International Telecommunication Union

ITU-D   STUDY GROUP 2   4th STUDY PERIOD (2006-2010)

Utilization of ICT for disaster management, resources, and active and passive space-based sensing systems as they apply to disaster and emergency relief situations

ITU International Telecommunication Union

THE STUDY GROUPS OF ITU-D

In accordance with Resolution 2 (Doha, 2006), the World Telecommunication Development Conference (WTDC-06) maintained two study groups and determined the Questions to be studied by them. The working procedures to be followed by the study groups are defined in Resolution 1 (Doha, 2006) adopted by WTDC-06. For the period 2006-2010, Study Group 1 is entrusted with the study of nine Questions. Study Group 2 is also entrusted with the study of nine Questions.

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PREFACE

This publication, which is the first output of the ITU-D Study Group 2 Question 22/2, is meant to facilitate the implementation of the Common Alerting Protocol (CAP) standard for public alerting and hazard notification in disasters and emergency situations. CAP addresses the long-standing need to coordinate the information content across all of the mechanisms used for warnings and alerts. The publication contributes to the rest of the work being undertaken as part of the Doha Action Plan implementation.

It is my fervent hope that policy-makers, telecommunication regulatory authorities, and telecommunications operators will find this initial work invaluable in their effort to use information and radiocommunication technologies to mitigate the impact of disasters and save human lives. Special thanks are due to the Chairman of ITU-D Study Group 2, Mr Nabil Kisrawi, the Rapporteur of ITU-D Study Group 2 Question 22/2, Mr Thomas vonDeak, Mr Cosmas Zavazava, Head of the Programme for the least developed countries, small island developing states, and emergency telecommunications, who is the focal point on this Study Question, and the many experts from administrations that participated and contributed to this output, as well as those in ITU-T Working Party 2/17, which adopted the CAP Recommendation ITU-T X.1303.

I take this opportunity to wish all those involved in the proceedings of this Study Question much success and look forward to the final output at the end of this Study Period.

Sami Al Basheer Al Morshid
Director
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Abstract:

This Guidelines document is a result of work undertaken by the ITU-D Study Group 2 Question 22/2 under Task 8 of its Work Plan: "Provide proposed recommendations/guidelines for a 'Content Standard' to be used for all alerts and notifications for disasters and emergency situations". This work was undertaken with the support and contribution of ITU-D Programme 6, which is mandated and is implementing activities and projects in the area of emergency telecommunications that include the application of information and communication technologies in disaster preparedness, early warning, disaster response/relief, and reconstruction, as well as ITU-T SG 2 which adopted CAP Recommendation ITU-T X.1303.

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1 Introduction

Across the globe, disasters have been on the increase in recent years. The magnitude of these disasters has also increased, resulting in loss of human lives, displacement of millions of people, and destruction of critical infrastructure. Preparedness and early warning are critical elements of managing these disasters and reducing loss of human lives to the bare minimum.

This "guidelines" document is intended for use by telecommunication operators, policy-makers and regulators to facilitate implementation of the Common Alerting Protocol (CAP) standard for public alerting and hazard notification in disasters and emergency situations. CAP addresses the long-standing need to coordinate the information content across all of the mechanisms used for warnings and alerts. Maintained by the Emergency Management Technical Committee of the Organization for the Advancement of Structured Information Standards (OASIS), the CAP standard is also designated Recommendation ITU-T X.1303.

1.1 Structure of this guidelines document

Section 2 gives an overview of guidelines and best practices that practitioners, policy-makers, and others involved in public alerting should consider in the design and deployment of hazard warning systems at national, regional and community levels. The particular emphasis here is on implementation considerations in applying the Common Alerting Protocol (CAP) content standard. The advice is based on findings from research studies and operational experience from a range of experts active in disaster management.

Section 3 offers a case study on implementation of the Common Alerting Protocol content standard in Sri Lanka. This section illustrates operational practices as well as key principles in standards-based, all-hazards, all-media public alerting. Such operational experiences should be relevant to all those involved in design, deployment and evaluation activities.

Section 4 provides brief suggestions of actions that can be taken immediately to implement the Common Alerting Protocol content standard, delineated by the various roles that organizations have with regard to the use of information and communication technologies for disaster management.

The bibliography provides the sources of various informative materials related to the use of information and communication technologies for disaster management.

Annex I contains details about work on Question 22/2.

Annexes II and III contain the texts of ITU Resolution 34 (World Telecommunication Conference, Rev. Doha, 2006) and ITU Resolution 136 (Plenipotentiary Conference, Antalya, 2006). Resolution 34 is titled: "The role of telecommunications/information and communication technology in early warning and mitigation of disasters and humanitarian assistance". Resolution 136 is titled: "The use of telecommunications/information and communication technologies for monitoring and management in emergency and disaster situations for early warning, prevention, mitigation and relief". Among other provisions, Resolution 136 instructs the ITU Bureaux: "to promote implementation by appropriate alerting authorities of the international content standard for all-media public warning, in concert with ongoing development of guidelines by all ITU Sectors for application to all disaster and emergency situations".

2 The Common Alerting Protocol content standard

2.1 Need for the Common Alerting Protocol (CAP)

With adequate warning, people can act to reduce the damage and loss of life caused by natural and man-made hazard events. The key is to get timely and appropriate alerts to everyone who needs them and to only those who need them. Nonetheless, appropriate and complete alerting is a complex challenge.

