GENERAL

CHAPTER 1 BACKGROUND AND PURPOSE OF THE GUIDELINES

1.1 Background of the Guidelines

Japan is blessed with rich natural environment. Such natural environment, however, presents severe natural and meteorological conditions. With complex topography and vulnerable geology, the Japanese archipelago is highly susceptible to a variety of natural phenomena, such as typhoons, torrential rainfalls, heavy snowfalls, earthquakes, and volcanic eruptions. When looking back over the 20th century alone, the Japanese people were never spared from these natural perils in any part of the country. Every year, severe flooding and sediment disasters are repeated across the country, causing tremendous damage to the lives and properties of the people. Even in July 2003 when these guidelines were being prepared, a major sediment disaster involving a number of slope failures and debris flows occurred mainly in Kumamoto Prefecture in the Kyusyu Region, under the influence of torrential rainfall at the end of the rainy season. This disaster claimed the lives of 22 persons (See Fig. 1.1).

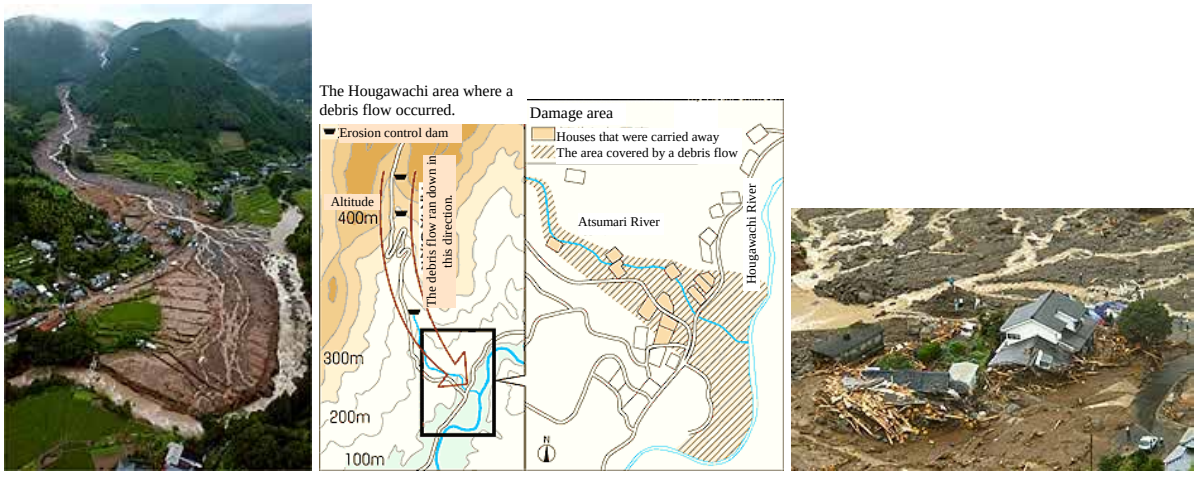

Fig. 1.1 Houses were carried away by a debris flow that occurred in Hougawachi, Minamata City, Kumamoto Prefecture (July, 2003) [1)]

When turning our eyes to the world, it is known that a myriad of people have been victimized by sediment disasters in many parts of the world. In 1985, a total of 22,000 people were killed in Columbia when a volcanic mudflow triggered by the Nevado del Ruiz Volcano eruption engulfed the town of Armero. In June 1989, more than 2,000 people lost their lives and more than 18 million people sustained damage as a result of flooding and landslides that occurred in Sichuan Province and the neighboring regions in China. In November 1991, more than 6,300 people became dead or missing in the flood and landslide disasters that occurred in Ormoc on Leyte Island in the Philippines due to a typhoon attack involving torrential rainfall. In July 1996, 238 people were killed when a landslide and the subsequent debris flow hit the northeastern part of Nepal. Even during the five-year period from 1996-2000, 46 major sediment disasters occurred, killing about 2,500 people in total. As seen, sediment disasters costing invaluable lives are commonplace in many countries in the world, but they are especially frequent in developing countries with rugged mountains and much rainfall.

