The Booklet of
Best Practices of
resilient ICT systems
in JAPAN

M I C
Ministry of Internal Affairs
and Communications

CTI Engineering Co., Ltd.
CTI Engineering International Co., Ltd.

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Introduction

Purpose

In January 2014, the Ministry of Internal Affairs and Communications (MIC) dispatched a public-private joint mission on the field of information and communications technology (ICT) covering digital terrestrial broadcasting and disaster management to the Republic of the Philippines. Following the discussions between the mission and the major cabinet members of the Philippine Government, the MIC agreed that the Government of Japan would enhance the partnership with the Philippines in the entire field of ICT that would also contribute to disaster management. Accordingly, the Minister of MIC and the Philippines' Secretary of Science and Technology signed a joint statement on cooperation and promotion of ICT in the Philippines and agreed on implementation of an "International Joint Program for resilient ICT".

Under the Program, Japan and the Philippines will jointly develop the best practices through a joint study on the resilient ICT system which takes advantage of the countries' experience and knowledge of natural disasters particularly the Great East Japan Earthquake (GEJE) and the Philippines' typhoon damages with an eye to the possibilities that Japan will assist the Philippines to adopt a resilient ICT system and that the countries will work together to encourage ASEAN countries to adopt similar ICT systems.

Based on experiences of earthquakes, floods, volcanoes, tsunamis, typhoons and other natural disasters that are frequent in both countries, the Program aims to compile exemplary uses of resilient ICT systems and produce a booklet of best practices that can be referred to when both the governments of Japan and the Philippines consider policy development.

International Joint Program for Resilient ICT system

*tentative translation

1. Principles

- Co-developing best practices by collaborating study in the ICT for resilient Society (**Resilient ICT system**), by concentrating experience and knowledge of disasters in Japan and the Philippines, such as the Great East Japan Earthquake and Typhoon Yolanda (Haiyan)
- Supporting its introduction into the Philippines, and facilitating the development into other ASEAN countries with the cooperation of the both countries

2. Joint pilot project for Resilient ICT system with ISDB-T standard

(1) Trial of practical operation of Emergency Warning Broadcast System (EWBS)

- Operating EWBS practically through a trial ISDB-T broadcasting by the broadcasting company (PTV), aiming at preparing for the next typhoon season in the Philippines.
- Supporting the practical use of EWBS in the Philippines through its operation.

(2) Transmission of weather forecast diagram using Data broadcasting (BML) by ISDB-T

- Transmitting information of weather forecast diagram and various alarms utilizing Data broadcasting mechanism by which it is possible to send characters and illustrations to TV receivers , in addition to (1) above,

3. Feasibility Study for introduction of other Resilient ICT systems

- Examining the development and introduction of the systems (J-ALERT, area mail, etc.)

4. International Seminar on Resilient ICT system (for fiscal year 2014)

- International seminars in the Philippines (twice) and Tokyo & Sendai (once) in Japan (invitation to Japan for the Filipino government officials) hosted by the both countries.

Resilient ICT Systems
in Japan

Resilient ICT Systems in Japan

Japan has experienced a wide range of disasters not just the GEJE but also other earthquakes, typhoons, floods and other natural disasters, and thus has knowledge and experience about which systems were effective for disaster management, and what should be kept in mind when these systems are actually used. This report will introduce the best practices of Japan's resilient ICT systems that have been established and enhanced through the experience of past natural disasters.

Types of the resilient ICT systems to be introduced

This report introduces two types of services provided with resilient ICT systems: citizens' services and services for administrative agencies.
 • **"Citizens' services"** refer to services which chiefly administrative agencies, public organizations and business enterprises in infrastructure or highly public industry segments provide to the general public. These services are used by individual citizens in different disaster phases.
 • **"Services for administrative agencies"** refer to services which chiefly administrative agencies use to share information with related organizations when they engage in disaster risk reduction and management (DRRM) activities.

This report also classifies resilient ICT systems in terms of how they are used: that is, services which users passively use and those which users actively use.
 • **Passive services** ··· services which enable users to obtain information even if they take no particular action (services that automatically releases information).
Passive services include "Area Mail" (early warnings) and other broadcast mailing services, siren services and other warning services to a wider area.
 • **Active services** ··· services which users actively use to obtain information.
Active services include data broadcasting services and services which require users to configure the relevant devices in advance and operate them.

Resilient ICT systems are also classified according to the disaster phase they are used.
 • **Prevention/preparedness phase**
 • **Response phase** ··· within 72 hours after a disaster strikes
 • **Rehabilitation phase** ··· after 72 hours after a disaster strikes

● How to view the information

Name of the resilient ICT system

This section indicates phases in which the resilient ICT system is expected to be used.
- Prevention/preparedness phase
- Response phase
  (within 72 hours after a disaster strikes)
- Rehabilitation phase
  (after 72 hours after a disaster strikes)

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

This section indicates whether the system is used actively
(for example, users actively use the system to find out something)
or passively (for example, users perceive a siren of the system).

Summary of the service

● This section summarizes the resilient ICT system and its features.

【Devices used for the system】 This section lists devices, etc. to be used for the resilient ICT system.

Effectiveness of the System

● In the case of a Japanese system, this section explains the coverage of the system and the dissemination rates of the relevant terminal devices.

● This section also provides effectiveness of the system estimated based on the actual use of the system at the time disasters strike.

Issues

● This section describes the aspects of the resilient ICT system which should be rectified or improved.

Cautions for use

● This section describes cautions and points to remember when the system is used.

Use of the system at the time the disasters happened

● This section explains the performance of the system at the time the disasters happened.

● This section provides selected reference materials such as newspaper articles and survey results after the disasters struck.

Resilient ICT Systems in Japan

1.   List of citizens' services

Services used by individual citizens to manage disasters, and confirm the safety of their family members and other people

| No.	Service name	Form of use	Phase where the system is used
1-1	Provision of early warning and other disaster information through "Area Mail" and other emergency cell broadcast services	Passive	Response and rehabilitation phases
1-2	Distribution of disaster information through terrestrial digital media broadcasting	Active/passive	Prevention/preparedness, response and rehabilitation phases
1-3	Distribution of early warning and other disaster information through one-segment broadcasting	Active	Prevention/preparedness, response and rehabilitation phases
1-4	Provision of disaster and evacuation information through multiple-address wireless communications	Passive	Response and rehabilitation phases
1-5	Confirmation of the safety of family members and other people through emergency messaging and telephone voice-mail services	Active	Response and rehabilitation phases
1-6	Provision of early warning and other disaster information through disaster information e-mail	Active	Prevention/preparedness, response and rehabilitation phases
1-7	Distribution of disaster and evacuation information through radio announcement	Active	Prevention/preparedness, response and rehabilitation phases

Active services	Passive services

Prevention/preparedness phase   Response phase   Rehabilitation phase

Disaster

1-1 Provision of early warning and other disaster information through "Area Mail" and other emergency cell broadcast services

1-2 Distribution of disaster information through terrestrial digital media broadcasting

1-3 Distribution of early warning and other disaster information through one-segment broadcasting

1-4 Provision of disaster and evacuation information through multiple-address wireless communications

1-5 Confirmation of the safety of family members and other people through emergency messaging and telephone voice-mail services

1-6 Provision of early warning and other disaster information through disaster information e-mail

1-7 Distribution of disaster and evacuation information through radio announcement

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

Summary of the service

- The Area Mail and emergency cell broadcast services simultaneously transmit emergency earthquake warnings and disaster information issued by the national and local government units to all cellular phones covered by a specific base station. These services are provided by the mobile carriers.
- Unlike the ordinary mailing services, the services are free from network congestion when transmitting information.
- During emergency, texts are drafted and sent by officers of the national and local governments, and public organizations which have agreements with mobile carriers.

Emergency earthquake warnings Tsunami warnings

Japan Meteorological Agency (JMA)

This is the Shimotsuke City Government.
We released an "evacuation advisory" to xxx area at xx:xx.
Please evacuate your home immediately. The water level of xxx River is rising and may reach a dangerous level in xxx hours' time.
Please evacuate your home and tell your neighbors to do so, too.0

Disaster and evacuation information

National and local governments

Mobile carrier (Area Mail center)

Simultaneous transmission to the subject area

Warnings to prepare for evacuation "Residents in xx area are advised to flee to xxx primary school. (City of xxx)

【Devices used for the system】 Cellular phones

Effectiveness of the System

<Status of development in Japan>
・The diffusion rate of cellular phones is 88.7%.1)
・The system of emergency earthquake warnings is used nationwide.

<Use of the system in the response phase>
・In principle, citizens, etc. within the subject area are able to receive "Area Mail" when it is transmitted.
・A survey shows that 46.3% of the respondents cited "Area Mail" as a means of obtaining information at the time of the GEJE.2)

<Estimated delivery efficiency>
・The ratio of people to which disaster information was transmitted by Area Mail was estimated at 88.7% (88.7% x 100%).
・The ratio of people who effectively used the mail transmitted was estimated at 41.1% (88.7% x 46.3%).

1) Dissemination rate for the entire households from Section 4. "Dissemination, Ownership and Replacement of Major Durable Goods" in the Consumer Confidence Survey (the results of the survey conducted in March 2014), Cabinet Office (in Japanese)
2) Chapter 3, Clause 1 of the "2012 White Paper on Telecommunications", MIC
http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h24/html/nc131110.html (in Japanese)

Issues

- The total letter count is limited, so the volume of information which can be transmitted is also limited.
- The mail transmitting the procedure needs to be taken into consideration for each carrier, thus the workload of the officers in charge are heavy.
- This method is unsuitable for visually impaired persons and foreigners who cannot read Japanese.
- Transmission may fail if the line between the municipalities and the carriers are disconnected because of the outage or other reasons.

Cautions for use

- Concise and plain expression should be used.
- Installation of a "read-out" function in terminal devices (receivers) is encouraged for visually impaired persons.
- Provision of information in various languages should be considered.
- Multiple communications lines and backup power sources should be secured.

- Emergency earthquake warnings are released through Area Mail several to several tens of seconds prior to an earthquake to provide information about the location, scale and expected shaking of the earthquake.
- NTT DOCOMO, Inc. (DOCOMO) developed the early warning "Area Mail R" using the cell broadcast service. The service enables municipalities and other agencies to promptly transmit disaster and evacuation information to targeted citizens. Thanks to Docomo's measure to make the service free on Friday, July 1, 2011, an increasing number of municipalities and other organizations have adopted the service. By Sunday, April 1, 2012, more than 1,000 municipalities have adopted it out of an approximate total of 1,800 municipalities across the country. Currently, approximately 41 million people have cellular phones compatible with the service.
- At the time of the GEJE on March 11, 2011, the Kesennuma City Government of Miyagi Prefecture was reportedly unable to use the Area Mail because of the outages and disconnection of communications lines. Because the service was available only through the fixed line at the premises of the city government for security reasons, officers were unable to transmit texts by other communications means, either. The trouble highlighted the necessity of measures against outages and installation of multiple communications lines.
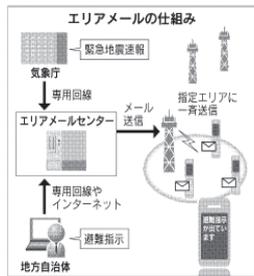
Simultaneous transmission of disaster information to cellar phones at a specific area
More municipalities adopt "Area Mail"
Page 14, Nihon Keizai Shimbun (evening edition), June 10, 2011
This article was printed with permission of Nihon Keizai Shimbun.

<Trend in the number of municipalities equipped with Area Mail>

No. of municipalities using the service exceeds 1,000.

