office crisis management center announced that the Turkish armed force had rescued 40,646 victims who had been buried under debris.

Day 30

The Minister of Reconstruction announced that they had reached an agreement with the government on the temporary housing issue.

Free public telephones were set up at disaster areas: Yalova (170), Adapazari (248), Kocaeli (2020), and Bolu (30).

< Crisis Management Centers >

The crisis management center make emergency decision coordination and implementation in order to rescue victims and support disaster areas.

Members

1. Director: Deputy parliamentary vice-minister, Prime Minister Office
2. National Safety Secretariat
3. Ministry of Interior
4. Ministry of Foreign Affairs
5. Ministry of Public Works and Housing
6. National Safety Committee
7. Army Headquarters
8. General Directorate of Local Affairs
9. General Directorate of Disaster Management Affairs
10. The Red Crescent Society (Turkey Red Crescent) board of directors

According to the head of the Crisis Management Center, the center coordinates related organizations for a short period of time. In addition to the above members, TUBITAK, National Treasury Vice Minister, and Ministry of Public Works and Establishment cooperate with the center. Most ministries and bureaus set up their own crisis

management center.

The main activities of SPO are to implement reconstruction plans in disaster area on a mid-and long-term basis. The plans are compiled by the General Directorate of Economical Sectors and Coordination and the General Directorate of Regional Development and Structural Adjustment .

<Victims>

| Prefecture | Red Crescent Society | Armed Forces | International Aids | General Companies | Total No. of refugee tents | No. of camps |
|------------|----------------------|--------------|--------------------|-------------------|----------------------------|--------------|
| Sakarya | 9,846 | 600 | 12,539 | 2,524 | 25,509 | 39 |
| Kocaeli | 8,784 | 400 | 24,573 | 2,942 | 36,699 | 27 |
| Yalova | 8,800 | 230 | 4,608 | 1,704 | 15,342 | 19 |
| Golcuk | 5,357 | 355 | 7,673 | 750 | 14,135 | 22 |
| Bolu | 3,730 | - | 4,996 | - | 8,726 | 44 |
| Istanbul | 963 | 20 | - | 50 | 1,033 | 5 |
| Total | 37,480 | 1,605 | 54,389 | 7,970 | 101,444 | 156 |

The Kocaeli governor announced that they had already set up 51 test villages, but were still short of 50,000 tents, and appealed the need for the prompt installation of winter tents.

<Clearing up debris>

The pollution of the Imit Gulf was caused by the petroleum and fuel spilling from oil refineries, and disposed debris. According to the OCHA team who visited the Abujural and Buyuchekmeje district in Istanbul, they had already cleared the debris as of August 28, and lives of the residents were back to normal.

Disposal of debris to sea and rivers was prohibited by the concerned authorities.

The government has announced the need for debris disposal measures.

<Emergency Risk Assessment>

Emergency Risk Assessment comes under the jurisdiction of the Ministry of Public Works and Housing, and was implemented immediately after the earthquake. The primary assessment was carried out one to three weeks after the earthquake. The assessment was divided into seriously damaged buildings (require urgent demolition, entry prohibited), moderately damaged buildings (require structural reinforcement, entry restricted), and mildly damaged buildings (no structural damages, entry allowed). The survey was conducted not on a building, but household or office basis. The results were compiled into a ledger that includes records of lump sum allowances, temporary housing rent, fees for reconstruction or reinforcement of buildings, or low-interest loans of expenses. The results of the primary assessment were announced promptly so that households could protest their dissatisfaction or appeal for more detailed surveys. In previous earthquakes, the number of totally damaged households was found to double several weeks after quakes, since many households pressed the authorities for lump sum allowances. Due to the considerable damage in this earthquake, each officer was assigned 500 to 1,000 households. Thus there have been opinions that these officers recorded the damages as filed by households, and totaled them without checking before reporting them to the central government. It has also been reported that some officers in charge of evaluation committed suicide due to the stress of the work.

As of September 16, there were 130,000 households classified as serious damage and moderate damage. In respect to this, the Red Crescent Society set up 40,680 tents, the armed forces 2,122, overseas aid 54,841, and private assistance 7,970, totaling 105,000.

Recovery and reconstruction measures

The recovery and reconstruction measures specified by the Disaster Reconstruction Law and the Competent authorities are as follows. Implementation falls under the jurisdiction of the Ministry of Public Works and Housing.

1. Town relocation plan

Jurisdiction: Ministry of Public Works and Housing, Ministry of Interior, Ministry of Health, Ministry Agriculture , Ministry of Forestry and local affairs, Ministry of Finance, Ministry of Education, Ministry of Trade and Industry.

2. Implementation of town relocation

3. Construction of temporary and permanent housing

4. Procurement of machines and equipment

5. Procurement of funds

At first, the government announced the plan of relocating the central town of Adapazari to a hilly area 8 km to the south, but this yet to be realized.

The SPO announced that, to raise the funds required for reconstructionrestoration, " 3.5 billion dollars went to the construction of temporary housing, permanent housing, and the repara of housing out of the 6.2 billion dollars borne by the national treasury." The World Bank and Turkish government agreed to a loan of 1.7 billion dollars for recovery and reconstruction, which will be implemented in mid-December.

3-3-2 Countermeasures after the Occurrence of the Taiwan Earthquake

1) Reaction of Authorities

In Taiwan, as the main body of disaster control is the central government, a centralized system where the central government constructs organizations and implements plans after the earthquake disaster is formed.

2) Emergency Measures

(1) Information and Public Affairs Activities

As to information collection, the damage situations were not grasped without delay in mountain-ringed regions, since communication with the outside was disabled due to breakage of roads, communication networks and the like.

As to information transmission and public affairs activities, immediate actions and positive information disclosure were made by various means. That is, the Executive Yuan formed a list of 19 items of Emergency Relief Measures including payment of consolation money, on September 25 immediately after the occurrence of the earthquake. It is noteworthy that the items include quick responses such as the amount of payment of consolation money for the fatalities and persons whose houses were completely collapsed, and housing loan.

Further, as the Internet is widely utilized mainly by young generations, the authorities publicize the measures on homepages. The Executive Yuan has a web page on 921 Great Earthquake including pages by related ministries and a page often updated with information on the post-disaster situations.

(2) Security of Traffic for Emergency Transportation and Emergency Transportation Activities

For several days after the occurrence of the disaster, there was confusion in attainment of traffic for relief and rescue and for emergency transportation. In the disaster areas, the roads had bumps and cave-ins, and further, fragmentation of roads and bridges occurred, due to influence of fault and the like.

Note that as to isolated regions such as the mountain-ringed regions where the roads were broken, the military used helicopters to conduct midair dropping of relief materials and conveyance of injured people.

(3) Relief and Rescue Activities

In addition to the military's activities, the relief and rescue activities were conducted by special teams from fire-fighting offices and police. Further, civil volunteer groups and rescue parties dispatched from the respective countries (according to the investigation by the United Nations Office for the Coordination of Humanitarian Affairs, 20 relief and rescue teams having staff of about 670 were dispatched from 17 countries) joined the teams, thus making strenuous efforts.

The Disaster Control Local Head Office had the Central Command Post, the Local Disaster Control Head Office, further, the police, the fire-fighting offices, the military, the civil volunteer groups together, thus conducting relief and rescue activities, material distribution, cooking and various consultations.

(4) Activities for Acquisition and Supply of Food, Drinking Water and Living Necessities, and Stabilization of Prices

About the third day from the occurrence of the earthquake, food, drinking water and living necessities were acquired mainly by the military and the volunteer groups, and the serious shortage was gradually dissolved. On the other hand, problems occurred in uneven material distribution. For example, some disaster areas still suffered from shortage of drinking water and food in spite of arrival of large amount of medicine, otherwise, suffered from shortage of medicine, tents and the like. The materials arrived one after another were carelessly stacked in school gymnasium or the like, which provided a problem in efficient classification.

As to prices, the Fair Trade Commission prohibited artificial price raising and cornering of important national living materials, and at the same time, enhanced the supervision by providing special-purpose telephones for investigation and apprehension in the disaster areas.