To prevent such destructive sediment disasters, massive sediment disaster prevention efforts have been made not only in Japan but also in other countries in the world. But, the

results are not so fruitful. Because the sediment disaster hazard area is numerous in number and extends over a vast area, an enormous amount of time and cost are required to make all the hazard areas safe with the installation of disaster prevention works. For this reason, when promoting sediment disaster prevention measures, versatile non-structural measures should be taken in addition to structural measures such as installation of disaster prevention works. Non-structural measures include the designation of a sediment disaster hazard area and the development of a warning and evacuation system appropriate for those areas. As to the highly vulnerable hazard areas, it may be necessary to implement comprehensive measures which include restrictions on building structures and new land development.

With respect to the development of a warning and evacuation system against sediment disasters, it is well known that sediment information plays a very important role in realizing a timely warning and a speedy evacuation. To best utilize this kind of information, a risk management system should be established first that enables a quick grasp of the actual damage conditions and a swift collection/delivery/transmission of disaster-related information. To keep the resulting damage to a minimum, the disaster prevention awareness of the local people should also be enhanced. In addition, to build a close cooperation between the administrative bodies and the local people, support should be extended to a variety of activities held for disaster prevention purposes. Disaster prevention drills consisting of information transmission, evacuation, and other trainings, should also be conducted to motivate the local people for active involvement.

In Japan, preventive measures against floods and sediment disasters had been carried out based on the Sabo Law, the Landslide Prevention Law, and the Law Concerning Prevention of Disasters due to Collapse of Steep Slopes (Steep Slope Law). However, taking the 1999 sediment disaster in Hiroshima Prefecture as a momentum which clearly indicated the need of integrated disaster preventive measures, another law was enacted in 2000. This law, namely, the Law Concerning the Promotion of Sediment Disaster Prevention in Sediment Disaster Hazard Area (Sediment Disaster Prevention Law) mainly concerns with the establishment of a warning and evacuation system, restrictions on new residential development, and promotion of relocation of existing houses in disaster-prone areas. With the enactment of this law, non-structural measures in Japan have been diversified and consolidated. And now, on the basis of these four laws, the disaster prevention measures in Japan are evolving toward a comprehensive approach for an overall sediment disaster prevention.

The technology that has been accumulated in Japan for the development of a warning and evacuation system is probably very effective for the developing countries suffering from sediment disasters. Japan is expected to transfer its abundant experience and knowledge on these disasters to the developing countries, and the nation is willing to accept the duty.

Sending a large number of experts and engineers to developing countries through the programs of the Japan International Cooperation Agency (JICA), Japan has long contributed to the development of the socio-economic infrastructures, technological transfer, and the education of technical experts in developing countries. What is important with this kind of technical cooperation is, not to just transfer the technologies of developed countries to the developing countries, but to transfer the technologies or install the facilities in the way best suited to the situations of the receiving countries, including socio-economic systems and social conditions.

1.2 Purpose of the Guidelines

These Guidelines are intended for use as a technical reference when Japanese technical experts dispatched to the developing countries as well as the administrators and the policy organizers in the developing countries try to develop a warning and evacuation system against sediment disasters. Through such use, the Guidelines hope to contribute to the establishment of an effective standard and an effective system for warning and evacuation in developing countries that have long been troubled with sediment disasters. These Guidelines are formulated fully incorporating the extensive technology and experiences that have been accumulated in Japan over the past several decades.

These Guidelines specifically describe the development method of a warning and evacuation system appropriate also for developing countries where observation systems for rainfall and other parameters are not yet fully established. To develop an effective warning and evacuation system, the development method cited in the Guidelines takes into account the various conditions of the target country, including a monitoring system for potential disasters, a prediction system for disaster occurrence, the social structure, and the communications system.

Prediction of disaster occurrence, or various standards for warning and evacuation, are shown using the rainfall as the main indicator. If the short-term rainfall data (10-minute rainfall, the hourly rainfall, etc.) are obtainable in real time, highly accurate prediction of disaster occurrence is possible. However, if the only data available is the daily rainfall, highly accurate prediction is difficult.