The service is made free on Jul. 7, 2011

東日本大震災当日 48自治体
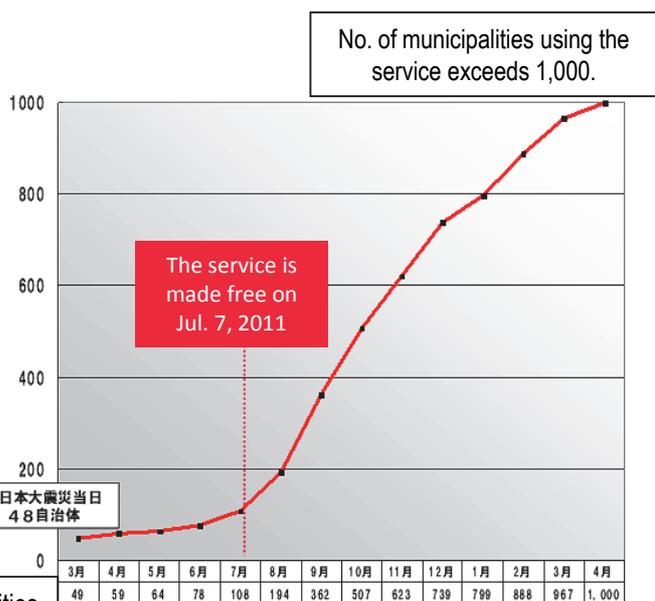
48 municipalities use the service on the day of the GEJE

No. of municipalities

	3月	4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月	4月
	49	59	64	78	108	194	362	507	623	739	799	888	967	1,000

Press release of NTT DOCOMO (April, 4, 2012)

1-2 Distribution of disaster information through terrestrial digital media broadcasting

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- The service provides emergency earthquake, tsunami and other warnings, the situations of afflicted areas, evacuation information and other contents through terrestrial digital broadcasting.
- In emergency, broadcasting stations activate the emergency warning broadcasting system (EWBS), which automatically turns on EWBS-compatible televisions to have users view emergency warning contents on their televisions.
- The EWBS can automatically make sirens from the loudspeakers of EWBS-compatible televisions with the siren function.
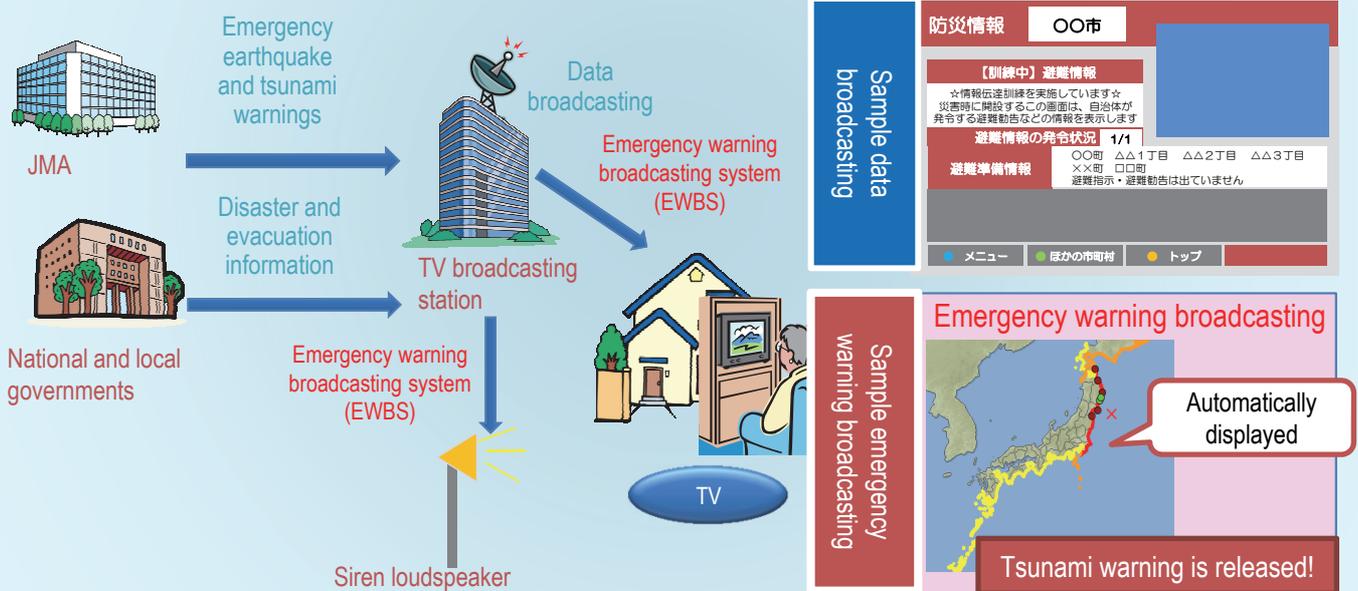
【Devices used for the system】 TVs

Effectiveness of the System

<Status of development in Japan>
・As of the end of March 2014, the dissemination rate of terrestrial digital televisions was 94.3%. 1)
・Terrestrial digital TV broadcasting can be received nationwide in Japan.

<Use of the system in the response phase>
・41.2% of the respondents surveyed highly evaluated TV broadcasting as a useful media after the GEJE. 2)

< Estimated delivery efficiency >
・Based on the dissemination of terminal devices and the performance of the system when disaster strikes, the delivery efficiency of terrestrial digital media broadcasting is estimated at 38.9% (94.3% x 41.2%).

1) Results of Terrestrial Digital Broadcasting Penetrance Survey, MIC, March 2011
   www.soumu.go.jp/main_content/000106190.pdf (in Japanese)
2) Chapter 3, Clause 1 of the "2012 White Paper on Telecommunications", MIC
   http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h24/html/nc131110.html (in Japanese)

Issues

- Home-mounted TV cannot receive information at the time of outages.

Cautions for use

- Display handling for data broadcasting should be simply designed.
- Use of data broadcasting in the prevention/preparedness and response phases should be promoted, and data broadcasting should be recognized more.
- Information to be distributed should be made easy to understand for every person.

- A survey conducted after the GEJE found that terrestrial broadcasting was an effective media when disaster stroke, reconfirming the effectiveness of providing disaster information on TV. (See the following figure.)
- Japan Broadcasting Corporation (NHK) set "People Finder Posts" at evacuation centers after the GEJE and released information gathered as "People Finder Bulletin" on data broadcasting of Education Channel. This scheme enabled people affected by the earthquake to confirm the safety of missing people.
- Yoozma Corporation opened a TV broadcasting service "Minamisoma Channel" covering Minamisoma City of Fukushima Prefecture after the earthquake. The TV channel provided disaster victims with information about everyday life by data broadcasting and moving picture. The broadcasting services used a channel which was unused after the termination of the analogue broadcasting services (white space).

Evaluation of media used during earthquake disaster
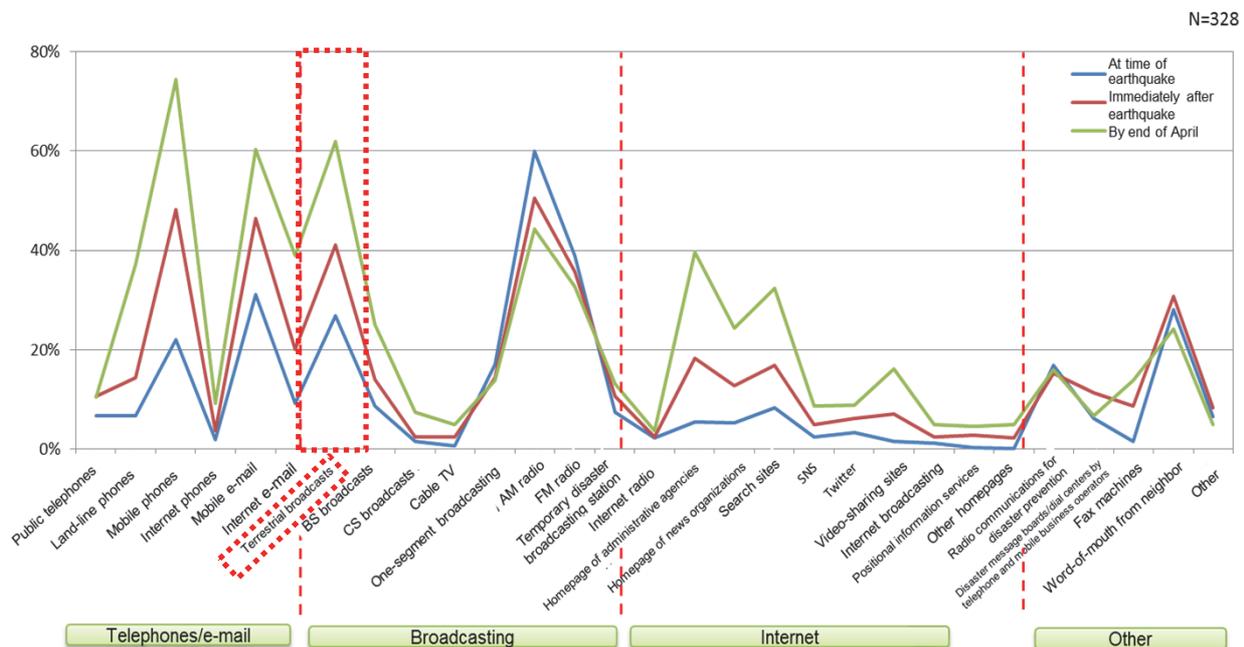
Results on Survey Concerning Ideals for Information and Communications during Disasters
（March 7, 2012　Ministry of Internal Affairs and Communications）

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- The service provides emergency earthquake, tsunami and other warnings, the situations of afflicted areas, evacuation information and other contents by using one-segment broadcasting, a part of terrestrial digital broadcasting, for mobile devices.
- In Japan, one-segment broadcasting is available to cellular phones and car navigation systems, and can be used outdoor.
- One-segment broadcasting can be received without using telecommunications of cellular phones or other terminal devices, and thus is free from network congestion of mobile telecommunications.
- One-segment broadcasting can be provided to a specific area (area one-segment broadcasting).

Emergency earthquake and tsunami warnings

Disaster and evacuation information

(Information provision in the prevention/preparedness phase, etc.)

TV broadcasting station

Cellular phone

【Devices used for the system】Cellular phones (one-segment broadcasting receivers)

Effectiveness of the System

<Status of development in Japan>
The dissemination rate of cellular phones is 88.7%. 1)

<Use of the system in the response phase>
14.3% of the respondents surveyed highly evaluated one-segment (mobile) broadcasting as a useful media in the response phase (after the GEJE). 2)

<Estimated delivery efficiency>
Based on the dissemination of terminal devices and the performance of the system in the response phase, the delivery efficiency of one-segment broadcasting of disaster warnings is estimated at 12.7% (88.7% x 14.3%).

<Others>
One-segment broadcasting enables users to obtain disaster information through TV or data broadcasting even if the telecommunication lines are disabled, so it is useful to transmit information to people outdoor.
It is an effective means of transmitting images or visual information without causing line load in the response phase.

1) The Consumer Confidence Survey (the results of the survey conducted in March 2014) (entire households, dissemination rate), Cabinet Office
http://www.esri.cao.go.jp/jp/stat/shouhi/2014/201403shouhi.html (in Japanese)
2) Chapter 3, Clause 1 of the "2012 White Paper on Telecommunications", MIC
http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h24/html/nc131110.html (in Japanese)

Issues

- Some terminal devices do not support one-segment broadcasting services.

Cautions for use

- Providers have to consider that the resolution, bit rate and frame numbers are limited when they broadcast programs through one-segment broadcasting.

- The MIC decided to support data broadcasting and one-segment broadcasting businesses to help afflicted municipalities send local information to local communities. The afflicted municipalities, with the support from the MIC, issued experimental licenses and granted subsidiaries to TV broadcasting stations.

- A questionnaire survey was conducted after the GEJE. The results showed that 24.2% of the respondents, the third highest proportion, cited one-segment broadcasting as a useful media to obtain information within several hours after the earthquake.
- Source: NHK news on October 2, 2011

- The City of Owase, Mie Prefecture, conducted an emergency drill against sediment disasters. The drill used one-segment broadcasting sounds and images to transmit a request for evacuation from the mayor. (June 8, 2014)


City of Owase performs an emergency drill against sediment disasters with one-segment broadcasting
[Photo] Mayor Iwata (front) calls on citizens to evacuate through one-segment broadcasting at Segiyama, Owase.
Page 21, Chunichi Shimbun (morning edition for the whole area of Mie Prefecture), June 10, 2014
This article was printed with permission of Chunichi Shimbun.

1-4 Provision of disaster and evacuation information through multiple-address wireless communications

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- Multiple-address wireless communication is a system which can promptly and accurately transmit information to local communities through sirens and speakers and other means at the time a disaster strikes.
- Specifically, siren loudspeakers and house receivers are classified as multiple-address wireless communication.
- House receivers and emergency radios are distributed to people in areas which the sound of sirens cannot reach.