(5) Emergency Accommodations (Provision of Evacuation Sites)

Nearly 380,000 disaster victims at the maximum became homeless, and some of them were accommodated in billets provided by the military and state-owned buildings, but most of them lived in tents in school yards, parks, military grounds and the like. Partially because of the delayed house judgment by experts, many disaster victims afraid of collapse of buildings by aftershock spent their own houses in daytimes but spent in nearby tents in night times. Accordingly, the number of people who lived in tents was more than that of the actual disaster victims by complete or partial collapse of houses.

In many cases, temporary accommodations were big temporary tents having a support center presented by volunteers, a food distribution corner, a power generator and the like, with outdoor tents and temporary toilets for the disaster victims around such big tents.

(6) Emergency Measures for Lifeline Facilities

As to electric power, the very-high voltage wire connecting the south and the north of the country, which was a literally lifeline, was broken by collapse of substations in the disaster areas and breakdown of the power supply system. The power supply failure influenced the capital Taipei as one of the most prominent high-tech industrial districts as well as the disaster areas.

The power outage was made in consideration of influence on the high-tech industries as assigned higher priority than daily life. It was determined to ① first, ensure power supply to industrial electric utility customers using a special-purpose very-high voltage wire for use of 1000 kW or higher power, then ② release limitations on power supply to high-pressure and low-pressure industrial electric utility customers, and ③ release limitations on power supply to civil electric utility customers. As a result, the limitations on power-supply for industrial use were released on October 5, and all the power supply limitations were released on October 9.

As to attainment of water supply, the damage to water supply dams due to raise of faults caused breaks in water supply service in 280,000 houses. However, acquisition of water from the outside and use of pumped ground water, recovery of water pipes and the like, attained normal-level water supply in mid-October.

Note that the following measures were taken for the disaster victims' convenience.

- Payment expiration dates of telephone, electric power, gas services and the like were postponed.
- The disaster victims were exempted from payment of telephone basic fees for 6 months. The domestic call fees were uniformly reduced to half. Further, the disaster victims were excused from pay compensation for broken telephones, and were able to had new telephones installed at no charge.
- Free telephones were placed in the disaster areas for the disaster victims.
- Calls to the disaster areas from the respective parts in the country were made at half of original fees.

(7) Activities for Hygiene, Epidemic Control and Retrieval of Dead Bodies

Mainly the evacuation sites reported hygienic control problems such as pulmonary troubles due to dust caused by rubble removal, diarrhea due to shortage of sanitary institutions including toilets, insufficient waste disposal, further, food poisoning related to eating and drinking.

As to retrieval of bodies, especially in the mountain-ringed regions, remains were left in many collapsed houses or exposed on the streets in extended high temperature due to delayed rescue activities and shortage of mortuary. As a result, in some villages, a stench wafted through the air.

(8) Emergency Risk Assessment on Houses and Acknowledgment of Damages

Two-stages of emergency risk assessment was conducted. At the first stage, experts classified risk levels as "safe", "care needed" and "dangerous" by visual observation. Among these levels, the houses judged as "dangerous" were examined at the second stage, and again classified as "safe", "care needed" and "dangerous". As a result, the houses were classified into (A) houses completely unrecoverable, (B) houses recoverable with 75% or more of reconstruction cost, and (C) houses recoverable with 50% or more of reconstruction cost. The houses (A) were regarded as completely collapsed, and the houses (B)(C), as half-collapsed.

However, actual designation of damages were relegated to village headmen (elected). In case of complete collapse, 200,000 Taiwan yuan was to be paid, and in case of half-collapse, 100,000 Taiwan yuan was to be paid. However, many applicants worried about judgment of complete collapse since the houses judged as completely collapsed were pulled down. The village headmen hardly ignored the applicants' feelings, thus fair designation was not made without difficulty.

(9) Waste and Rubble Disposal

As to building pull-down works and rubble disposal, waste dumps were selected regardless of usage of land, and the military support was determined, by the emergency order by the President. The military pulled down four-story or lower buildings, and the local governments pulled down five-story or taller buildings by using dismantlers.

Reusable ferroconcrete and construction materials and the like were selectively used for construction of highways. The valleys were permanently sealed, and the materials at the riverbeds were utilized for construction of parks and levees.

The rubble disposal as a whole was completed in about one month.

(10) Secondary-Disaster Prevention Activities

In some of the mountain-ringed regions, villages vanished due to landslips. It is predicted that the widespread vanishment of forest trees will prolong currently-formed forest conservation projects. Further, there are fears of damages by landslides and mud flows.

(11) Voluntary Support Activities by Volunteers etc.

In the emergency time immediately after the occurrence of the earthquake disaster, volunteers arrived at the disaster stricken sites earlier than the officials of the authorities, and started life saving, delivery of relief materials, emergency medical services and the like. After the full-scale activities were conducted by the authorities, the volunteers positively continued the activities avoiding overlapped works with those by the authorities. Such voluntary activities were highly evaluated by the ordinary citizens.

The activities by these volunteer groups were not limited to the emergency relief and rescue activities. For example, a Buddhist organization "Tzu Chi Association", having 4,000,000 or more members and holding a network over Taiwan and foreign countries, conducted, as well as software support such as mental care, construction of temporary houses and temporary school buildings, and further, recovery and rehabilitation activities which originally were to be performed by the authorities, such as construction of permanent school buildings.

3) Recovery and Reconstruction Activities

(1) Living Recovery and Reconstruction

① Consolation Money

1,000,000 Taiwan yuan was paid for the fatalities; and 200,000 yuan, for the injured. 200,000 yuan was paid for completely-collapsed buildings; and 100,000 yuan, for half-collapsed buildings.

② Measures for Socially Disadvantaged

To support orphans who lost their families and aged people, "Aid Act" was established.

③ Mental Care for Residents in Disaster-Stricken Areas

The authorities, and the military and civil organizations as well, dispatched alienists, psychological counselors and the like to the disaster areas, to open counseling windows and conduct circular guidance.

④ Taxation

Tax break measures were taken in consideration of the disaster victims by reduction/exemption of income tax,

house tax, business tax, land value tax, freight tax, and inheritance tax.

⑤ Insurance

The disaster victims, with consideration of indigenous people, were exempted from payment of their share of insurance expense by March 2000, regardless of presence/absence of certificate of national health insurance. Thus confusion accompanying presence/absence of certificate of insurance was prevented. More specifically, "921 Earthquake Disaster Insurance Card" was issued for exemption of payment of all the medical treatments and hospitalization and the card holder's share of other payments.

⑥ Employment

Employment measures for disaster-caused unemployed workers were positively made, through support to participation to free job training and job mediation (during a training period, allowance was paid) mainly for blue-collar workers.

⑦ Educational Measures

By the latest earthquake disaster, 619 schools were damaged and disabled to continue classes.
(Classification)

| | |
|---|-------|
| Universities, junior colleges and academies | : 33 |
| High schools | : 20 |
| Junior high schools and elementary schools | : 566 |
| Total | : 619 |

Note that among the disaster-stricken schools, 1,186 schools including closed schools re-started classes by the end of October by preparation of prefab school houses including school houses constructed by civil organizations. For school children and students, apart from the general consolation money, the following consolation money was to be paid for fatalities and injured.

- 10,000 yuan was paid for 1 dead student; 30,000 yuan, for an educational worker; and uniformly 5000 yuan, for an injured person.
- In elementary and junior high school students, 250,000 yuan was to be paid for a dead/seriously-injured students; 140,000 yuan to slightly wounded; and maximum 10,000 yuan, as ambulant support.

Further, if an elementary/junior high school student moved to another school, 100 yuan per day as allowance for food expenses, and 200 yuan per day as allowance for dormitory expenses were paid. Further, in case of movement within a disaster area, 40 yuan as an allowance for lunch expense was paid.

In addition, students whose houses had been completely collapsed were exempted from payment of school fees and other expenses, and students whose houses had been half collapsed were exempted from payment of school fees. Further, disaster-stricken high-school entrance examinees were given priority by obtaining additional points in examinations.

⑧ Identification Including Family Registration

To prevent delay of various procedures due to loss of identification, the Executive Yuan set up family registration offices in the disaster areas, to issue temporary identification to identify the disaster victims (without photograph). The issuance of family registration certificate was made at no charge, and further, registration of change of residence was accepted without certificate.