Each country should decide by itself what level of rainfall-gauging system and a warning and evacuation system are needed for each hazard area, by taking into account the social situations in the country. However, regardless of the target levels of the systems, the important thing is to build a warning and evacuation system anyway utilizing currently available rainfall data, and then to initiate an operation of the established warning and evacuation system in close cooperation with the local people.

CHAPTER 2 APPLICATION OF THE GUIDELINES

2.1 Potential Users of the Guidelines

The Guidelines are designed to be used primarily by the technical experts in developing countries who perform surveys and designs in the fields of rivers, sabo (erosion and sediment control), and disaster prevention. In brief, the following experts are considered as the potential users of the Guidelines.

1) Short-term and long-term experts sent by the JICA of Japan
2) Administrative organizations in developing countries
3) Educational institutions, such as universities, in developing countries
4) Civil engineers in the private sector in developing countries

2.2 Scope of Application

The Guidelines are intended for use in any developing countries susceptible to sediment disasters. In other words, the Guidelines are appropriate for developing countries with numbers of steep mountain streams, much rainfall in wide areas, and under constant threat of sediment disasters.

CHAPTER 3 ORGANIZATION AND FEATURES OF THE GUIDELINES

3.1 Organization of the Guidelines

These Guidelines consist of three parts - General, Basis of Sediment Disaster, and Planning of Warning and Evacuation System. The structures of the three parts are shown in Table 1.1. The second part, Basis of Sediment Disaster, covers the preventive measures against sediment disasters and the technical background for the prediction of disaster occurrence, both serving for the development of a warning and evacuation system. The third part, Planning of Warning and Evacuation System, deals with the practical steps toward the actual setting of a warning and evacuation system against sediment disasters.

Table 1.1 Organization of the Guidelines

General			
Chapter 1	Background and purpose of the Guidelines		
Chapter 2	Application of the Guidelines		
Chapter 3	Organization and features of the Guidelines		
Basis of Sediment Disaster		Planning of Warning and Evacuation System	
Chapter 1	Principles of occurrence of sediment disasters	Chapter 1	Identification of sediment disaster hazard areas
Chapter 2	Actual state of sediment disasters and preventive measures	Chapter 2	Monitoring and forecasting of sediment disasters
Chapter 3	Prediction method of occurrence of sediment disasters	Chapter 3	Delivery and transmission of sediment disaster information
Chapter 4	Actual state of warning and evacuation system against sediment disasters	Chapter 4	Evacuation plan

The flowchart showing the steps for the establishment of a warning and evacuation system against sediment disasters is described in Fig. 1.2.