Siren loudspeaker

Municipal disaster management radio communication network

House receiver
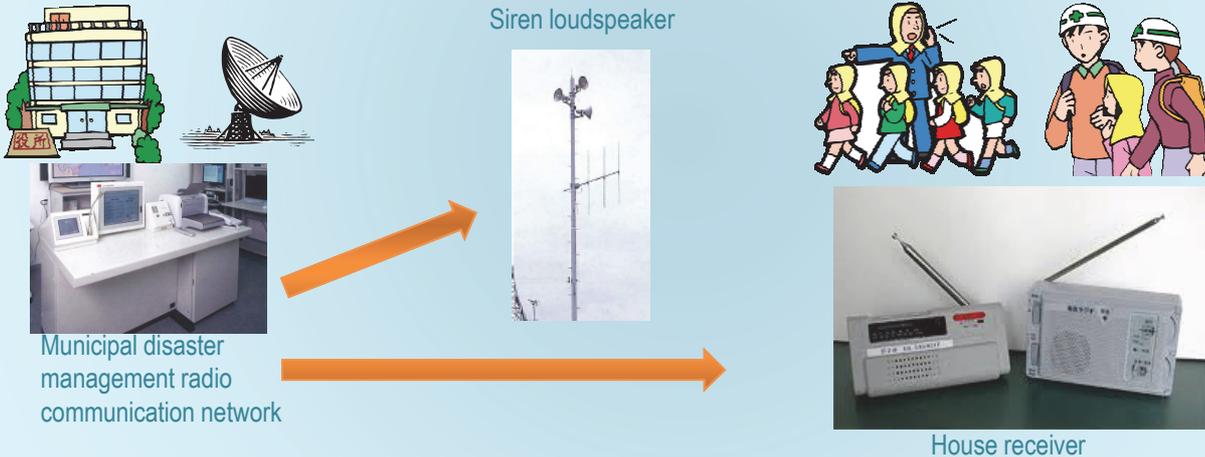
【Devices used for the system】Disaster management radio communication network

Effectiveness of the System

<Status of development in Japan>
The coverage of disaster management communication network stood at 76.3% (as of March 2013). 1)

<Use of the system in the response phase>
67% of the respondents surveyed cited disaster management radio communication as an information source for evacuation after the earthquake stroke. 2)

<Estimated delivery efficiency>
Based on the dissemination of terminal devices and the performance of the system when disaster stroke, the delivery efficiency of disaster management radio communications is estimated at 51.1% (76.3% x 67%).

1) The coverage of disaster management radio communications, "the Radio Use Web Site", MIC
   http://www.tele.soumu.go.jp/j/adm/system/trunk/disaster/change/index.htm (in Japanese)
2) On the Results of a "Survey on the Great East Japan Earthquake (questionnaire survey to people afflicted)", Ministry of Land, Infrastructure, Transport and Tourism, and the Kesennuma City Government
3) Chapter 3, Clause 1 of the "2012 White Paper on Telecommunications", MIC (in Japanese)

Issues

- Announcements may not clearly reach target audiences depending on the climate conditions (heavy rain, storm wind, etc.) or locations (places far from radio communications devices, high-rise condominiums, etc.)
- Radio communications are not suitable for hearing-impaired persons.

Cautions for use

- The devices are installed outdoors, so care must be taken to prevent breakdown due to snowfall, salt damage or other reasons.
- The devices require regular operation checks in the prevention/preparedness phase through, for example, regular voice guidance.
- Speech texts should be plain and easy-to-understand.
- Siren loudspeakers should be installed to minimize areas where it is difficult to hear announcements.

- A survey after the GEJE found that siren loudspeakers and other warning devices were the most effective device for people to make decisions on evacuation. Quite a few people who did not recognize the danger of tsunami were alerted and prompted to escape from tsunami, so sirens and voices were found to be very effective.
- Approximately 66% of the respondents surveyed cited the arrivals of tsunamis as information obtained through radio communications in areas afflicted by the GEJE. The devices played an effective role in warning general public about tsunami.
- On the other hand, some respondents said that they "could not hear announcements because there was no radio communications device nearby" and that they "felt like they heard something, but did not hear what it said". The survey reconfirmed that the positioning of loudspeakers was important.

Reasons of the evacuation
(Investigation for those who escaped before the arrival of Tsunami) N=215

The investigation after the Great East Japan Earthquake (Sendai city)

(%)

usage rate	
47.0	Thinking that Tsunami would arrive immediately
24.2	Hearing the alert and the announcement for the evacuation
21.9	Thinking that aftershocks would come
16.3	Hearing the announcement from sound cars and patrol cars
14.9	Being advised to escape from neighbors
14.0	Neighbors' escaping
13.5	Leaving because of worrying about their family
10.2	In advance, deciding to escape in their workplace
8.8	Being told to escape by their family
5.6	Feeling uneasy about surviving in their house because of blackout and suspension of water supply
4.7	In advance, deciding to escape in their home or neighborhood
4.7	Getting information about Tsunami from radios and TVs
1.9	Their houses' being broken
1.9	The rest
1.9	Non - response

The source: The report of the questionnaire for the citizens on the Great East Japan Earthquake (Sendai city)

Summary of the service

Phase where the system is used			Form of use	
Prevention/preparedness	Response	Rehabilitation	Active	Passive

<Service to fixed-line phones>
- The service can record messages of 30 seconds to numbers of fixed-line telephones in afflicted areas and store them for 48 hours after recording. 1)The service is used when an earthquake or other natural disaster occurs and the fixed lines in the afflicted areas are congested.

<Service to cellular phones>
- The service enables cellular phone users in afflicted areas to register up to 10 messages when an earthquake of "intensity 5 lower" or higher, or other large natural disaster occurs.
- If users register telephone numbers as receivers, message texts are read out by the automatic voice reader.
- If users register mail addresses of family members or friends, messages registered in advance are automatically sent to the addresses.
- These services are provided by cellular phone carriers including NTT DOCOMO, KDDI, SoftBank Mobile Corp., WILLCOM Inc. and EMOBILE Ltd.

Register a message

Dial "171".
Dial "1".
Dial the number of the other end of the line.
(Users in afflicted areas can register their own fixed-line telephone numbers.)

Replay the message

Dial "171".
Dial "2".
Dial your own fixed-line telephone number.

Name _____
Safety status ☐ I'm okay. ☐ Need help. ☐ Safe at home. ☐ At evacuation area.
Message _____

【Devices used for the system】 Cellular phones and PCs

Effectiveness of the System

<Status of development in Japan>
- Dissemination rate of fixed-line phones   51.06% 1)
- Dissemination rate of cellular phones   88.7% 2)
- Dissemination rate of PCs   67.0% 2)

<Use of the system in the response phase>
- Ratio of people using an emergency messaging on the day of the earthquake   6.0% 3)
- Ratio of people using a (mobile) emergency messaging on the day of the earthquake   10.0% 3)
- Ratio of people using a (PC) emergency messaging on the day of the earthquake   4.0% 3)

<Estimated delivery efficiency>
Based on the dissemination of terminal devices and the performance of the system in the response phase, the delivery efficiency of emergency messaging and telephone voice-mail services is estimated as follows.
- Estimated efficiency of fixed-line phones   3.1%   (51.06% x 6.0%)
- Estimated efficiency of cellular phones   8.87%   (88.7% x 10.0%)
- Estimated efficiency of PCs   2.68%   (67.0% x 4.0%)

1) World Telecommunication/ICT Indicators Database, MIC
   http://www.soumu.go.jp/g-ict/item/phone/ (in Japanese)
2) Dissemination rate for the entire households from Section 4. "Dissemination, Ownership and Replacement of Major Durable Goods" in the Consumer Confidence Survey (the results of the survey conducted in March 2014), Cabinet Office
3) Questionnaire Survey concerning Stranded Commuters in Metropolitan Area in the East Japan Great Earthquake; U Hiroi, N. Sekiya, R. Nakajima, S. Waragai and H. Hanahara, Journal of the Institute of Social Safety Science No. 15, Nov. 2011.

Issues
- The recording time, types of texts and storage period are limited (recording time: 30 seconds, storage period: 48 hours)

Cautions for use
- PR activities should be fully performed to make the system and usage known to the general public.

- NTT East and cellular phone carriers launched emergency messaging services immediately after the GEJE. Approximately 3.3 million messages were recorded on NTT's emergency messaging board, approximately 260,000 messages on emergency broadband boards, and approximately 4.25 million messages on emergency messaging boards.
- 11.3% of the respondents surveyed highly evaluated emergency messaging services as a useful media in the response phase. The services should be promoted to gain higher recognition.
- After the GEJE, communications companies (NTT East, au, SoftBank Mobile) launched emergency message boards to allow users to confirm the safety of their family members and friends.
- Some 19% of the respondents surveyed said that they did not understand how to use emergency messaging and telephone voice-mail services to communicate with their family members or friends at the time of the GEJE. It was clarified that the services need to be made better known to the general public. (See the following figures.)
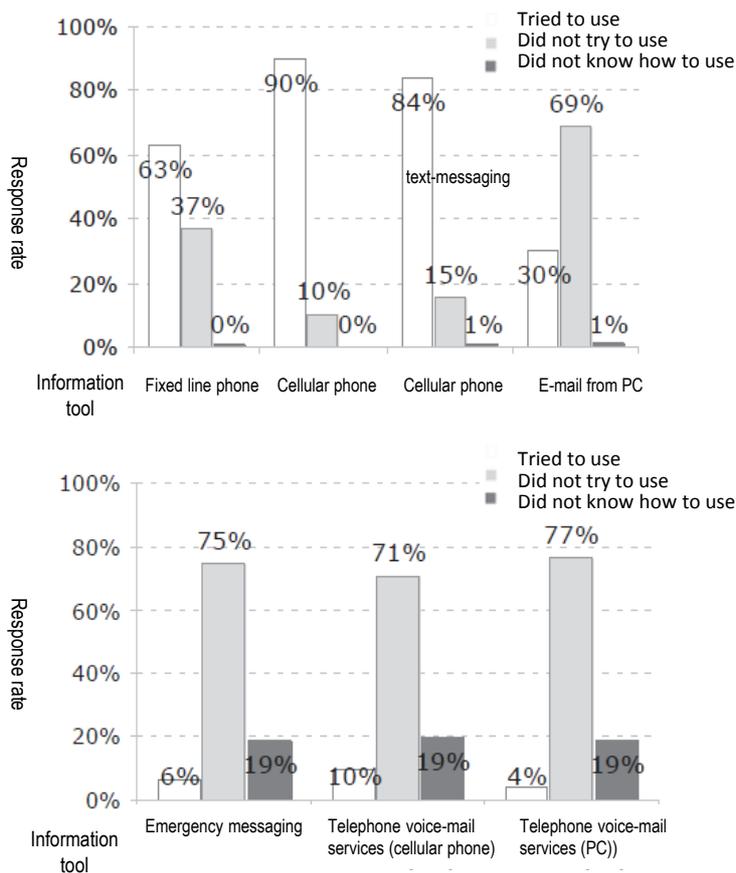
Figure 15   Means of contacting family members and friends

Source: Questionnaire Survey concerning Stranded Commuters in Metropolitan Area in the East Japan Great Earthquake; U Hiroi, N. Sekiya, R. Nakajima, S. Waragai and H. Hanahara, Journal of the Institute of Social Safety Science No. 15, Nov. 2011.

Remember "171".
[Photo] Quite simple emergency messaging board of cellular phones
Yomiuri Shimbun (morning edition), March 19, 2011 This article was printed with permission of Yomiuri Shimbun.

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- Disaster information mail is mailing services of municipalities and other local public organizations to provide disaster-related information to people who register to the services.
- Unlike Area Mail, the services use ordinary telecommunication networks and thus are subject to network congestion.
- The services can provide information to a wider area than Area Mail. At a ordinary time, some of the services provide local news and information. Users can select the types and regions of information to receive.

Municipality

Registration in advance

Disaster-related information (disaster and evacuation information) that users want to receive are distributed.

To:○○○○
Sub:△△市防災メール
　　警報注意報

△△市防災メール
警報注意報

○年○月○日
○時○分発表
警報注意報が発表されました。
〈□□県　東部〉
　暴風波浪警報
〈□□県　西部〉
　暴風注意報
‥‥‥‥

To:○○○○
Sub:△△市防災メール
　　震度情報

△△市防災メール
震度情報

○年○月○日
○時○分発表頃
□□県北部で震度5強の地震を観測しました。
▼震源地
□□県沖合
▼各地の震度
【震度5強】
△△市北部、△△市南部　‥‥‥‥
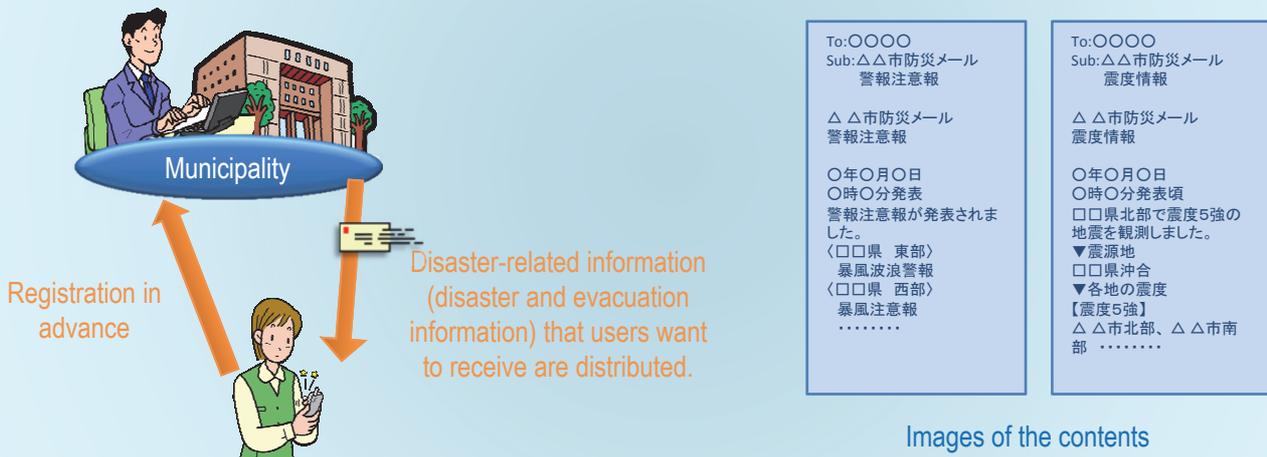
Images of the contents

【Devices used for the system】Cellular phones and PCs

Effectiveness of the System

<Status of development in Japan>
- The dissemination rate of cellular phones is 88.7%. 1)
- The dissemination rate of PCs is 67.0%. 1)

<Use of the system in the response phase>
- 46.3%(cellular phones) or 20.1%(PCs) of the respondents surveyed cited disaster information mailing services as an information source (means actually used) after the earthquake stroke.[2]

<Estimated delivery efficiency>
- Based on the dissemination of terminal devices and the performance of the system in the response phase, the delivery efficiency of disaster information mailing is estimated as follows.