(2) Recovery and Reconstruction of Houses

① Provision of Temporary Houses

According to a survey on January 4, 4651 houses were completed, and 4248 households were already settled in the houses. At the beginning of construction, the floor space was about 26.4 m²; however, in response to the request from the disaster victims, the floor space was widened to about 39.6 m². Thus the construction of temporary houses was made in a flexible manner. As a general arrangement of the rooms, each house has two bedrooms, a kitchen, a living room, a dining room and a bath room. In consideration of community formation, a meeting place, a library, a dispensary, a supermarket, a children's playground and the like were set within the ground of the temporary houses.

② Provision of National Houses

The 5,988 national houses were provided at 70% of posted prices to the owners of completely or half collapsed houses.

As to housing loan, by emergency loan from the Central Bank, the ordinary banks conducted financing within 1,500,000 Taiwan yuan at no interest, and over 1,500,000 to 3,500,000 Taiwan yuan, at an annual interest of 3%, with payment due within the maximum 20 years. The national house was purchasable with 100,000 Taiwan yuan down.

③ Rental Subsidy

As rental subsidy, 3,000 Taiwan yuan was paid per one disaster victim for one year. As it was possible to rent a

nearly about 132 m² house without payment by the disaster victim himself/herself even in an urban area, many application was submitted.

④ Housing Loan to Damaged Houses

The capital repayment was postponed until a 5-years later date (exemption of payment in 5 years), at 4%-reduced interest. Further, payment of the interest was postponed until a 6-months later date.

⑤ Housing Policy to Laborers

As in the case of the employment measures, low-price houses were provided to laborers at construction cost of 60,000 yuan per about 3.3 m² by utilization of lands provided from large companies in the disaster areas. For this purpose, "Laborer's House Purchase Loan", with an upper limit of 2,200,000 Taiwan yuan, was made at an annual interest of 5.075%. Further, "Laborer's House Repair Loan", with an upper limit of 500,000 Taiwan yuan, was made at an annual interest of 5.075%.

⑥ Trends in Private Housing

Since there had been many empty rooms, private condominiums were sold at 20% discount of the market prices.

(3) Industrial Recovery and Rehabilitation

Since the disaster-stricken mountain-ringed regions are most prominent tourist attractions in Taiwan, tourism industries, small and medium local and traditional industries such as Shaoxing rice wine makers, and agriculture were fatally damaged.

Accordingly, a 60,000,000 Taiwan yuan low-interest loan preferential measure at an annual interest of 3% was implemented for the tourism businesses, and 6-month postponement of capital repayment to financial institutions was implemented for commerce and industry. Further, measures of construction of collective commercial and industrial region, development of mass merchandisers, rehabilitation of tourism and traditional industries by marketing and the like were considered.

Further, in the agriculture, washed-away and buried farms were subsidized. Specifically, in case of 0.05 ha or larger washed-away farm, 100,000 Taiwan yuan per 1 ha was paid, and in case of 0.05 ha or larger buried farm, 50,000 yuan per 1 ha was paid. Further, industrial low-interest loan with the maximum 3,000,000 yuan at an annual interest of 3% was made for the people engaged in the agriculture, forestry, fishery and livestock farmers.

4) Reconstruction Plan

(1) Outline of Entire Plan

① Plan Goals and Basic Rules

② Preparation Works

- * Enhancement of earthquake resistance and designing standards
- * Survey on geology and damage conditions
- * Basic land survey
- * Specification and publication of construction-prohibited area
- * Establishment of data center on human resources and disaster information

③ Entire Reconstruction Plan

- * Public building plan
- * Industrial reconstruction plan
- * Life reconstruction plan
- * Regional reconstruction plan

④ Necessary Measures

- * Enactment of special act and revision of existing laws and regulations
- * Enhancement of relief and disaster prevention system
- * Usage of sites of public projects
- * Cadastral survey
- * Provision of human resources

(2) Enhancement of Earthquake Resistance

The earthquake resistance of buildings was to be studied so as to attain resistance against earthquake of seismic intensity 7 levels as in the United States and Japan. Especially, public buildings were to be inspected by construction consultant companies by administrative regulations for compliance with the earthquake resistance designing standards. Further, introduction of new construction methods was to be promoted by tax reduction upon improvement of infrastructure including highways.

(3) Public Construction Plans

As to reconstruction of schools, since the damage to the school houses was being suspected of results of shoddy construction works, the system to inspect use of cheap construction materials and construction situations was to be enhanced.

Further, in consideration of load on the government in public reconstruction, the construction of traffic infrastructure, waste disposal institutions, schools and the like by private companies by BOT or BT method was promoted.

(4) Industry and Life Reconstruction Plans

The industry reconstruction plans were made for reconstruction of the agriculture in counties and mountain-ringed

areas, local industries including Shaoxing rice wine makers and tourism industries.

As to the life reconstruction plans, participation by civil volunteer organizations mainly in mental care services was promoted.

(5) Regional Reconstruction Plans

The local governments were to take initiative to implement the regional reconstruction plans with participation by private companies and support by the central government, while the central government was to drive the other three plans driven. Conventionally unused methods in Taiwan, e.g., to require participation by residents as well as persons of learning and experience from the planning stage, was considered.

① Implementation of Regional City Planning without Construction Prohibition Limitation

In principle, reconstruction was positively supported by simplification of reconstruction procedures, low-interest loan, mitigation of capacity volume ratio and the like.

② Reconstruction of Vanished Mountain-Ringed Counties

Mainly in mountain-ringed deep regions where the indigenous people live, nearly 20 villages vanished. Accordingly, reconstruction or movement of villages were planned.

i) Reconstruction of Village

- * First stage: making of reconstruction plan (99.10.16–99.12.15)
- * Second stage: implementation of reconstruction plan (99.12.16–01.12.31)

ii) Movement of Village

- * First stage: making of movement plan (99.10.15–99.12.15)
- * Second stage: implementation of movement plan (99.12.16–01.12.31)

3-3-3 Investigation of Drought Disaster Countermeasures in Korea

3-3-3-1 Introduction

Recently, natural disaster such as earthquake, flood and drought occurs frequently in the world. Then, it is necessary to endeavor to establish countermeasure of the world climate change. Total volume of water in the world is 1.4 billion cubic kilometer. Water could be classified into two categories, which are sea-water and fresh-water. The former takes 97.5%, and the latter takes 2.5%. Most of fresh-water is glacial situation in the south and the north of pole region. Only about 0.8% of total water in the world could be used. The utility of water-resources is prepared for drought as a storage of water because of characteristic of precipitation. However water is limited with storage reservoirs. As usage of the water is increases, coefficient of utilization to surface water is raised gradually. It has been known that most of the regions are very weak at drought. Damage of drought is enlarged to the world at large such as weakening of national competitiveness. Then, it is necessary that drought countermeasure should be prepared for the minimum damage. As water resources can not be compatible to the situation immediately, additional water in drought has to be found as soon as possible. Steady investment and interest for primary drought countermeasures would be required.