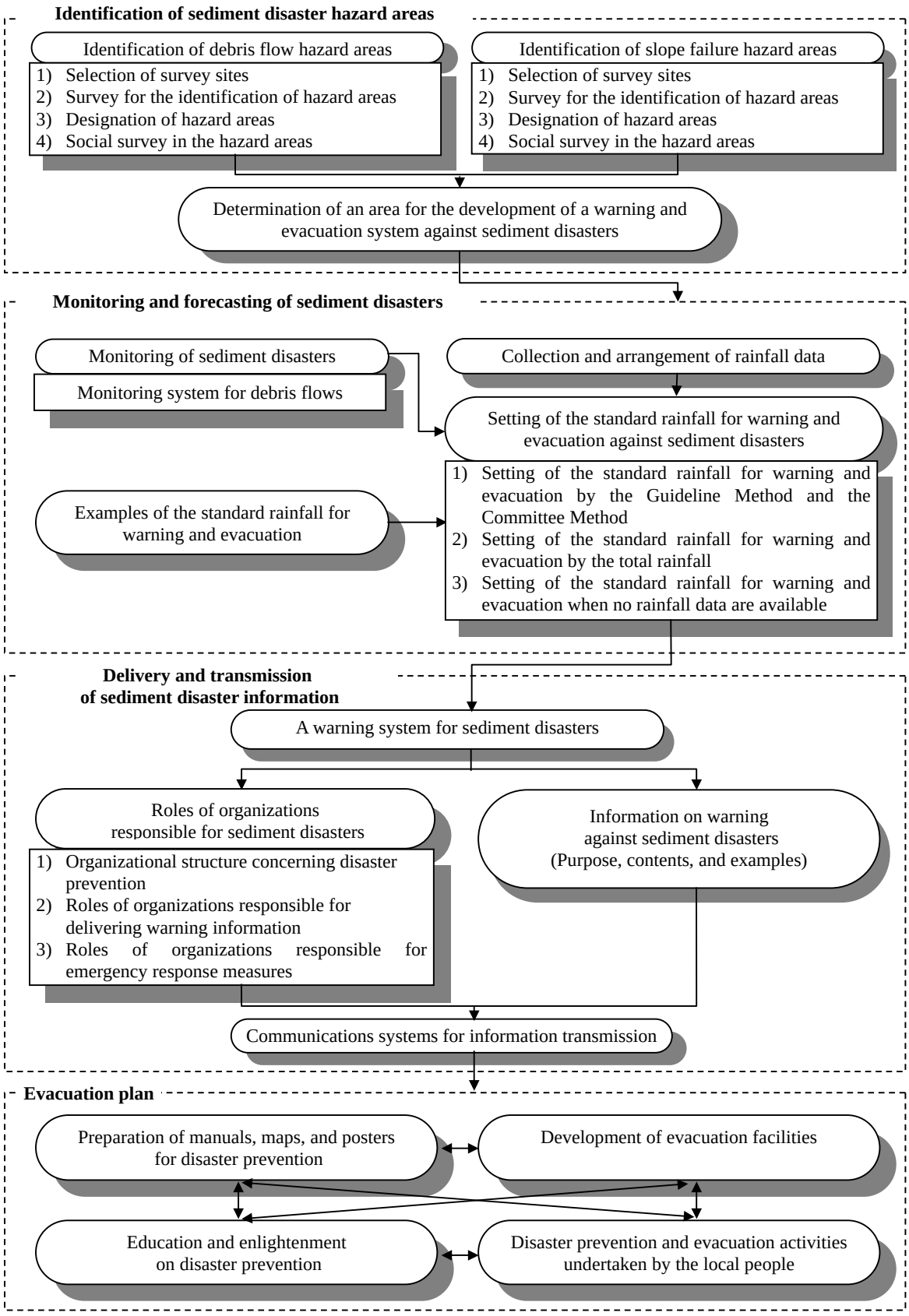

Fig. 1.2 Flowchart showing the steps for the establishment of a warning and evacuation system against sediment disasters

3.2 Features of the Guidelines

The features of these Guidelines are summarized as follows:

1) The Guidelines are expected to be used mainly by civil engineers, researchers, and scholars. But, as some officials in administrative bodies and disaster prevention organizations do not have an engineering background, care was taken to explain the ideas as simple as possible so that they can also use these Guidelines.

2) Those who are not familiar with sediment disasters can obtain a basic knowledge about this disaster and can understand the necessity of establishing a warning and evacuation system, if they read the second part "Basis of Sediment Disaster". If they continue to read into the third part "Planning of Warning and Evacuation System", they can be ready to begin an actual planning of a warning and evacuation system.

3) The Guidelines show sediment disaster prediction methods usable in any rainfall-gauging levels (hourly rainfall, daily rainfall, and no rainfall data) so that an appropriate warning and evacuation system can be set up even in areas where the necessary data, such as topography, geology, and hydrology, are not so much available.

4) The Guidelines primarily focus on the development of a warning and evacuation system among various preventive measures against sediment disasters. Hence, the data collection/arrangement, survey methods, and planning methods useful for the establishment of the system are mainly explained in the Guidelines. As a result, when a comprehensive disaster prevention plan incorporating other types of prevention measures is needed, additional survey methods or additional steps may become necessary. Relevant materials for this purpose are available from the list in References.

5) With regard to Chapter 3 - Delivery and transmission of sediment disaster information and Chapter 4 - Evacuation plan, both in the part of "Planning of Warning and Evacuation System", a variety of forms are conceivable depending on the conditions of each country or region. Therefore, only the basic concept and examples implemented in Japan are showed in the Guidelines.