① Estimated efficiency of disaster information mailing (cellular phones)　41.1%　(88.7% x 46.3%)
② Estimated efficiency of disaster information mailing (PCs) 13.5%　(67.0% x 20.1%)

1) 4. "Dissemination, Ownership and Replacement of Major Durable Goods" in the Consumer Confidence Survey (the results of the survey conducted in March 2014), Cabinet Office
2) Chapter 3, Clause 1, 1-(1) of the "2012 White Paper on Telecommunications", MIC
　http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h24/html/nc131110.html (in Japanese)

Issues

- Information can be provided to those who register for the services only.
- Information cannot be provided to visually impaired persons.
- Foreigners may find it difficult to understand information if the services are provided in Japanese only.

Cautions for use

- Registration for mailing services should be made better known to local people.
- Information should be provided in clear and concise texts.
- Information should be provided in multiple languages and through voice mail.

- A questionnaire survey of the MIC shows that 45.7% of the respondents surveyed cited cellular phones as the device that made it possible for the first time for them to contact somebody they were worried about after the GEJE. This was followed by e-mail (28.7%).
- The government of Toyohashi City, Aichi Prefecture, planned to launch disaster information mailing services in Portuguese for Brazilians as part of support services to foreigners in the city in the response phase (as of September 2011).
- An increasing number of municipalities introduced disaster information mailing services after the GEJE.

Q7 Means with which respondents was able to contact their family members/friends for the first time (whole)

Fixed-line phone (except public phone) 14.9%
Public phone 3.7%
Cellular phone (voice communications) 45.7%
PHS 0.9%
Internet phone (skype, etc.) 0.4%
E-mail (text messaging from cellular phone/PHS, etc.) 28.7%
E-mail 3.1%
Twitter, etc. 1.3%
Emergency messaging (171) 0.4%
Telephone voice-mail Services 0.7%
Broadband voice-mail services(web171)0.0%
Others 0.2%

Legend:
- Fixed-line phone(except public phone)
- Public phone
- Cellular phone (voice communications)
- PHS
- Internet phone (skype, etc.)
- E-mail (text messaging from cellular phone/PHS, etc.)
- E-mail
- Twitter, etc.
- Emergency messaging (171)
- Telephone voice-mail Services
- Broadband voice-mail services (web171)
- Others

Figure 1-6-5

Source: A Questionnaire Survey on the Statuses of Communications after the Great East Japan Earthquake, MIC

Protect "the vulnerable to natural disasters", including handicapped persons and foreigners City of Nagoya sends care workers to evacuation centers
City of Toyohashi introduces disaster-prevention mailing services in foreign languages
Source: Local news page, Nihon Keizai Shimbun (morning edition for Nagoya area), September 1, 2011
This article was printed with permission of Nihon Keizai Shimbun.

1-7 Distribution of disaster and evacuation information through radio announcement

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- Emergency earthquake and tsunami warnings, interruption broadcasting for disaster and evacuation information on analogue radios.
- Emergency earthquake and tsunami warnings, interruption broadcasting for disaster and evacuation information through multimedia broadcasting for mobile terminals and Internet broadcasting.
- Moreover, some terminals support FM teletext broadcasting and textual information services.

We're changing programs!

This is an emergency earthquake warning.

This is an emergency earthquake warning.

JMA

National and local governments

Emergency earthquake and tsunami warnings

Disaster and evacuation information

Radio station

Radio

Cellular phone

PC
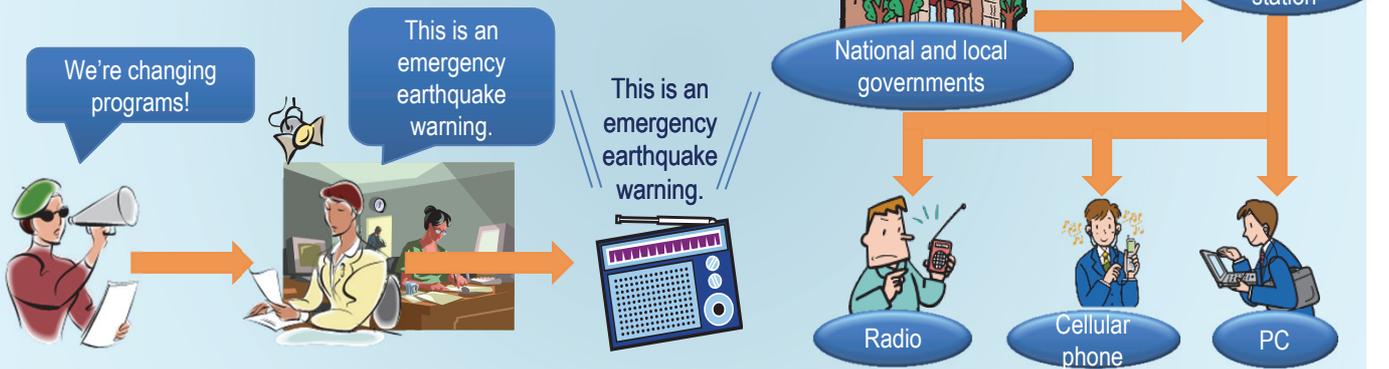
【Devices used for the system】 Radios

Effectiveness of the System

<Status of development in Japan>
86.1% of the entire households in Japan have a radio. 1)
88.7% of the entire households in Japan have a cellular phone. 2)
67.0% of the entire households in Japan have a PC. 2)

<Use of the system in the response phase>
50.6% of the respondents surveyed highly evaluated radios as a useful media in the response phase (after the GEJE). 3)

<Estimated delivery efficiency>
Based on the dissemination of terminal devices and the performance of the system in the response phase, the delivery efficiency of radio disaster information broadcasting is estimated as follows.

- Estimated efficiency of disaster information radio broadcasting (radios) 43.6% (86.1% x 50.6%)
- Estimated efficiency of disaster information radio broadcasting (radio on cellular phones) 44.5% (88.7% x 50.6%)
- Estimated efficiency of disaster information radio broadcasting (radio on PCs) 33.9% (67.0% x 50.6%)

1) MIC
   http://www.soumu.go.jp/iicp/chousakenkyu/data/research/survey/telecom/2007/2007-2-02.pdf (in Japanese)
2) The Consumer Confidence Survey (the results of the survey conducted in March 2014) (entire households, dissemination rate), Cabinet Office
   http://www.esri.cao.go.jp/jp/stat/shouhi/2014/201403shouhi.html (in Japanese)
3) Part 1, Chapter 3, Clause 1 of the "2012 White Paper on Telecommunications", MIC
   http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h24/html/nc131110.html (in Japanese)

Issues

- The services are not widely used among young people. (The listening rate of the entire radio stations stands at 6.4%, while the rate for young people stands at a mere 2.8%.)

Cautions for use

- Terminal devices need to be made ready so that they can receive broadcasting even at the time of outages.
- Battery-powered and hand-cranked radios should be promoted more.
- Information closely related to local communities should be transmitted through community FM and other broadcasting stations.

- Battery-powered radio was found to be a useful device at the time of the GEJE because they can be used even in the event of outages. They were an essential item for affected people, who wanted to learn about the safety of their family members and necessary livelihood information about, for example, the locations of evacuation centers and water supply points.
- In some afflicted areas, community FM radio stations played a useful role in providing livelihood information after the disaster stroke. Some stations obtained "emergency disaster broadcasting licenses" from the national government through their local municipalities and broadcast 24-hour programs about safety information and various other detailed information about the locations where water and foods were distributed, the business hours of supermarkets that resumed business, and so on. There were also radio stations which provided local information through moving image websites on the Internet, and those which provided multiple-language services to support foreigners afflicted.

臨時FM 被災地で活躍

安否や配給所情報 24時間発信

生活支え安心紡ぐ

被災地で放送中の臨時災害FM局（23日現在）

放送局名（＊は新設局）	固周波数 (MHz)
▽岩手県	
FM One（花巻市）	78.7
奥州エフエム（奥州市）	77.8
みやこさいがいエフエム（宮古市）＊	77.4
▽宮城県	
おおさきさいがいエフエム（大崎市）＊	79.4
ラジオ石巻（石巻市）	76.4
H@！FM（はっとエフエム、登米市）＊	76.7
BAY WAVE（塩釜市）	78.1
ほほえみ（岩沼市）	77.9
やまもとさいがいエフエム（山元町）＊	80.7
けせんぬまさいがいエフエム（気仙沼市）＊	77.5
▽福島県	
FM POCO（福島市）	76.2
▽茨城県	
FM かしま（鹿嶋市）	76.7
ラヂオつくば（つくば市）	84.2

A temporary FM station helps people in afflicted areas. Information about the safety and locations where water and foods are supplied 24-hour broadcasting Supporting evacuees and bringing a sense of security
[Photo] "BAY WAVE", a temporary FM Station, continues to broadcast radio programs from a rented room of the municipal government office. (City of Shiogama)

Source: Page 27 of Nippon Keizai Shimbun (morning edition) August 28, 2011
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<Multiplexing and diversifying resources of transmitting information>

・To ensure the safety of people amid earthquakes, tsunamis and other natural disasters, it is extremely important for the national and local governments to provide them with disaster-related information swiftly without fail.

・To this end, the means of transmitting information must be multiplexed and diversified so that every citizen can obtain necessary information in one way or another.

・It is hardly possible for a single line or option to transmit information to all people. It is thus desirable to consider the actual situation of afflicted areas and the characteristics of varied options of transmitting information, systematically combine a number of suitable options and resources, and build a comprehensive information transmission system which is robust against natural disasters.

<Improvements in emergency drills, inspections and maintenances for better transmission>

・To transmit information more effectively when disaster strikes, emergency drills and tests must be conducted constantly to prepare for the disaster.

・In the GEJE, quite a few useful systems were available but some of them were not well known among the general public and were not fully used.

・Moreover, regular inspections and maintenance works must be conducted for better transmission of information.

Resilient ICT Systems in Japan

2. List of services for administrative agencies

Services which administrative agencies use when they engage in DRRM activities.

No.	Service name	Form of use	Phase where the system is used
2-1	Disaster information sharing through J-Alert	Passive	Response and rehabilitation phases
2-2	Disaster information sharing through a particular system (L Alert)	Active/ passive	Prevention/preparedness, response and rehabilitation phases
2-3	Securing of communications in afflicted areas through MDRU	Active	Response and rehabilitation phases
2-4	Securing of communications in afflicted areas through portable satellite communications systems	Active	Response and rehabilitation phases
2-5	Disaster information sharing through regional satellite communications networks	Active	Prevention/preparedness, response and rehabilitation phases
2-6	Disaster information sharing through priority telephone links in disaster	Active	Response and rehabilitation phases
2-7	Observation information sharing through the integrated river information system	Active	Prevention/preparedness, response and rehabilitation phases
2-8	Disaster information sharing through contents management systems	Active/ passive	Prevention/preparedness, response and rehabilitation phases

Active services   **Passive services**

Prevention/preparedness phase

Response phase

Disaster

Rehabilitation phase

2-1 Disaster information sharing through J-Alert

2-2 Disaster information sharing through a particular system (L Alert)

2-3 Securing of communications in afflicted areas through MDRU

2-4 Securing of communications in afflicted areas through portable satellite communications systems

2-5 Disaster information sharing through regional satellite communications networks

2-6 Disaster information sharing through priority telephone links in disaster

2-7 Observation information sharing through the integrated river information system

2-8 Disaster information sharing through contents management systems

2-1　Disaster information sharing through J-Alert

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- The national early warning system (J-Alert) is a satellite-based nationwide warning system in Japan, which allows national authorities(Cabinet Secretariat/Japan Meteorological Agency (JMA) via Fire and Disaster Management Agency (FDMA)) to automatically activate multiple-address wireless communications systems of municipalities and instantly and directly provide citizens with emergency messages about, for example, ballistic missiles, tsunami, emergency earthquake warnings and others which require immediate responses.
- In 2009, the coverage of J-Alert was expanded from municipalities only to designated administrative agencies (JMA, etc.), designated regional administrative agencies (regional police bureaus, etc.) and other agencis (judicial courts, etc.) as well as designated public organizations(NHK, etc.) which the Civil Protection Management Office of MIC finds it necessary to include in J-Alert.