3-3-3-2 Definition of Drought

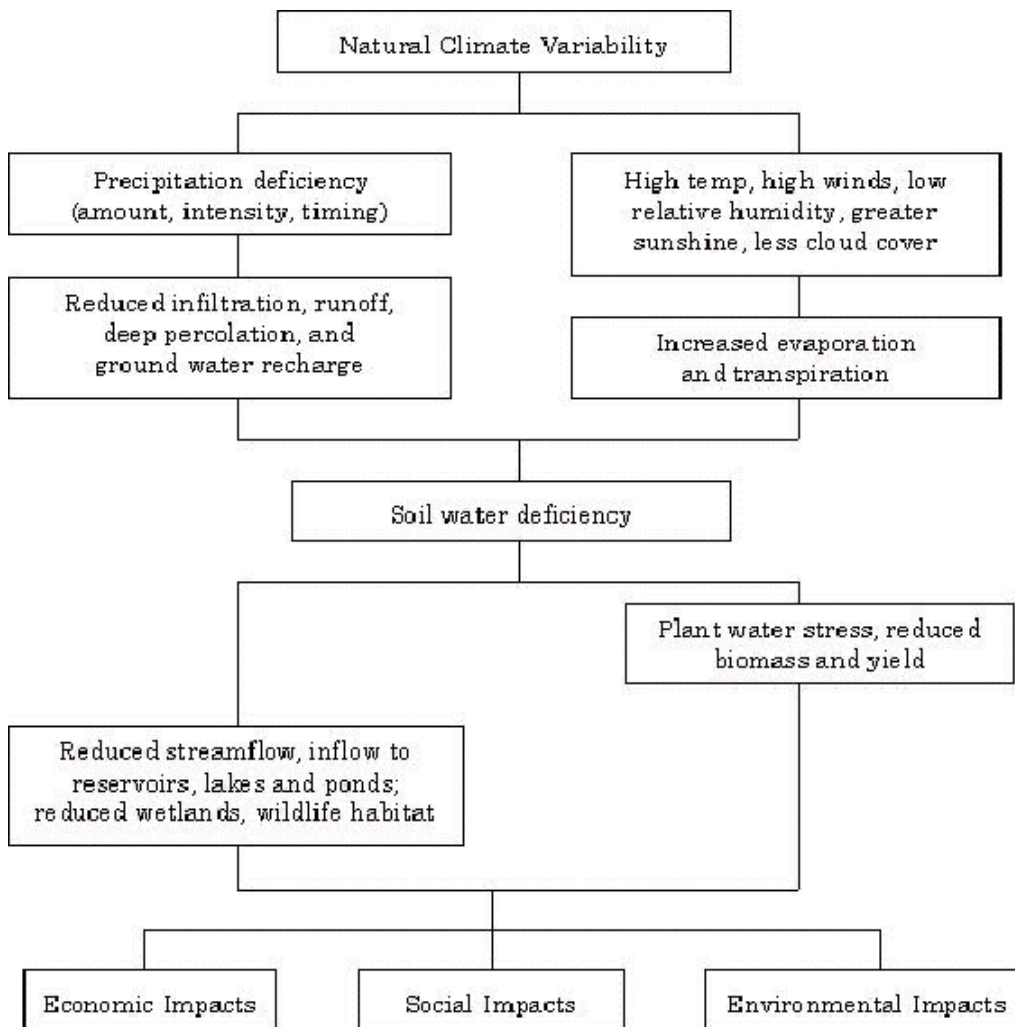
It is difficult to overcome drought perfectly. In early 1970s and 1980s, many people were starved due to drought disaster in northern Africa. Drought brought difficulties to the national economy, and destroyed to natural ecosystem. It is difficult to define drought simply. Depending on the definition of drought situation, it has many kinds of standard. In water resources engineering, drought depended upon lack of channel flow and storage water volume in reservoir. But in hydrology engineering, drought depends upon lack of rainfall and deficiency of outflow. Of course, drought situation is identified as the deficiency of water and unbalance of demand and supply. The drought here is defined as;

“Drought is a condition of moisture deficit sufficient to have an adverse effect on vegetation, animals, and man over a sizeable area.”

Concretely, drought can be explained in many ways such as the precipitation phenomenon and water use. They are as follows;

- Meteorological drought : A period of abnormally dry weather sufficiently prolonged for the lack of water to cause serious hydrologic unbalance in the affected area.
- Climatological drought : A explanation as percentage of annual average to same period of monthly or yearly precipitation.
- Atmospherical drought : A definition as temperature, wind and humidity
- Agricultural drought : A climatic excursion involving a shortage of precipitation sufficient to adversely affect crop production or range production.
- Hydrological drought : A period of below average water content in streams, reservoirs, ground-water aquifers, lakes and soils.

Fig3-3-3-1 Draw of drought connection



Drought phenomenon seldom occurs individually or independently. If meteorological drought is sustained, it influences agricultural drought which causes deficiency of soil moisture. As a result, agricultural drought is connected with hydrological drought by decreased channel flow or storage in water reservoir. Fig. 1 explains to connection of meteorological drought, agricultural drought and hydrological drought.

1) Meteorological drought

If the meteorological drought is sustained, it affects to the various fields. If meteorological drought is connected to atmospheric drought, humidity would be lower gradually. It is promoted that evaporation would be accelerated by high temperature. And it is brought to agricultural drought with soil moisture dehydration. It is very important to forecast long-range meteorological drought. If hydrological drought can be predicted, drought disaster countermeasures can be established.

2) Agricultural drought

Agricultural drought caused by meteorological drought is connected with reduction of yield and quality of crops. For instance, in 1995, 5 billion dollars crop yield reduction was measured in spite of supporting 4 billion dollars for the drought countermeasures, then the damage of agricultural drought was reached 9 billion dollars.

3) Hydrological drought

Hydrological drought can be displayed by numerical index from runoff simulation model of water circulation course in concentrated area. The drought is assessed by the amount of money consumed with living water, industrial water, channel maintenance water and the drought damage. Proceedings of the drought could be predicted if the concept of hydrological response in watershed is defined.

If the proceedings of drought can be predicted, it is possible to recognize that the frequency of the drought, the damage and the lack of water supply in the future, the amount of rainfall necessary for drought disaster prevention. Based on the results acquired above, we can announce a drought-flash and establish the drought countermeasures.

3-3-3-3 Drought disaster countermeasures

In this report, the drought countermeasures of each state in short term drought disaster or emergency situation in Korea and Japan have been stated, and the internet reports of Fiji and Papua New Guinea(PNG) have been used.

1) Korea

(1) Korea's background

Korea is located in south of Korean-peninsula in Asia. The territory is 98,480 square-kilometers and reservoir area is 290 square-kilometers. The irrigation area was 13,350 square-kilometers in 1993 and population was about 46.4 million persons in 1998. The average precipitation is 1,274 millimeters in a year and the length of channels is 1,609 kilometers. The national per capita income was 13,700 USdollars in 1997.

(2) Korea's drought countermeasures

Development of ground-water

-Development of the artesian well, the small deep well and the gathering well.

Simple water source

- Excavation work of channel bottom, field spring and movable pumping facilities.

Pumping water supply

- Using water supply and many step pumping with pumping implements.

Each self-government body

- Countermeasure of water supply according to each steps in district situation

Announcement of water saving movement :

- Water saving movement using broadcasting medium.

- Production and showing of public information movie.

- 10 percent water saving movement of living water.

Water supply for suspensive area :

- Use the facilities of idle well and agricultural well.

- Drinking-water supply with cooperation of drinking-water company.

- Drinking-water supply for island using ship-cleaning the navy.

Table3-3-3-1 Countermeasures according to each steps of drought disaster

| Steps | Criterion | Contents |
|--------|-------------------------------|--|
| 1 step | 10 percent saving supply | - Carriage supply of deficient water area - Public information of water saving - Strengthening of water quality maintenance (disinfection of purification facilities, inspection of feed-valve) |
| 2 step | 10-30 percent saving supply | - Operation the headquarter of emergency water supply countermeasure with each city - Shrinkage of operating business-time against using much water facilities - Enlargement water saving of public facilities and tall buildings - Saving of factorial water and enlargement of reuse - Execution of controlled water supply once in two days or three days |
| 3 step | 30-50 percent saving supply | - Once in two days of using much water facilities - Transfer agricultural and industrial water to drinking water |
| 4 step | 50-60 percent saving supply | - Once in three to five days according to actual circumstances - Supply to minimum living water - Enlargement to public use of private well and only drinking-water supply |
| 5 step | over 60 percent saving supply | - Shutdown to operations of using much water facilities to drinking-water |
| 6 step | exhaustion of water resources | - Transport to water from other place - Operation to minimum water distribution system |

2) Japan

(1) Japan's background

Japan is located in Asia and it is consisted of islands. The country area is 377,835 square kilometers and reservoir area is 3,091 square kilometers. The average rainfall is about 1,700 millimeters in a year and the length of channels is about 1,770 kilometers. Irrigation area was 27,820 square kilometers in 1993. Population was about 125 million people and the national per capita income was 24,500 dollars in 1997.

(2) Japan's drought countermeasures

Improvement of system

–Establishment headquarters of drought countermeasures and hydraulic control organization.

Guarantee of using water

– Supply water with moving truck.

– Security of equipment gained from salt-water to fresh-water.

– Reusing of electrical water and sewage disposal water.

– Utility of reservoir storage water.

Thoroughness of water saving

– Offer of water saving guidance and drought information.

– Formation of conference to limit of using water.

– Understanding and opposition of water quality according to economic impact.

– Support measure for business-man and farmers.

For example, as the yearly average rainfall in Hyogo prefecture is 1,200–2,400 millimeters, it is prepared for drought each region. In Hyogo prefecture, the area is about 8,385 square kilometers and it has about 44,000 reservoirs as a drought countermeasure. And Japan has about 50 equipments which can convert salt-water to fresh-water.

3) Fiji

(1) Fiji's background

Fiji is located in the Oceania of South-Pacific and it is composed of 332 islands. Population was about 800,000 in 1998 and national per capita income was 6,500 dollars in 1996. The country area is 18,270 square kilometers and it does not have any reservoir. The average rainfall is about 2,500 millimeters in a year. The length of channels is 203 kilometers and irrigation area is 10 square kilometers.

(2) Fiji's drought countermeasures

Water and food are transported by truck and boat to water deficient area.

The ministry of agriculture, health, education and public works are also running similar education programs.

Corporation is providing relief funds for crop rehabilitation.

In order to avoid possible drought disaster, there is a planned river dredging.

There are inspections of sanitary and supply of water tank in important area.

They are investing to sea and developing irrigation techniques for new crops.

There is a supply to implement irrigation improvement.

4) Papua New Guinea

(1) PNG's background

PNG is located in the Oceania of South-Pacific in around equator and it is close to Indonesia. The country area is 462,840 square kilometers and reservoir area is 9,980 square kilometers. The average rainfall is 2,800 millimeters in a year, the length of channels is 10,940 kilometers. Population was about 4.6 million in 1998 and national per capita income was 2,650 dollars in 1996.

(2) PNG's drought countermeasures

Build wells in the country.

Provide a portable sawmill for shelters.

Provide irrigation facilities for production and seeding of crops.

Solve problems for urgent health.

Maintenance of foundation facilities for transportation.

Public information to drink boiled water.

Supply water tanks to island regions.

Provide technical assistance and excavator of ground water.

Provide small-scale pump and purification facilities for fresh water.

Inspection of level and quality in ground water.

Supply seeds to farmers.

3-3-3-4 Comparison and analysis of drought disaster countermeasures

1) Comparison of general characteristics to each country

When drought disaster occurs, each country requires drought countermeasures. The general characteristics are listed in Table 2.

Table 3-3-3-2 General characteristics of each country

| | Korea | Japan | Fiji | PNG |
|----------------------------|------------------------|-------------------------|------------------------|-------------------------|
| Country area | 98,480 km ² | 377,835 km ² | 18,270 km ² | 462,840 km ² |
| Reservoir area | 290 km ² | 3,091 km ² | 0 km ² | 9,980 km ² |
| Irrigation area | 13,350 km ² | 27,820 km ² | 10 km ² | - |
| Population | 46.4 million | 125 million | 0.8 million | 4.6 million |
| Channel length | 1,609 km | 1,770 km | 203 km | 10,940 km |
| Average precipitation | 1,274 mm | 1,700 mm | 2,500 mm | 2,800 mm |
| National per capita income | 13,700 \$ | 24,500 \$ | 6,500 \$ | 2,650 \$ |

In Table 3-3-3-2, average population density, the ratio of reservoir area by country area, reservoir area by population and irrigation area by channel length is produced as follows.

Table 3-3-3-3. Comparison of characteristics to each country

| | Korea | Japan | Fiji | PNG |
|--|-------|-------|------|---------|
| Population density (persons/ km ²) | 471 | 331 | 44 | 10 |
| Reservoir area by country area | 0.29% | 0.82% | 0.0% | 2.16% |
| Reservoir area by population (km ² /10,000 persons) | 0.06 | 0.25 | 0.0 | 21.70 |
| Irrigation area by channel length (km ²) | 8.30 | 15.72 | 0.05 | Unknown |

As shown in Table 3-3-3-3, Japan has 2.8 times larger than Korea in irrigation area ratio because reservoir area is larger. Japan seems to overcome its drought with many reservoirs. PNG has 2.6 times larger than Japan's reservoir area ratio. If PNG well maintains and operates reservoirs, it can overcome the drought.

3-3-3-5 Comparison of drought countermeasures

The below is comparison by important subjects in drought situation to each country.

Table 3-3-3-4. Comparison of drought situation to each country

| | Korea | Japan | Fiji | PNG |
|-------------------------------|--|---|--|---|
| Establishment of organization | National disaster prevention and counter-measures headquarters Drought disaster report office | Headquarters of drought counter-measure Hydraulic control organization | | |
| Guarantee of using water | Development of ground-water Simple water source Pumping facilities | Reservoir storage water Electric using water Sewage treatment water | Dredging of channel bottom Establishment of water tank Using of irrigation equipment | Supply water tanks Development of ground water Facilities of purification |
| Water saving movement | Broadcasting medium Showing movie | Guidance Conference for limit use water | Drought education | |

| | | | | |
|--------------------------------|--|---|-------------------------------------|--|
| | Supply with counter-measure with steps | Under-standing of water saving impact | | |
| | | Support measure | | |
| Water supply suspensive region | Cooperation of drinking-water company Using ship cleaning | Moving truck Equipment gained from salt water to fresh water | Moving truck Support measure | Supply medicine Supply shelter Health manage |
| Increasing of income | | | Using the sea | Supply seed |
| Infrastructure | | | Improvement of irrigation technique | Road pavement Irrigation facilities |

In Table 3-3-3-4, we know that Korea and Japan is different from Fiji and PNG in drought countermeasures. Korea is focusing on development of ground water and water saving movement. While, Japan's focus is reuse of water, announce of water saving movement and converting facilities from salt water to fresh water. In case of Fiji, it is dredging channel bottom, and PNG is excavating of ground water and supplying medicine.

Japan prefers to use reservoir than developing ground water for drought countermeasures. The ratio of reservoir area in Japan is 2.8 times larger than that of Korea. Korea prefers to develop ground water than storing water in reservoir for drought countermeasure. But it is necessary that ground water level should be checked because Korea is in peninsula which has territory area like Fiji where the development of the facilities convert salt water to fresh water is recommended. In the case of Fiji, more economic converting facilities are needed. PNG has 2.6 times larger reservoir area than that of Japan. It is necessary for PNG to make a research about more effective reservoir management. And, it is recommended that PNG develops ground water because it has territory of twice larger than Japan's territory.

3-3-3-6 Conclusions

The report is concerned about the drought countermeasures of Republic of Korea, Japan, Fiji and PNG (Papua New Guinea).

The conclusions are based mainly on the Internet data. General characteristics of 4 countries were analyzed and drought countermeasures were compared in this report.

It has been revealed that Korea has reasonable groundwater compared to Japan which has many reservoirs as a countermeasure against drought disaster. Fiji has better develop groundwater and purifying facilities from salt-water to fresh-water. It is recommended that PNG also need to develop irrigation system and operate system for reservoirs. And it is recommended to both Fiji and PNG to conceive a plan for water saving movement against drought disaster.

In conclusion, circumstances in each country such as geographical and climatological conditions should be considered to prepare for drought disasters.

3-3-4 Coping with Century Flood Disasters in Central Vietnam

1) Background

Vietnam is very high disaster prone country. The Central Vietnam is most vulnerable compare to other regions of the country. This area is home to 7.5 million people and is one of the country's poorest regions. Disasters are the annual event in this region ranging from flood, typhoon, inundation, drought and others. Over the past 20 years, the region has suffered up to 70% of the damage nationwide caused by floods and storms. Exposure to disasters is one of the causes of poverty and malnutrition here.

2)The synopsis of flooding

Due to the effect of cold air in combination with the tropical convergence zone and tropical depression, the record floods had occurred that devastated the Central provinces of Vietnam in late 1999 – first in early November and then later in early December. Torrential rain occurred on a large scale and concentrated in a short period. Maximum daily rainfall reached 1,384 mm in Hue City. This is the highest level of rainfall ever recorded in 100 years in Vietnam since 1886.