Japan Meteorological Agency

Disaster management and weather information

Cabinet Office

Information about military threats

FDMA

Satellite

Prefectural government
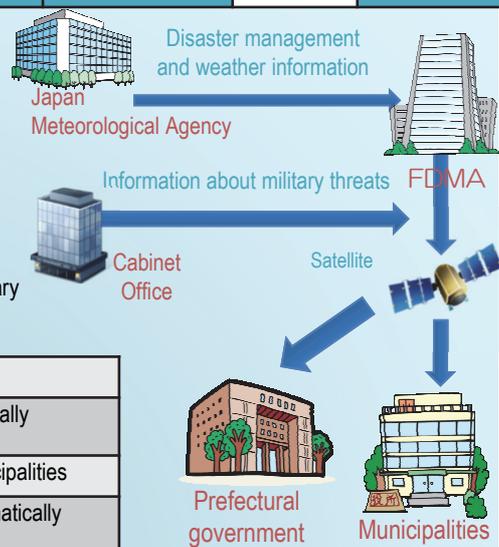
Municipalities

Legend of categories

◎	In principle, relevant multiple-address wireless communications systems are automatically activated.
○	Relevant multiple-address wireless communications systems upon the setting of municipalities
△	In principle, relevant multiple-address wireless communications systems are not automatically activated.

No.	Type of information	Category	No.	Type of information	Category	No.	Type of information	Category
1	Ballistic missiles	◎	9	Volcanic eruptions (residential areas) (*)	◎	17	Sediment disaster warnings	○
2	Air assaults	◎	10	Weather and other special warnings (*)	◎	18	Tornado warnings	○
3	Attacks from guerillas and special forces	◎	11	Prediction information of Tokai earthquakes	○	19	Record-breaking deluge in a short period	△
4	Large scale terrorism	◎	12	Advisory information of Tokai earthquakes	○	20	Flood forecasting of designated rivers	△
5	Other information for protecting citizens	◎	13	News flash of earthquake intensity	○	21	Survey information of Tokai earthquakes	△
6	Emergency earthquake warnings	◎	14	Tsunami advisories	○	22	Information about hypocenters and intensities	△
7	Large tsunami warnings (*)	◎	15	Volcanic eruptions (near craters)	○	23	Prediction of volcanic eruptions	△
8	Tsunami warnings	◎	16	Weather and other warnings	○	24	Weather and other advisories	△

(*) Special warnings

【Devices used for the system】Satellite communications lines

Effectiveness of the System

<Status of development in Japan>
The ratio of municipalities covered by J-Alert　91.3% 1)
<Disaster mitigation effects>
1,629 out of the total 1,741 municipalities are equipped with systems responding to J-Alert. 1)
<Possible usage>
J-Alert can immediately transmit disaster, earthquake and other urgently needed information, and thus is expected to mitigate damages at the occurrence of disasters and expansions of damages due to delays in initial responses.

1) A Summary of J-ALERT, MIC and FDMA
http://www.fdma.go.jp/html/intro/form/pdf/kokuminhogo_unyou/kokuminhogo_unyou_main/J-ALERT_gaiyou.pdf (in Japanese)

Issues

- The ratio of municipalities having the automatic activation device for wireless administrative communications remains 80% only.

Cautions for use

- To provide information immediately after receiving it from J-Alert, municipalities need to take certain measures to minimize the processing time.

- J-Alert was used to transmit tsunami warnings at the time of the GEJE.
- J-Alert was the sole means of transmitting information in some municipalities during power outages.
- J-Alert enabled some municipalities to receive information much earlier than other communications systems. It was also used for in-house announcements and activation of e-mail systems at some municipal government offices.
- On the other hand, some municipalities had trouble in activating their communications systems because of mechanical failures, which suggests that the automatic activation devices need to be regularly checked.

Use of J-Alert at the time of the GEJE

No. of municipalities using J-Alert as of March 11	773 municipalities (Approx. 46% of all the 1,691 municipalities)
Of which, No. of municipalities using the receiver only)	391 municipalities (Approx. 23% of all the 1,691 municipalities
Of which, No. of municipalities using the receiver and automatic activation function	382 municipalities (Approx. 22% of all the 1,691 municipalities)

Of which, No. of municipalities covered by emergency earthquake warnings 63 municipalities	Of which, No. of municipalities covered by tsunami warnings 145 municipalities
Of which, No. of municipalities using the automatic activation function 35 municipalities	Of which, No. of municipalities using the automatic activation function 99 municipalities
Of which, No. of municipalities whose system failed to activate because of the setting of earthquake intensity or moratorium time 27 municipalities	Of which, No. of municipalities covered by automatic tsunami advisories 36 municipalities
Of which, No. of municipalities whose system failed to automatically activate due to accidents 1 municipalities	Of which, No. of municipalities whose system failed to activate as expected due to accidents or other reasons 8 municipalities
	Of which, No. of municipalities which were not sure if their system automatically activated 2 municipalities

* The figure excludes 59 municipalities in Fukushima Prefecture.

* Targeted 8 tsunami warnings (from 14:49, March 11 to 03:20, March 12).

Source: the Study Group for Improving and Strengthening Measures against Earthquakes and Tsunamis in Regional Disaster Prevention Plans (FDMA)

◆ Japan uses J-Alert to transmit information chiefly via multiple-address wireless communications systems, but J-Alert is expected to be used more widely if it is used with other systems.

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- The disaster information sharing information system (L Alert) is a system which converts information from public organizations into XHL, e-mail and other formats, and transmits it to the media and communications companies.

- L Alert can efficiently and swiftly transmit information from all the participants in the system in a certain format. 1)
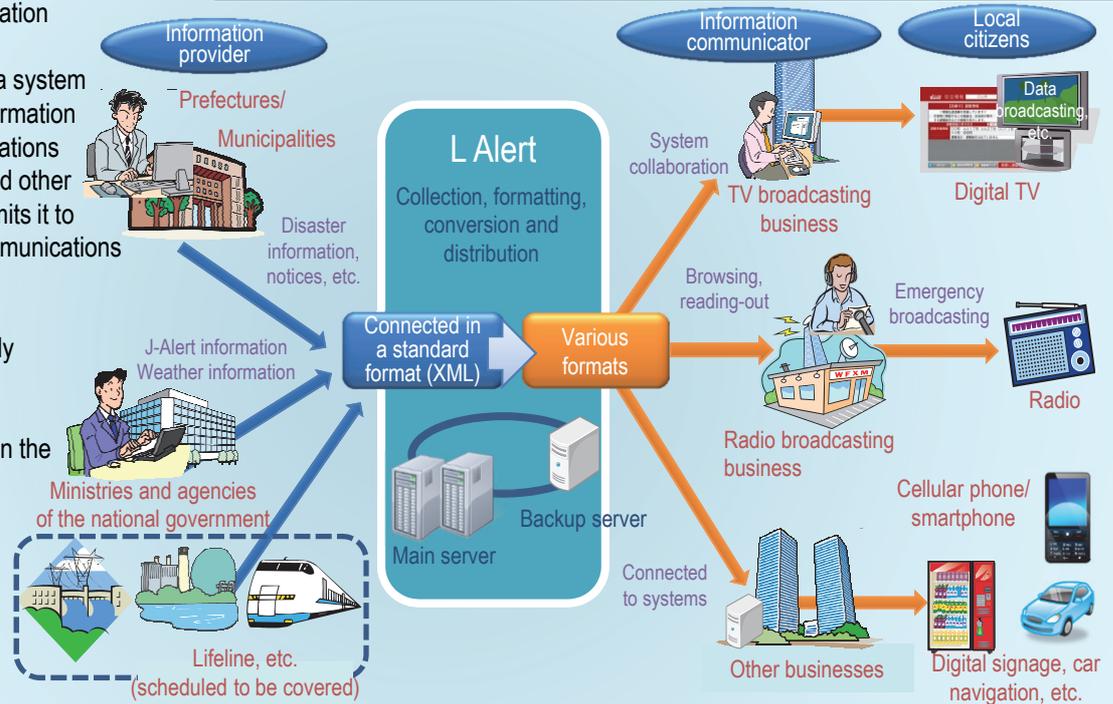
【Devices used for the system】Cloud systems

Effectiveness of the System

<Status of development in Japan>
A total of 299 municipalities are connected to the L-Alert system. 1)

<Disaster mitigation effects>
・ Simply entering information in the L-Alert system enables to transmit the information to various media, and substantially reduce the burden of data input work. 1)
・ The L-Alert system enables to instantly understand the situations of neighboring municipalities and other regions afflicted by disasters. 1)
・ The L-Alert system enables to obtain public information across the country in the optimal format simply by following standardized procedures, which will help reduce the cost and work of data acquisition. 1)

<Possible usage>
Currently, 21 prefectures operate the L-Alert system and 15 prefectures are preparing or testing for the introduction of the system, while a total of 299 municipalities are connected to the system. The L-Alert system can centrally manage disaster information and is expected to reduce the burden of municipalities for reporting even when they are affected by disasters and help neighboring municipalities easily obtain disaster information.

1) Foundation for Multimedia Communications   http://www.fmmc.or.jp/commons/ (in Japanese)
2) Cyber Government Online, Hitachi Ltd.   http://cgs-online.hitachi.co.jp/contents/334_2.html (in Japanese)

Issues

- The system can be affected by outages and network disconnections when data is being entered or acquired.
- The system produces effects if many administrative agencies participate in the system. (In Japan, some prefectures have not yet participated, and the participation rate of municipalities remains a mere 16.6%. The primary issue is to promote them to participate in the system.)

Cautions for use

- Measures should be taken in advance against power outages and network disconnections.
- A mechanism should be established to facilitate many municipalities to participate in the system.

● The Tokyo Metropolitan Government announced that it would link the L-Alert system to digital signage to navigate people who are unable to return home after disasters. It expects other municipalities to introduce similar systems.

Introduction of the L-Alert system, by prefecture
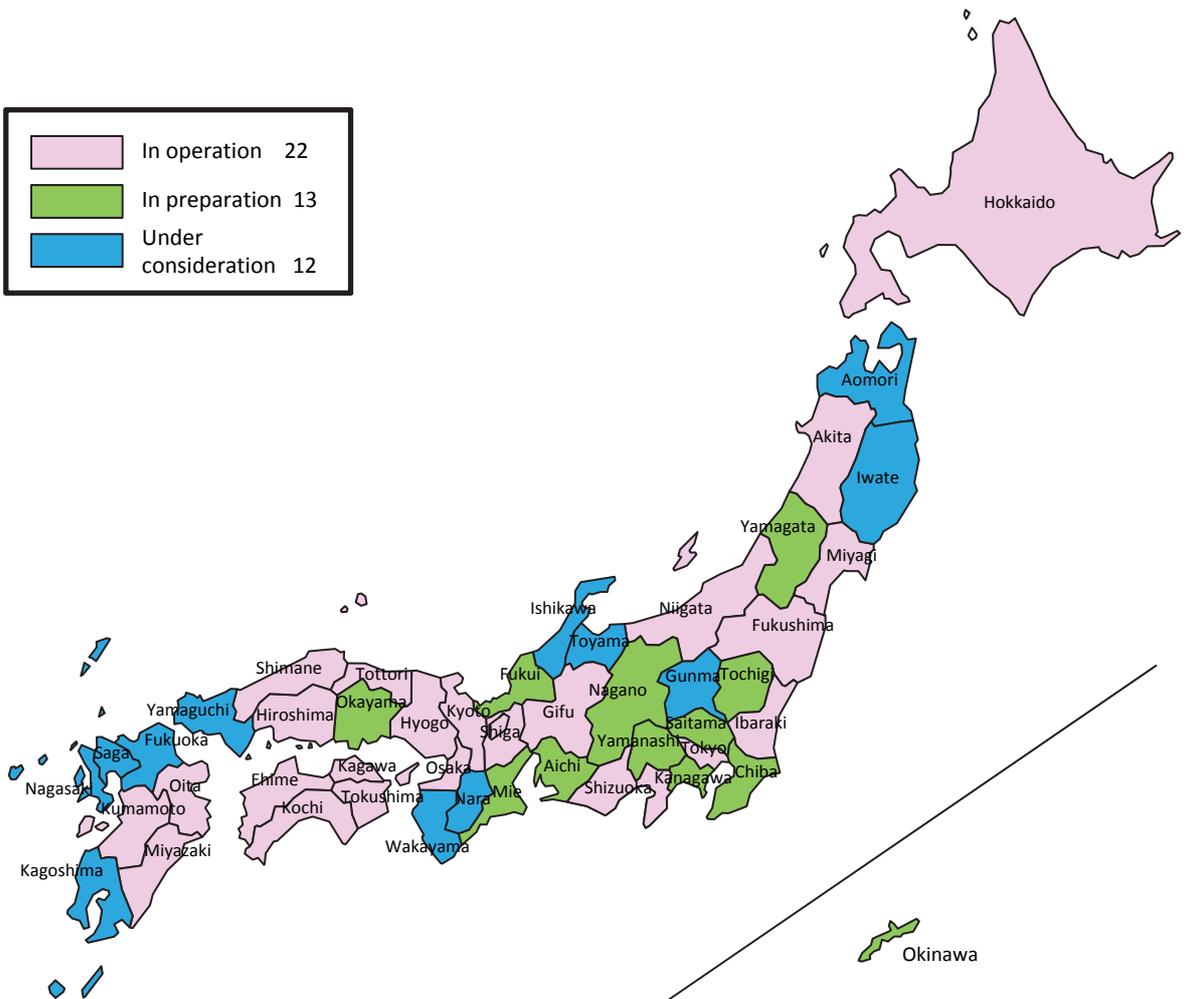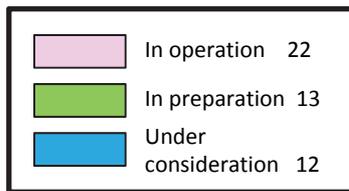
In operation	22
In preparation	13
Under consideration	12