Heavy rains in a short period caused large flooding in many areas. Flood stage on some rivers surpassed historical levels.

In these disasters, nine provinces in all were flooded -- Quang Binh, Quang Tri, Thua Thien Hue, Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen and Khanh Hoa. Thua Thien Hue and Quang Tri were the worst affected in the

first round of flooding, and Quang Ngai, Binh Dinh and Quang Nam were hit badly in the second. In the first flood, all districts of Thua Thien Hue Province and many districts of Quang Tri, Quang Nam, Quang Ngai, Quang Binh, Da Nang, and Binh Dinh Provinces were in deep inundation: 20 districts in this region were 2 to 4m under water. The National Highway 1A was 2 m under water. Transportation from the North to the South was paralysed for many days. Communication link is cut off for many hours in Hue City. In the second hit, heavy rainfall, mainly concentrated on the west of the Truong Son Range, caused flash floods in mountainous provinces such as Quang Ngai, Binh Dinh, Quang Nam, Phu Yen, Khanh Hoa Provinces. Flooding on a large scale occurred in provinces from Khanh Hoa to Thua Thien – Hue. In this double tragedy, 745 people lost their lives, 55,000 families were left homeless, while hundreds of thousands of others lost all their property and livestock. Bumper crop food reserves, built up in September/October, were swept away or spoiled. Over 60,000 hectares of fertile paddy were either washed away or rendered useless through sand inundation.

3) Quick response of the government

Right after the outbreak of the events, the high-ranking people were informed promptly and they immediately took necessary actions to cope with disasters.

At the first flood, after briefing with information on disasters, Prime Minister sent urgent telegrams to the Provincial People's Committees, requesting them to immediately implement preparedness and response activities and provide people in flood-stricken areas with emergency relief. He requested the Central Committee for Flood and Storm Control, in co-ordination with relevant Ministries and Sectors, to immediately support and assist localities in responding to floods.

A Special Mission of Government was set up and dispatched to the Central region in an attempt to directly monitor the response activities. Based on the flood and rain situation, the Mission advises the Government to implement emergency measures.

Army was promptly ordered to take over rescue and relief operations. Ministry of Defence mobilize forces and means of transportation to help transport aid commodities to the flood-affected areas. Air Force planes and helicopters were mobilized to rescue stranded residents and drop the relief goods while naval ships search for missing fishing boats.

Air bridges was set up across the country as in airports of Gia Lam – Vinh – Dong Hoi – Phu Bai – Da Nang Tan Son Nhat – Da Nang – Chu Lai – Phu Bai to transport the most urgently needed communities to the flood stricken areas once the weather allowed flights to resume.

All forces were mobilised to clear air and land transportation and create favourable conditions for transporting food and aid commodities to flood-stricken areas.

24 army planes, 280 trucks, 2 information-monitoring cars, 2 switchboard cars, and many means of transportation were mobilised to support the relief mission.

In the first days, 800 tones of aid commodities (which included noodles, life buoys, clothes, medicines, blankets, mosquito nets, and other necessities) were transported to flooded-stricken areas.

In the first round of flooding, the government supply free-of-charge 33,000 tons of food-stock from the National Reserve Source to help the victims in flood-stricken areas.

Relief forces and local people rescued 600 people who were caught by flooding; 28 thousands of people were taken to safe areas; 1 million people were provided with foods and aid commodities.

The Health Care Sector immediately set up its emergency Health Care Network. Medicines and water-filtering chemicals were transported to flooded provinces. Many doctors and nurses came to the areas to treat and take care of flood victims.

The Transportation Sector quickly repaired the roads and railway to help transport aid communities from the North and the South to the Central provinces.

During flooding, the Post and telecommunication Sector had tried their best to establish a communication hot line to help Thua Thien – Hue Province, and other isolated provinces revitalise the contact with Central Government.

The Electric Sector immediately repaired electric network and the 110 kV line in Da Nang and Hue Cities. At the same time, the cable wires, and high – low voltage networks were also restored as soon as the floodwaters fell.

The Ministry of Agriculture and Rural Development mobilised rice from the two Food Incorporations in the South and the North and organised the transportation of salt and aid commodities to flood-affected people.

Other Ministries and Sectors actively implemented the Instruction Telegram of the Prime Minister. They quickly prepared materials to help the Central Provinces restore production as soon as floodwater fell.

At the time of flooding, the Standing Office of CCFSC and the Hydro-Meteorology Service's staff were working around the clock to bridge the communication between Localities and Sectors in an effort to sum up situation reports and monitor the co-ordination among sectors and localities.

The Government requested the Ministry of Labour, War Invalids, and Social Affairs, Ministry of Trade, the CCFSC, the Fatherland Front, and the Red Cross Organisation to work out optimal measures on relief missions to ensure proper and quick aid commodity distribution.

Media, radio, and television quickly broadcast the synopsis of the flooding in the Central Provinces. Information on flooding immediately attracted great attention of people all over the country. This creates a sense of emotion and unity nation-wide. People immediately gathered aid commodities and raise funds that would later be sent to the flood-affected areas. Many people went to the airports, the television and broadcasting stations, the Fatherland Front, relief organisations and donation points to make their contribution.

Right after the outbreak of the disasters, the Fatherland Font had launched an appeal for support to the victim in flood stricken areas. The general public responded by providing hundreds of metric tonnes of food and clothing to the two agencies designated by the Government of Vietnam for collecting assistance -- the Fatherland Front, and the Vietnam Red Cross. In the first days of the November floods much of this was transported by air, until rail and road links were resumed.

Viet Nam Father Land Front, in co-operation with the Aid Reception and Management Committee of the Ministry of Finance and the Viet Nam Red Cross have received and delivered aid to Gia Lam, Tan Son Nhat, Da Nang, and Chu

Lai Airports. Ministries and branches co-operated with the armed forces and local people to gather all means and stocks for facilitating the aid relief.

The contribution of the Vietnam Red Cross has been recognised as a fundraiser alongside the Fatherland Front, but the greatest recognition has been for the effective performance in the field on rescue and relief mission.

While the relief operation was getting underway, another wave of floods hit these same provinces, this time slightly further south, and in particular devastating the province of Quang Ngai. In this flood the agriculture sector was badly hit. The crop seed reserves were seriously damaged. Farmers who had been able to plant rice following the first flood saw it washed away in the second round. Local residents exhausted with previous long flood have again suffered with hash condition of another flooding.

One again, all forces was mobilised to cope with disasters. By this time, the rescue operation and logistics system was working well.

The government responded promptly, 214 MT of instant noodles and 100,000 raincoats was sent to Quang Ngai and Quang Nam within the first 48 hours. Senior ministers and high-ranking people went to the affected areas. High-level meeting took place with Prime Minister, deputy Prime Minister and other concerns agencies. Army personnel and equipment were once again swiftly mobilised to rescue and assist people and protect the main reservoirs. Ten of thousands of people have been evacuated by the authorities from vulnerable areas.

When the second wave of floods hit, the planting season was almost at an end. This could have spelt disaster, causing severe food insecurity for six to nine months ahead for millions in these provinces. Thanks to the quick intervention of the Central government reserves, many farmers were able to plant rice and other food crop for the next harvesting season.

The Government of Vietnam has facilitated the work of the international humanitarian organisations throughout the relief operation such as providing military aircraft and rail transport free of charge for International Federation of Red Cross and Red Crescent Society, Vietnam Red Cross during their operation. Bureaucratic obstacles have been swiftly overcome by the intervention of senior officials.

At local level, the People's Committees have established the Aid Receiving Boards to help receive and transport aid commodities to flood-affected areas. Local staffs worked diligently and try their best to bring relief goods to the victims on time event they some time faced with dangerous condition during their relief missions.

After the flood receded, the government has quickly implemented necessary actions to prevent the outbreak of secondary disasters. Soldiers were mobilised to clean up the environment, restore the water and sanitation utilities and help local communities repair and construct temporary houses for the immediate needs. Doctors and medical volunteers come to the flood affected areas to provide free treatment and vaccinate to prevent the outspread of the post-flood diseases. The relief system continues its operation to ensure proper distribution of relief goods among the affected local communities.

All the sectors and branches used reserve funds to help their local branch offices recover its normal operation. Micro credit funds were provided for the affected households to restore the production and business.