Hokkaido

Aomori

Akita

Iwate

Yamagata

Miyagi

Ishikawa

Niigata

Fukushima

Toyama

Shimane

Tottori

Fukui

Nagano

Gunma

Tochigi

Yamaguchi

Hiroshima

Okayama

Kyoto

Gifu

Hyogo

Shiga

Saitama

Ibaraki

Fukuoka

Saga

Yamanashi

Tokyo

Nagasaki

Oita

Ehime

Kagawa

Osaka

Aichi

Kanagawa

Chiba

Kumamoto

Kochi

Tokushima

Nara

Mie

Shizuoka

Miyazaki

Wakayama

Kagoshima

Okinawa

（19th December in 2014）

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- A movable and deployable ICT resource unit (MDRU) is a mobile ICT unit for communications when disasters strike. It consists of communications devices, and information processing and storage devices mounted on a mobile container or vehicle. 1)
- An MDRU can be brought to disaster-afflicted areas within a short time after a disaster, and serve as a telephone/communications infrastructure. 1)
- An NDRY is equipped with a system to collect data on affected people, which streamlines the understanding and management of affected people. 1)
- Some units are equipped with solar panels, power source or generator, and can be operated for five days or so without external power sources.
- Users can make telephone calls with their smartphones with the relevant application.
- MDRUs take different forms and sizes, including large ICT units, medium-sized ICT units, small ICT vehicles, and attache case-type units.
- MDRUs can use different communications lines such as satellite and existing optical fiber lines, depending on area characteristics.

The Container- typed ICT Unit

The Compact ICT car

Attache case – typed ICT BOX

【Devices used for the system】Communications infrastructure

Effectiveness of the System

<Disaster mitigation effects>
Wi-Fi connection is available within some 500m radius from the location of an MDRU, so a larger number of terminal devices can use the system than a traditional one-on-one communications device.2)
MDRUs can help smooth communications among disaster headquarters, relevant organizations and afflicted areas (such as evacuation centers).

<Possible usage>
MDRUs are transported to and installed in disaster afflicted areas immediately after a disaster occurs, and a wireless communications network is built near the MDRUs to realize telephone calls, information provision systems and other ICT in the areas. 1)

1) "On development of 'ICT cars' that can immediately recover communications infrastructure when a large-scale disaster occurs", NTT Corporation
   http://www.ntt.co.jp/news2014/1401/pdf/140128a.pdf (in Japanese)
2) "On development of 'ICT cars' that can immediately recover communications infrastructure when a large-scale disaster occurs", NTT Corporation, NTT Technology Journal, April 2014, p.57
   http://www.ntt.co.jp/journal/1404/files/jn201404057.pdf (in Japanese)

Satellite

Disaster afflicted area

MDRU

Surviving line
(such as optical fiber)

Disaster-management organization
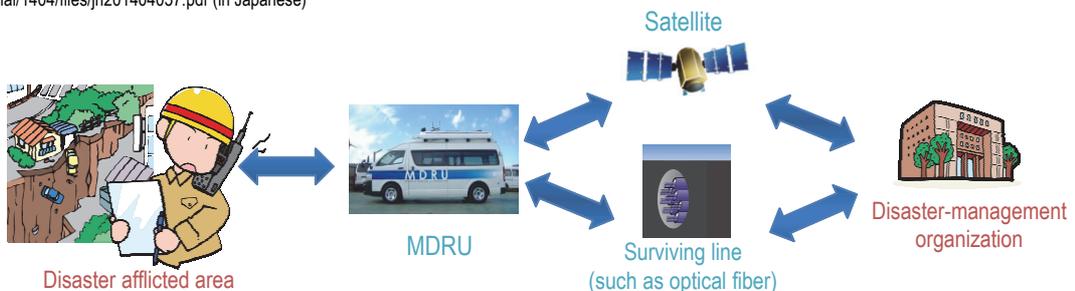
Issues

- Means of transporting MDRUs to afflicted areas need to be considered in advance.

Cautions for use

- Training and experimental tests for the installation of the application and operations of MDRUs should be desirably performed.

- NTT group and Tohoku University etc. developed "ICT car" which can recovery communication within 1-2 hours when stricken by a catastrophic disaster in January 2014. They attempt to introduce the system to NTT group and municipalities with in 1 -2 years.
- NTT group operated demonstration of the ICT unit in Cebu of the Philippines.

災害時に通信環境提供
NTTなど 車で無線ネット電話

NTT未来ねっと研究所（神奈川県横須賀市）は東北大学、富士通、NTTコミュニケーションズと共同で、大規模災害時に1～2時間で通信を回復できる「ICTカー」を開発した。半径500㍍以内のエリアにWi-Fi（ワイファイ）ネットワークを構築。その技術者以外の利用を想定し、スイッチ一つで起動できるようにした。複数台の連携や、光通信や衛星通信の活用で、被災地外との通話などもできるようになる。自家発電機能などにより、最大5日間の運転が可能。また免許証や顔写真をタブレット端末で撮影してサーバに登録し、被災地への普及を目指す。

者が手持ちのスマートフォンやタブレット端末（携帯型情報端末）に専用のアプリケーションをダウンロードすれば、普段使っている電話番号のままで受発信できる。1～2年以内にNTTグループ各社や自治体などへの導入を目指す。

バンタイプの自動車にサーバ群やアンテナ、小型交換機などを搭載。技術者情報を収集するシステムも搭載した。避難状況や支援計画などへの活用を視野に入れる。2月下旬に高知県南国市と同黒潮町で、ICTカーの実証試験を始める。平常時の活用法なども含めて検証を進め、各地への普及を目指す。

開発したICTカー。サーバ群やアンテナなどを積み、被災地の通信環境を復旧する

Communications environment for disaster afflicted areas
NTT and other parties develop wireless communications vehicles
[Photo] An ICT vehicle is equipped with servers, antennas and other communications devices to recover communications infrastructure in disaster afflicted areas.
Source: January 29, 2014   Page 21, Nikkan Kogyo Shimbun
This article was printed with permission of Nikkan Kogyo Shimbun.

2-4 Securing of communications in afflicted areas through portable satellite communications systems

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- A portable satellite communications system takes moving pictures of disaster afflicted areas and sends the data via a satellite to disaster headquarters and other relevant offices, which take advantage of the pictures to make countermeasure plans.
- In Japan, regional development bureaus of the Ministry of Land, Infrastructure,Transport and Tourism (MLIT) have founded fixed stations, in which a number of portable satellite communications systems are stationed to prepare for disasters.
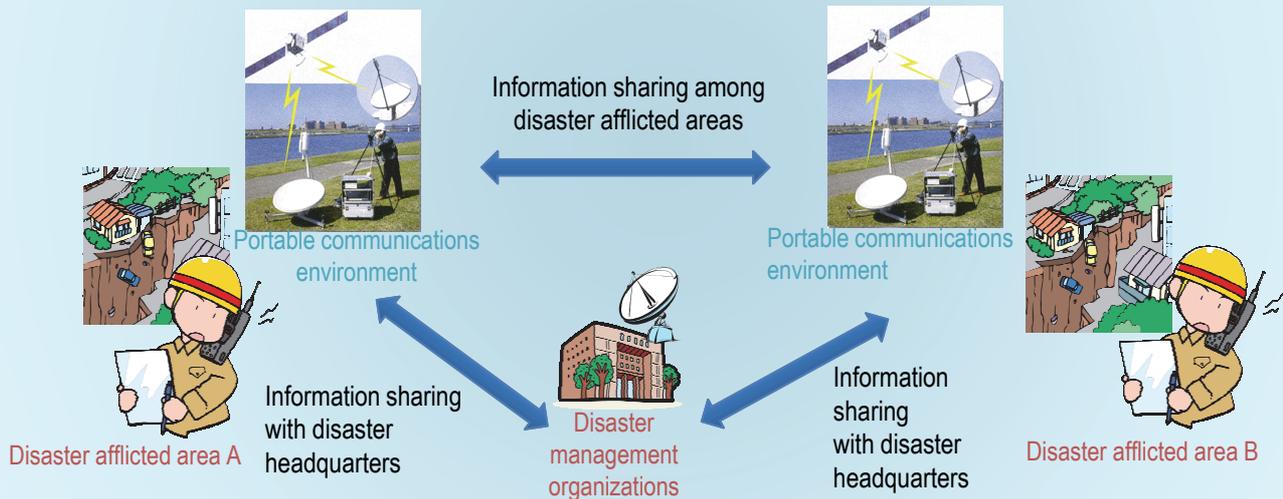
Information sharing among disaster afflicted areas

Portable communications environment

Portable communications environment

Information sharing with disaster headquarters

Disaster management organizations

Information sharing with disaster headquarters

Disaster afflicted area A

Disaster afflicted area B

【Devices used for the system】Satellite communications infrastructure

Effectiveness of the System

<Status of development in Japan>
The MLIT puts a total of 344 portable satellite communications systems across the country:
24 in Hokkaido, 24 in Tohoku, 87 in Kanto, 36 in Hokuriku, 47 in Chubu, 29 in Kinki, 24 in Chugoku, 20 in Shikoku, 24 in Kyushu and 7 in Okinawa (as of August 1, 2010).

<Disaster mitigation effects>
Acquisition of moving pictures from disaster afflicted areas enables authorities to understand their situations more swiftly and accurately.

<Possible usage>
Moving pictures of areas afflicted by disasters are filmed by officers in charge, converted through a decoder and other devices, and transmitted via the parabola antenna of a portable station to disaster headquarters and other relevant offices. Portable satellite communications systems can transmit pictures even at the times when the communications facilities on the ground are damaged and when a power outage occurs.
Water level indicator temporarily installed

Sample of Satellite Communication system

Issues

- The network bandwidth is relatively small and may not be suitable for transmission of large-volume data.

Cautions for use

- The locations and number of systems must be systematically determined for efficient transport in preparation for disasters.

Use of the system at the time the disasters happened

- Information Network Laboratory Group of NTT have developed the resilient satellite communication system, and provided two satellite communication systems, the Ku- band compact satellite communication system and the portable satellite communication system, as means of the telecommunication at the stricken area.

- NTT group provided about 900 S-band satellite movable communication systems developed by NTT docomo. In some cases, satellite communication systems were used as entrances of base stations of cellular phones.[2]

- NTT communications operated ComSAT from 12th March to 4th August in the vast stricken area after the GEJE.[3]

- Satellites of Intel-SAT are used in ComSAT, so it is able to cover the large area over the world. [4]

The Ku-band small satellite system at the shelter after the Great East Japan Earthquake
(provided by NTT East Japan)

Source : [2] Takashi Hirose, Yutaka Imaizumi , Hidekuni Yoshida, "The NTT resilient satellite system used after the Great East Japan Earthquake" Space Japan Review, No. 76, October / November 2011

The cover area of ComSAT after the Great East Japan Earthquake

[3] Provided by NTT Communications

The area of ComSAT
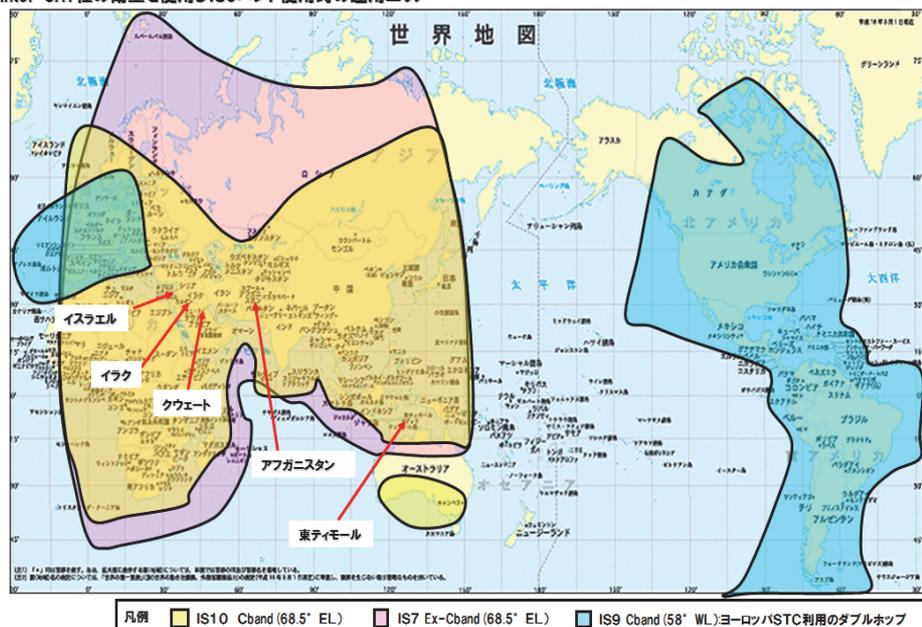
[4] Provided by NTT Communications

2-5 Disaster information sharing through regional satellite communications networks

Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- Regional satellite communications networks are used to send and receive voices, data and images of local public organizations via stationary satellite communications.
- The networks are regarded as supplementary to disaster management radio communications or as a tool contributing to efficient transmission of administrative information.
- The networks can be used for general voice communications, facsimile, data transmission, direct connections to pre-set numbers, simultaneous transmission of facsimile and data to municipalities, transmission of moving pictures, and packet data transmission. 1)
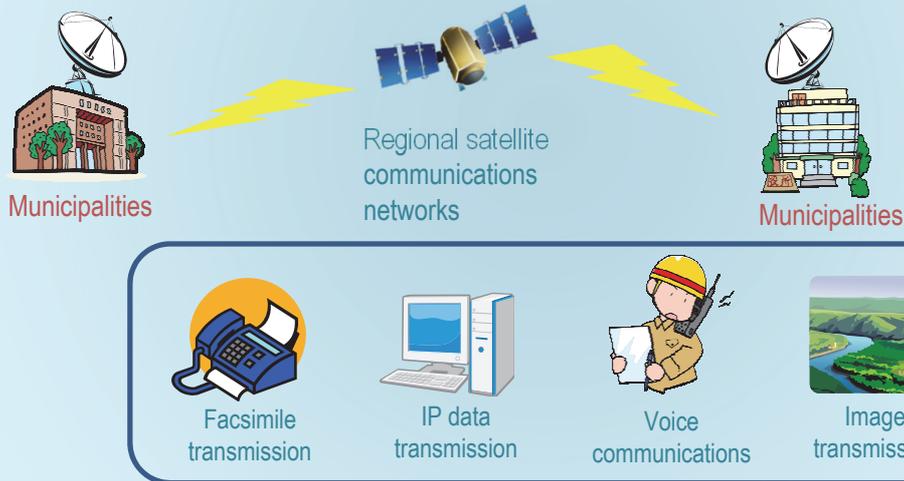
Municipalities

Regional satellite communications networks

Municipalities

Facsimile transmission　　IP data transmission　　Voice communications　　Image transmission

【Devices used for the system】Satellite communications infrastructure

Effectiveness of the System

<Possible usage>
Regional satellite communications networks use satellite communications to enable municipal offices (disaster headquarters) and on-site officers, and municipal offices and other municipalities to communicate with each other by telephone and exchange data. Specifically, these networks have the following functions.

Voice communications……voice communications by satellite cellular phones
Digital image transmission……digital transmission of images
IP data transmission……IP data transmission at 32 - 8,192Kbps (Two types of transmissions are available: instant and reserved transmissions. Bandwidth guaranteed data transmission services are also available.)
Packet data transmission……Transmission of data through connections lines allocated exclusively for individual prefectures

Source: Local Authorities Satellite Communications Organization (LASCOM)　http://lascom.or.jp/telno/index.html (in Japanese)

Issues

- Some people may find it difficult to use the networks in emergency unless they are used to the networks in the prevention/preparedness phase.
- The networks may not be used indoors because of the nature of the satellite communications.

Cautions for use

- Regular maintenance and training should be conducted in the prevention/preparedness phase.
- Users should understand areas where reception is poor and consider alternative means in such areas.

- The use of regional satellite communications networks in the GEJE is as in the following figure.
- The figure shows that the networks were utilized immediately after the earthquake occurred: the frequency and duration of network communications were about 14 times and 16 times more than the prevention/preparedness phase, respectively.
- During the GEJE, quite a few areas suffered from damage to their ground communications systems and thus found regional satellite communications networks useful to secure communications means.
- Some users were unable to use these networks because of damage from tsunami, but many users had their antennas and devices installed on the roof of their buildings and were able to use the networks even if the lower stories were inundated.
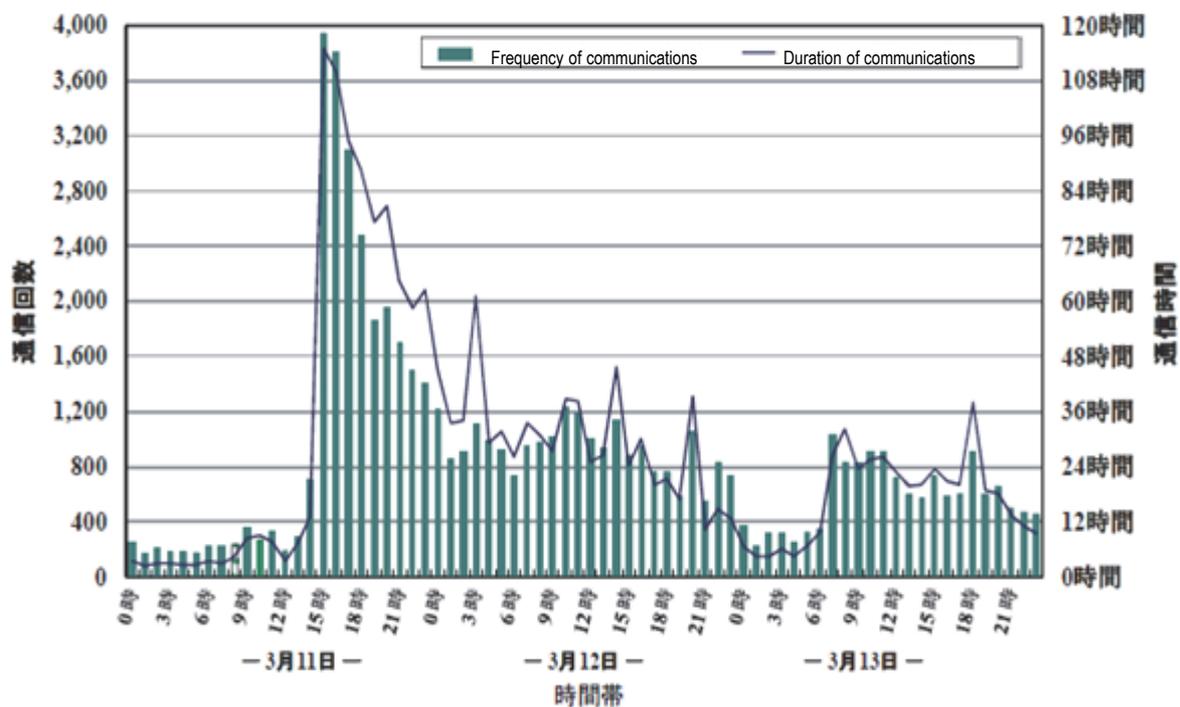
Figure 3.2-1 Changes in traffic time from March 11 to 13, 2011
(individual and IP communications in all the prefectures)

Source:
1) "Report on the GEJE and use of regional satellite communications networks", LASCOM, July 2012

| Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

Summary of the service

- The priority telephone links in disaster are a system which realizes telephone calls to numbers designated as priority numbers even when the telephone lines are congested after a disaster occurs (telephone calls from and to afflicted areas). The links are available to disaster management organizations and other organizations designated by law (such as the Ordinance for Enforcement of the Telecommunications Business Act). 1)

A priority telephone in disaster
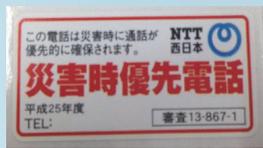
Sticker on telephones connected to priority links in disaster

How is the situation?

Ordinary line

Priority telephone links in disaster

Congestion/ communications restriction

The damage is minor.

Designated organization
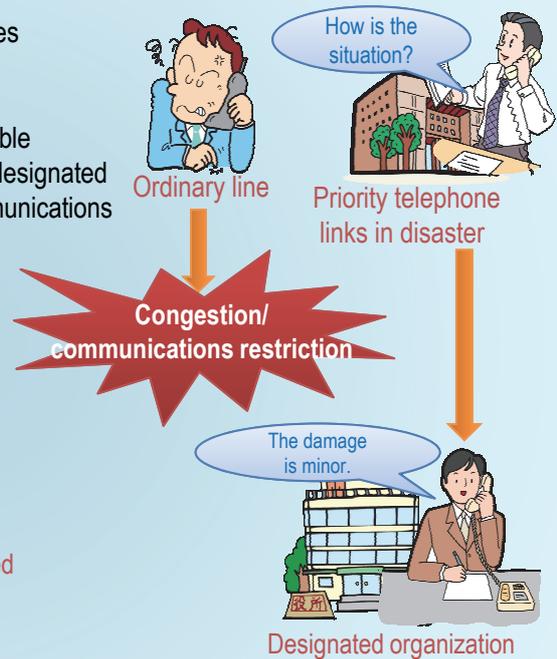
【Devices used for the system】 Fixed-line and cellular phones

Effectiveness of the System

<Disaster mitigation effects>
Local municipalities, and police, firefighting, meteorological, maritime safety, media, infrastructure, financial and other organizations, which are given priority by law may have access to priority telephone links in disaster. 1) 2)
The links enable these organizations to have important communications and exchange information freely from congestion after a disaster occurs.

<Possible usage>
The priority telephone links in disaster enable municipal offices to have telephone communications and data transmission with other municipalities, and police, firefighting and other designated organizations.

1) The priority telephone links on the website of the MIC
   http://www.soumu.go.jp/menu_seisaku/ictseisaku/net_anzen/hijyo/yusen.html (in Japanese)
2) Q&As on disaster countermeasures, NTT East
   https://www.ntt-east.co.jp/saigai/qa_taisaku/t_09.html (in Japanese)

Issues

- The priority telephone links in disaster may not be used if communications devices themselves are damaged due to disasters.

Cautions for use

- Users are required to file an application to the telephone operator.
- Users need to consider possible tasks in emergency and decide the necessary number of priority telephones.