Thank to extensive efforts of Central and local governments in disaster respond and rehabilitation, no diseases or hungers has occurred in the area in the aftermath of disasters, although local economy has seriously damaged.

4) Long-term plan

Currently, efforts are underway to seek suitable solutions for mitigating the natural calamities in this region. Socio-economic development plan for the region are focused on disaster control and mitigation.

Ministry of Agriculture and Rural Development in cooperation with the Netherlands Embassy has triggered an initiative to study of the disaster preparedness and mitigation solution for the affected area.

In early January, a team comprising UNDP, Dutch and Vietnam's Flood and Storm Control Department experts surveyed the five central provinces hardest hit by the floods.

At the beginning of March, Vietnamese officials and international organizations gathered at a seminar in the central city of Danang to identify the tasks for a second survey, which is expected to start sometime in the next few months, and will lay the groundwork for a forthcoming donor conference in Hanoi.

Much effort still needed for the natural disaster mitigation programme in the Central Vietnam. The government plan should receive a strong support from International communities to reduce the impacts of calamities and increase the living standards of local communities in this region and helping them better resist with natural disasters.

3-3-5 Countermeasures at the Tsho Rolpa Glacier Lake

1) Brief introduction of Nepal

Nepal is a small and land locked country in South Asia. It is situated between the two large and densely populated countries of Asia – China in the North and India in the South, East and West. It has an area of 147, 181 sq. kms. Within the short span of the country, all varieties of climate and topography can be found ranging from the sub-tropical to the alpine. The lowest altitude starts from 60 meters above the sea level to 8, 848 meters in the Northern part. Mt. Everest the highest peak in the world with an altitude of 8,848 meters.

Rugged and fragile geophysical structure of the country has made Nepal vulnerable to various types of natural disasters like: Glacier lake outburst flood (GLOF) flood, landslide, fire, earthquake, windstorm, hailstorm, thunderbolt, epidemic, avalanche, etc. These disasters occur almost every year in one part of the country or the other causing loss of life and heavy damage to physical properties.

2) Glacier Lake Outburst Flood

A glacier is a huge flowing ices mass. The flow is an essential property defining a glacier. Usually a glacier develops under condition of low temperature but the cold climate in itself is not sufficient to create a glacier. There are such regions on the earth where the amount of total depositing mass of snow exceed the total mass of snow melting during a year in both the polar regions and high mountain regions. Stretch of such an area is defined as

accumulation area. Thus, snow level is piled up year after year in the accumulation area because of the fact that the annual net mass balance is positive. As a result of snow layers piling of continuously, the deeper snow layers are compressed by the over burden pressure due to their own weight .As a consequence the density of the snow layers increases where by snow finally change to ice beyond a certain depth. Actually a glacier change sometimes change in size and shape subject to the influence of climate change. Glacier would advance with climate changing to a cool summer and a heavy snowfall in winter and monsoons seasons; the size would expand and the terminus would shift down to a lower attitude.

In the Himalayan region of Nepal glacier lakes are common. Mainly there are two types of glacier in the Himalaya One is debris covered type glacier and the other is clean type glacier free from debris on the glacier surface. A total of 159 glacial lakes have been found in Koshi basin and 229 in Tibetan Arun basin. Among them 24 are potentially dangerous. The areas like: Upper Barun, Lower Barun, Chamlangtsho, Tsho Rolpa, Sabou, Dudh Kunda, Majang, Inja, Thulari have potentially dangerous glacier lakes. These lakes contain huge volume of water and remain in unstable condition, as a result, they can burst any time and such disaster may cause heavy loss of human life and physical property. About 14 such glacier lake outburst floods have taken place in the past.

3) The Tsho Rolpa Glacier Lake

Tsho Rolpa Glacier Lake is located in Gaurishanker Village Development Committee, Dolakha District of Nepal. It is situated at an altitude of 4580 meters from the sea level and its area is 1.65 square kilometers. Water volume in this lake has been estimated to be 80 million cubic meters. It has been observed that the physical size of this lake has increased by five times since 1960. In 1997 Glacier Lake Outburst (GLOF) Specialist Dr. J. Reynolds warned that the lake might burst in the summer of the same year. Moreover, a report of the Ministry of Science and Technology stated that if the lake bursts, it would affect 18 Village Development Committees (VDCs) of Dolakha and Ramechhap districts. It was also stated in the above reports that some very necessary countermeasures should be taken immediately to reduce the extent of damage by the probable flood: Therefore, in view of the above reports and the increasing physical size of the lake and the trend of ice melting the Central Natural Disaster Relief Committee (CNDRC) decided to adopt necessary countermeasures. For this purpose the CNDRC constituted the Tsho Rolpa glacier lake Water Induced Disaster Prevention . Thus, some countermeasures are being adopted since June 1997.

A glance of Tso Rolpa Glacier Lake



4) Countermeasures at the Tsho Rolpa Glacier Lake

Reduce the water volume in the glacier: –

At the beginning, to reduce water volume of the glacier five siphons were installed by the Water Supply and Sewage Management Department. Besides the siphons, at present, the mouth of the lake is being cut to reduce the water volume of the lake

Move the endangered population:

Inhabitants of the downstream of the Tsho Rolpa glacier lake i.e. Rolwaling river have been moved up and above 20

meters from the riverbank.

Trial Siphon System



Establishment of the early warning system: – Sirens are being kept at the following places:

1. Nagau Dolakha District
2. Beding Dolakha District
3. Bhorle Dolakha District
4. Singhati Dolakha District
5. Dhumbu Dolakha District
6. Nayapul Dolakha District
7. Kirne Dolakha District
8. Khimti khola Ramechhap District
9. Manthali Airport Ramechhap District
10. Prakashpur Sun saris District
11. Kosibarrage–Sunsari District

Components of the first early warning system introduced at Tsho Rolpa Glacier Lake:

- Master Station – 1
- Glacier lake Sensing – 2
- Glacier lake Warning monitoring – 2
- Glacier lake Warning (Sirens) – 19
- Early Warning Relay Station – 3

Establishment of surveillance posts: –

A surveillance team comprised of Royal Nepal Army, communication personnel, specialists from the Department of Hydrology and Meteorology and Nepal Telecommunication Corporation have been posted to carry out regular monitoring of the glacier and to provide instant information to the concerned authorities during the rainy season.



5) Budgetary Provision

An amount of NRs. 5 million was made available from the Prime Minister Disaster Aid Fund for the above management at the Tsho Rolpa Glacier Lake in 1997. Since then His Majesty's Government of Nepal has spent NRs. 1.8 million in FY 1997/98, NRs. and 4 million in 1998/99. His Majesty's Government of Nepal is going to spend NRs. 5.4 million in the FY 1999/2000. Besides, the World Bank made available NRs. 50 million in the FY 1997/1998 whereas the Government of Netherlands provided NRs. 120 million for the FY 1999/2000. In addition, the Government of Netherlands will provide NRs. 200 million for the management of Tsho Rolpa Glacier Lake. *1.00 US\$ equivalent to Nepalese Rs 69.00

6) Conclusion

In the view of the geographical situation and resources constraints of the country it is very difficult to manage with glacier lake outburst disaster in Nepal. Moreover, the system of the hazard mapping, vulnerability assessment, risks analysis, scientific detection system to monitor change in the physical environment, effective early warning system are much more needed in Nepal.

3-3-6 Two Recent Disasters that Occurred in Nepal

Introduction

Nepal is vulnerable to various types of natural disasters such as earthquake, landslide, flood, fire, epidemics, hailstorm, windstorm, thunderbolt, avalanches, Glacial Lake Outburst Flood (GLOF), drought and so on. Among all these disasters flood and landslide cause heavy amounts of losses and damages each year. Two very prominent events of flood and fire will be presented below which happened in August 1999 and February 2000.

1) A Brief Description of Flood in the Chitawan District

Very high intensity of rainfall with thunder and lightening occurred in Kalyanpur, Ayodhyapuri, Baghuda and Gardi Village Development Committees of Chitawan district on 24 August 1999 between 2:00 to 5:00 A.M. which resulted into a devastating flood in that area. All the rivers in that area were swollen which caused heavy loss of human lives and enormous damage to physical properties.