- The Kansai Electric Power Co., Inc. increased the number of priority telephone lines from approximately 560 to approximately 1770 lines and is planning to review the allocation of the lines to make a regional balance. It also plans to enhance the reliability of in-house LAN, TV conference and other communications tools by ensuring backup lines in emergency.
- At the time of the GEJE on March 11, 2011, communications lines were heavily congested, and thus the priority telephone links in disaster and public telephones whose connection is prioritized were highly demanded.
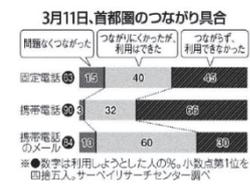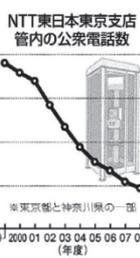
Connectability in the Tokyo metropolitan area on March 11

	Connected without problem	Had difficulty but was able to use	Did not connect and was unable to use
Fixed-line phone (63)	15	40	45
Cellular phone (90)	3	32	66
Text messaging of cellular phone (84)	10	60	30
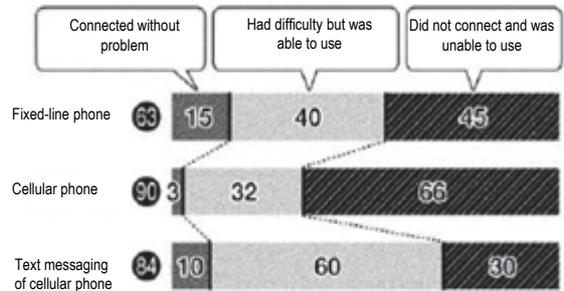
* The black-circled numbers indicate the percentage of the respondents who tried to use. The figures are rounded off to the nearest whole number. Source: the Survey Research Center

Public telephones smoothly connected in disaster -- Fading out but still useful

[Photo] People gather in crowds to make a call, 8:45 p.m., March 11, in Chiyoda-ku, Tokyo

Source : Page 20, Tokyo Shimbun (morning edition) , May 28, 2011

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Summary of the service

Phase where the system is used			Form of use	
Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- The integrated river information system is a system which gathers and provides telemeter information about the water level of rivers and rainfall, and radar rainfall data in an integrated manner across the country.
- The national and local governments can browse information on the website screen of the system. 1)
- Some of the data on the system is open to the general public, which can access information through PCs and cellular phones.
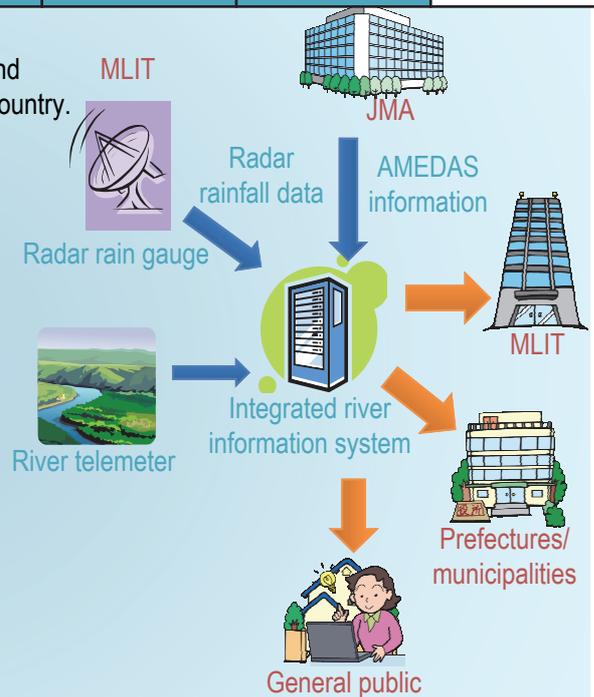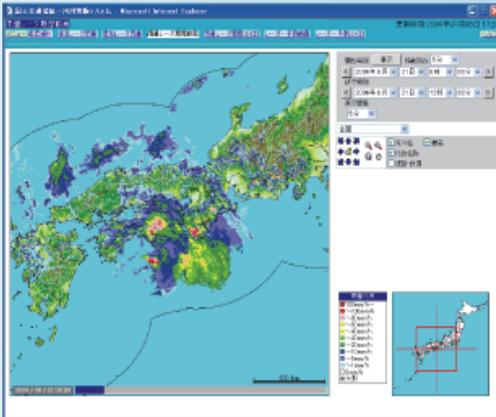
【Devices used for the system】Various sensors, telemeters and PCs

Effectiveness of the System

<Disaster mitigation effects>
The integrated river information system enables to check information about rivers across the country in an integrated manner.
The system is not just used by administrative agencies but also open to the general public on the website, providing useful information for both self-assistance and mutual assistance.
The system helps officers in charge of disaster management at municipalities gather relevant information swiftly.

Types of information that can be checked from the integrated river information system
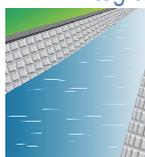
| Water levels and flow rates | Data on dams | Road telemeter | Radar rainfall gauge |
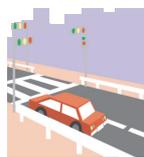
Issues

- River administrators have access to all the 37 data items of the system and municipalities to most of the 37 data items. But the general public has access to 15 items only.
- The mobile version is available, but provides only 9 data items and has functional restrictions.

Cautions for use

- Training should be conducted to officers in charge so that they can appropriately use the system and read information when a disaster occurs.

Use of the system at the time the disasters happened

- The integrated river information system enables officers to browse river information real time at the offices of the MLIT across the country. When a typhoon is approaching or it is raining heavily, officers at different offices across the country can monitor changes in the water levels of rivers in the same display format.
- Information in the system can be provided not only on the website but also through digital TV broadcasting if the system is linked to TV broadcasting services. TV viewers can check the water levels of their local rivers.

The water levels and other information about rivers can be checked on a TV screen.

WATER LEVEL AND RAINFALL

○○ City
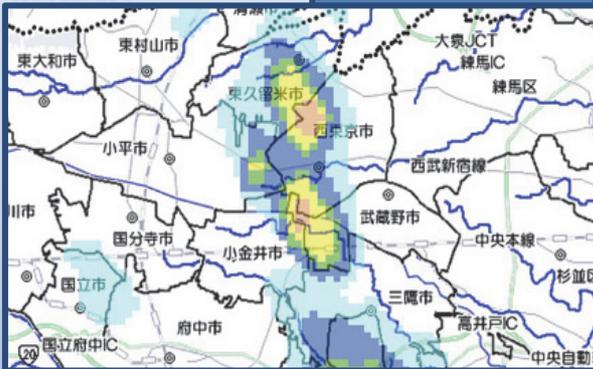
Miyata-nishi Observatory | Asahi river

Current level 330cm
Record-high level 210cm | At risk of flooding

Asahi river			Yamada river			Takano river	
Yamada-bashi	Miyata-nishi	Nishino	Hirata	Higashi-ohashi	Kawaguchi	Ohara	Matsuda-bashi
30cm	330cm	110cm	110cm	-10cm	170cm	170cm	50cm

🔵 River Menu　　🔴 Evacuation Menu　　🟢 River Disaster Management Top　　🟡 Top

	Phase where the system is used			Form of use	
Summary of the service	Prevention/ preparedness	Response	Rehabilitation	Active	Passive

- A contents management system (CMS) is a system that can simultaneously transmit traffic information (the state of injured persons, delay, detection of foreign materials, etc.) and weather information (typhoons, thunderbolts, earthquakes, tsunamis, etc.) to a number of communications means such as facsimiles, telephones and e-mails at the time of emergency.
- CMS can also send warnings and distribute facsimiles to smart devices at the time of emergency.
- Destinations of information can be selected by grouping destinations in terms of "region", "event" such as traffic and weather information, and "mode" such as emergency and normal situations.
- CMS also have a function to enable senders to check access to the information, history of information transmitted, and the statuses of responses from the fields.

Data input/output

Disaster management organizations

Managing information from various media in an integrated manner

Simultaneously transmitting data to various media
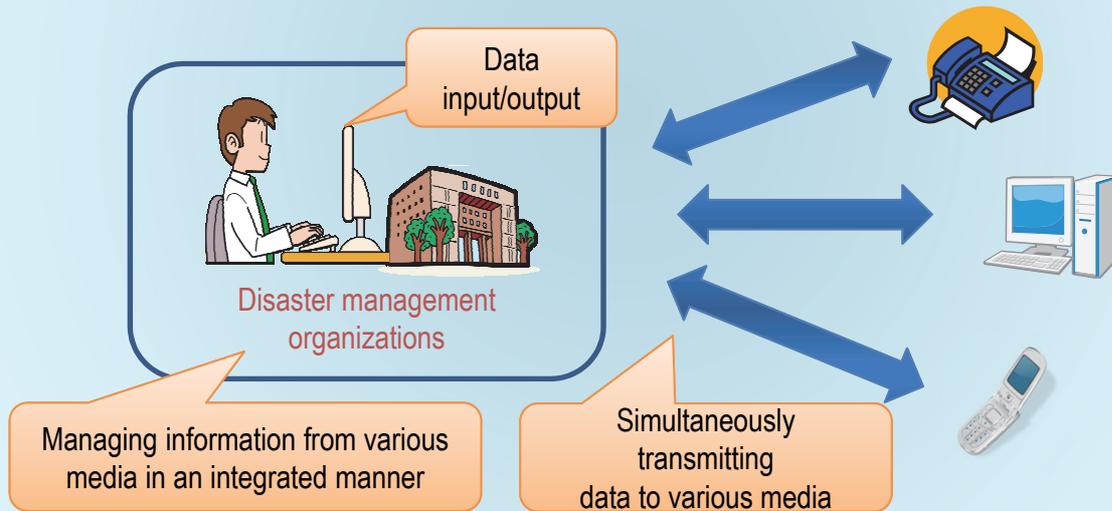
【Devices used for the system】 e-mails, facsimiles, PCs, etc.

Effectiveness of the System

<Effectiveness of the System>
When a disaster occurred, administrators used to send facsimiles one at a time, which was a great burden and caused time lags. CMS enable administrators to simultaneously send disaster-related information to various media such as facsimiles and e-mail.

<Sample usage>
Administrators can announce evacuation advisories/instructions through radio communications, and simultaneously transmit advisories/instructions to the website of municipalities, mailing services and (mobile) radio communications through CMS.

multiple-address wireless communications

Disaster Information system

Website of the municipality

Disaster prevention mailing service

Mobile wireless communications
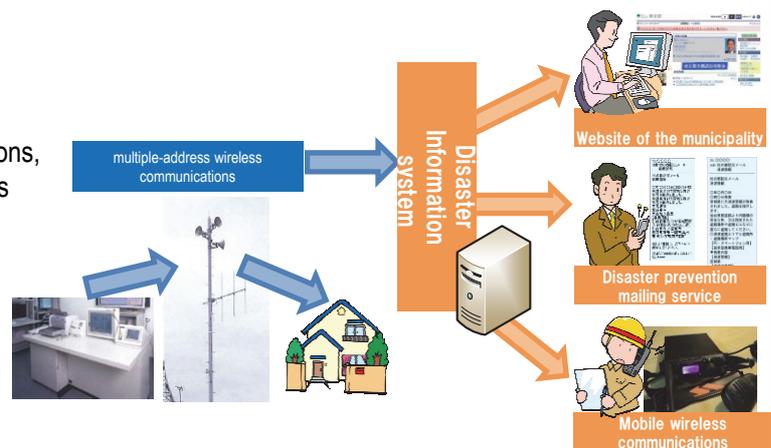
Issues

- An integrated information management system needs to secure redundancy by, for example, multiplexing the system through cloud environment.

Cautions for use

- To efficiently respond to disasters, administrators should classify destinations in terms of the type and content of information in advance.

● At the time of the GEJE, information about the disaster was not fully shared among or provided to related organizations and the general public. Based on the lessons learned, Japan has now established a mechanism that can swiftly collect and integrate disaster information, make the information visible for speedy decision-making, and distribute and share the information through various media. CMS are now adopted by many municipalities including the City of Rikuzentakata, one of the areas severely afflicted by the GEJE. (See the following figure.)

DRRM support system built in line with the lessons learned from the GEJE

Local meteorological observatory

FDMA J-Alert   Prefectures

Warning information

Weather information

Information about road damage and the water levels of rivers

Security information Situation of evacuation centers

Disaster information from afflicted areas

Collection of disaster information from the existing systems

Collection of disaster information from new systems

Integration of information Making information comprehensively visible

Disaster headquarters

Support to decision making

Information collaboration system resistant to disasters

Cloud data center

Simultaneous transmission of disaster Information through new systems

Tablet terminals in afflicted areas, evacuation centers, etc.

Area Mail (mobile carriers)

facebook   SNS
twitter

Website of municipalities about disaster management

Mailing services of municipalities

Channels (such as community FM) which municipalities want to add

Public Information Commons

Source: "Case examples of ICT services contributing to disaster prevention and mitigation", MIC, p.21

<Multiplexing and diversifying means of transmitting information>

・Once a large-scale disaster has occurred, some communication systems normally used cannot be used due to damage, congestion and other reasons. It is important to multiplex and diversify communication means to secure minimum communication tools even at the time of a disaster.

・After the GEJE, satellite lines were used to contact and transmit images from afflicted areas where communication facilities were damaged. This incident showed that satellite communication systems are less vulnerable to disasters, though their communication capacities are smaller than those of ground communication facilities.

<Response to diversification of types of data and terminal devices to receive data>

・As resilient ICT systems become sophisticated, the data volume increases. It is practically difficult for administrative officers to process and transmit data for each media, particularly when a disaster strikes.

・Thus, a mechanism, which can manage and transmit various data without causing much trouble to administrative officers is needed.

・Mechanisms which can manage information in an integrated manner and help parties concerned share such information, such as the L-Alert system and contents management systems, are effective not just from the viewpoint of information management but also from the viewpoint of information provision.