(1) Consequence of the Flood

Due to the devastating flood of 24 August 1999 in the above area of the Chitawan district 22 people died, 6 people missed, 900 cattle heads were lost, 510 houses and 502 cattle sheds were destroyed and 482 families were affected. This unfortunate event caused an estimated loss of NRs. 30 million.
(1.00 US \$ equals to NRs. 69.30)

(2) Reasons of Flood

The main reason of flooding in the above mentioned area was very high intensity of precipitation in three hours period. Moreover, precipitation was highly localized.

(3) Reasons of High Death Toll

As some fishermen and their families were living along the river bank of that area the swollen rivers swept away such a high number of people.

(4) Measures to be Adopted

In order to prevent the loss of lives and physical properties, the people should be convinced not to settle along the riverbanks. Moreover, flood forecasting/ warning system should be developed and established in the vulnerable areas, which are still undeveloped in Nepal.

It is also necessary to monitor and collect necessary precipitation data. Monitoring and data collection should be carried out throughout the year. Rain gauge station and installation of piezometers are necessary to understand the hydrology of the area.

2) Brief Description of the Fire Hazard in the Saptari District

A devastating fire hazard took place on 21 February 2000 at 15:00 hours in Ward No. 1 & 2 of the Tarahi Village Development Committee of the Saptari district of Nepal. The policemen and the local people controlled the devastating fire at 18:00 hours.

(1) Consequence of the Fire

Due to the devastating fire of 21 February 2000 in the above area of the Saptari district 41 thatched houses and 64 cattle sheds were destroyed and 41 families were affected. This unfortunate event caused an estimated loss of Rs. 27 million. Luckily there was no loss of human life in the above said fire hazard.

(2) Reasons of Fire

Dry weather, strong wind and thatched houses and cattle sheds which were build closely were the main contributing factors of fire hazard in the above mentioned area.

(3) Measures to be Adopted

To safeguard the human life and the physical properties from such fire hazards it is very necessary to raise the public awareness and convince them not to build thatched houses and cattle sheds and also not to build closely.

3-3-7 Analyzing the Problem of Forest Fire in Indonesia

1) Forest Management

The Ministry of Forestry manages approximately 60% of Indonesia's 190 million hectare land area (113.8 million hectares). The National Forest Inventory recently determined that 120.6 million hectares of the nation is still forested (GOI/FAO 1996), although the actual figure is thought to be about 25% lower. Only 91.7 million hectares remain forested within the designated national forest estate (Ramon and Wall 1998). Approximately 26 million hectares of the forest estate are eligible to be converted to other uses. Deforestation rates are estimated to be between 0.6 and 1.2 million hectares annually (Sunderlin and Resosudarmo 1996).

The most basic problem with the government's management of forests is that land was designated as production forest with little knowledge of the characteristics of the land, the traditional rights of communities already living there, or the conservation importance of forest ecosystems. The negative effects of uninformed land allocation decisions were exacerbated when concessions were awarded to companies and individuals with no experience in timber harvesting, supervised by forestry officials lacking the political support, incentives, and resources to provide

meaningful oversight of harvesting operations (Barber et. al. 1994). These weak forest management institutions resulted in inefficient extraction of timber, unnecessary damage to remaining trees, excessive waste wood left in the forest, unnecessarily severe impacts on animal populations, soil erosion, and stream pollution (World Bank 1995). Short duration concession contracts, low government royalties on timber, and weak performance supervision give the concessionaires little incentive to reduce timber waste, mitigate environmental impacts, or sustainably manage their concessions (Barber et. al. 1994). Virtually all of the lowland forests in Sumatra and most of the economically harvestable lowland forest in Kalimantan have been logged, leaving behind a legacy of social and ecological disruption, with little thought to sustainably managing the logged forests.

2) Background of Forest Fire

In 1982/83 one of the largest forest fires in this century raged for several months through an estimated 5 million ha of Borneo's tropical rainforests. The Indonesian province East Kalimantan was the area worst hit by the burning. Since then, fire has been a recurring feature of the islands of Borneo and Sumatra, burning large areas in 1986, 1991, 1994 and 1997.

Since the 1986 fires, Indonesia has been at odds with neighboring Malaysia and Singapore, as the haze from these fires covered the South East Asian region for weeks, causing health problems, disruption of shipping and aviation, and culminating in the closure of international airports. Economic losses and ecological damage were enormous. In 1991 Indonesia asked for international help.

3) Causes of Forest Fire

Much of the haze was caused by huge conversion burns in order to prepare land for pulp wood and oil palm plantations. The use of fire is officially forbidden, but every company uses fire, because this is the only viable and economic method of reducing the huge amounts of biomass. The underlying cause is hence the policy that targets to convert 500,000 ha of forests every year into plantations. This policy needs to be revised immediately. Plantations should be established in the abundant areas of already degraded and unproductive land, and not through conversion of remaining rain forests. This of course, is much less profitable because there is no marketable timber yields to provide huge profits at the time when the plantation is prepared. The establishment of a pulp wood plantation is profitable only because of the marketable timber, which is logged prior to planting, and the high subsidies paid from the reforestation fund. But pulp wood plantations carry an extreme fire risk and work only for one rotation if at all. Then the soils are exhausted and savanna is what will be left behind.

When logging companies enter into a new area, they automatically bring with them the fire problem. They are opening up the forests and making them more susceptible to forest fires through roads, logging waste, bulldozing through the stands and opening up the canopy and finally, by bringing in people as the source of fire. But they usually don't have a fire management concept nor are they prepared to handle wildfire emergencies. Many of the forests in Kalimantan can be used to sustainably, but fire is a crucial factor. Fires have now burned through all types of vegetation. Where ground fires burned through primary or logged-over forests they left behind a huge volume of dead trees as potential fuel for the next fire. There is a chance for these forests to recover, but another fire would mean the death penalty. So, timber companies have to be forced to do the utmost to protect them against fire and rehabilitate them where appropriate. In the future companies should only be given licenses for their annual cut when they prove to have a sufficient record in fire prevention and control.

A very complex but crucial factor is land use and land tenure policies. Basically all the forests are public forests. But people do live in and around the forest and many of them are newcomers. They don't have a traditional attachment to the forests or live in-tune with their natural environment like the Dayak tribes. In general people do not have the right to own or even use the forest. So they don't care for the forest when they cultivate a piece of land for their livelihood using fire. If an agricultural burn gets out of control and some public forest burns, who cares? There are impressive examples, that people do protect the forests from fire, when they have the right to use its products. The land tenure system urgently needs revision.

There is no lack of laws, though too often laws are contradictory and inconsistent, but law enforcement is particularly weak or almost non-existent. Too often public servants have to top-up their miserable salaries by turning a blind eye on unlawful activities in the forests.

Arson and land speculation has played an important role also during the 1997/98 drought. Stories are being of that many fires being lit in areas where people anticipated mining or plantation companies showing up in the near future. They would pretend to cultivate this land and ask for compensation. Other stories are of plantation companies burning the land of Dayak people who have traditional rights and rattan gardens and don't want to move out, of timber plantations being set ablaze as revenge for taking away a person's land. Illegal loggers are said to use fire to distract forests guards.

And finally, the economic crisis and the drought that caused crops to fail have added to people's hardship and caused fire to become a large-scale hunting tool. People would set forests ablaze with the objective to catch turtles or hunt deer.

4) Preventing from the Forest Fire

The most important steps to be taken to tackle the real causes of the fires and the haze are a revision of Indonesia's forest conversion policy and the policy on land use rights, law enforcement against timber companies and all too often well-known illegal loggers, a comprehensive fire management plan compulsory for timber and plantation companies and last but not least help for the poor to overcome their hardship so that they don't have to devastate the forest.

Fighting fires is not the conclusion of forest fire, because Indonesia in principle does not have a fire-fighting problem. Indonesia has the problem that too many people set too many fires, for whatever reason. There is the key to overcome this region's haze and fire problem. Hence it is pointless to focus on fire fighting, though of course such capacities are also urgently needed. It should not go unmentioned that it is not Indonesia alone, but the economic involvement of the whole region, including Singapore and Malaysia which contributes to the fire and haze problem.