There is today a bewildering diversity of public alerting mechanisms. In addition to local sirens and policemen with bullhorns, telecommunication carriers such as radio, television, telephone and Internet

service providers have each implemented different public alert technologies for disasters and emergencies. Without a common description of the underlying event, alert messages coming from different media are confusing and inefficient. Coordination across alert technologies is a major challenge internationally, and most large nations struggle with coordination among internal jurisdictions as well. This complexity is further compounded in that alert messages can be completely different across different types of hazard, including severe weather, fires, earthquakes, tsunami, disease, civil disturbances, and many others.

From the perspective of public warning investments, it makes no sense for societies to implement uncoordinated public warning systems for each particular threat. A standards-based, all-media, all-hazards public warning strategy makes for more efficient use of funds as well as more effective public warning. Such a strategy not only makes sense for governments who need to alert the public, it makes sense for a wide range of information technology providers and communication carriers.

Most wire and wireless providers of information and communications are migrating to digital technologies. This allows them to offer integrated services, merging radio and television with cellular and satellite telephone and with a variety of Internet-based and other digital network services. These providers of communication services are poised to support all-hazard alert messages across these integrated communication technologies through both wire and wireless, but they need a common standard for the content and handling of alert messages.

The content of alert messages is being standardized across all hazard types, in a manner that anticipates all communication technologies. The Common Alerting Protocol (CAP) was agreed in 2004 as an international standard and was adopted as an ITU-T Recommendation (X.1303) in 2007. An example of a CAP message is shown in Figure 1.

Figure 1: Example of a CAP message

Distribution of CAP messages is being implemented on ever larger scales, types of alerts and ranges of technologies. Operational systems have already shown that a single authoritative and secure alert message can quickly launch Internet messages, news feeds, television text captions, highway sign messages and synthesized voice over automated telephone calls and radio broadcasts. There are national and international CAP warnings available for a wide range of threats, including severe weather, earthquakes and volcanoes, among others.

2.2 Benefits of CAP

A key benefit of CAP for sending alert messages is that the sender can activate multiple warning systems with a single input. Using a single input reduces the cost and complexity of notifying many warning systems. A single input message also provides consistency in the information delivered over multiple systems. People receive exact corroboration of the warning through multiple channels. This is very important, as research has found that people do not typically act on the first warning signal but begin looking for confirmation. Only when convinced that the warning is not a false alarm do they act on it.

A further benefit of CAP for emergency managers is that standardized warnings from various sources can be compiled in tabular or graphical form as an aid to situational awareness and pattern detection. When CAP is applied extensively, managers will be able to monitor at any one time the whole picture of local, regional and national warnings of all types. CAP alert messages can also be used at sensor systems as a format for direct reporting of relevant events to centres for collection and analysis.

CAP is a breakthrough standard that opens the door to new alerting systems and technical innovation. For example, location-aware receiving devices can use the standardized geospatial information in a CAP message to determine whether that message is relevant based on the current location of the device.

2.3 CAP is a "content standard"

CAP can be viewed as a universal adaptor for alert messages. CAP defines one standard message format with the features that are essential to handle existing and emerging alert systems and sensor technologies. This standard format can replace a whole range of single-purpose interfaces among warning sources and disseminations channels. From the perspective of warnings technology, CAP addresses the concerns about compatibility and operational complexity that have been stifling development.

Rather than being defined for a particular communication technology, CAP is essentially a "content standard": a digital message format that can be applied to all types of alerts and notifications. In this way, CAP is designed to be compatible with all kinds of information systems and public alerting systems, including broadcast radio and television as well as public and private data networks. This characteristic is especially important as societies are certainly not invested solely in any specific technology, but are expanding into ever more versatile networks and applications and so improving overall redundancy and reliability. CAP is compatible with technologies that may span satellite, terrestrial and wireless hardware; legacy as well as the latest Internet web services software; and existing as well as newly emerging formats. CAP is also compatible with alerting systems designed for multilingual and special-needs populations including persons with disabilities. By reducing technical barriers, CAP helps to enable a technology-independent, international "warning Internet".

2.4 Development of the CAP standard

The impetus for the development of a content standard for public alerting stems in part from a report on "Effective Disaster Warnings" issued in 2000 by the US National Science and Technology Council, which highlighted the benefits of improved interoperability for the patchwork of alert and notification systems that had evolved over time.[1] The recommendations put forward in the report derive from findings by expert

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[1] "Effective Disaster Warnings", Report by the Working Group on Natural Disaster Information Systems Subcommittee on Natural Disaster Reduction (US National Science and Technology Council, Committee on Environment and Natural Resources, Nov. 2000). Available at: http://www.sdr.gov/NDIS_rev_Oct27.pdf.

studies into criteria for effective warning messages. These criteria can be categorized into six principles of effective alerting and notification:[2]

• *Coordination*: an alert and notification system should avoid duplication of effort where possible and support a shared understanding of the situation among different agencies involved in managing the incident.

• *Consistency*: messages must be consistent across different sources if they are to be believed by the general population. Conflicting messages tend to create uncertainty and will delay responsive action.

• *Channels (multiple)*: messages should be delivered over a variety of devices in order to reach people engaged in a range of activities and settings (e.g., at home, sleeping, travelling).

• *Completeness*: message content should include all pertinent details presented in a way that is easily and quickly understood by the population. This includes multiple languages in some cases, as well as the use of multimedia for illiterate or hearing/visually impaired individuals.

• *Coverage*: messages should be targeted to those communities at risk in order to reduce growing complacency from the larger population receiving alerts that do not apply to them.

• *Control*: messaging systems must be secure and have a means of authenticating users to reduce incidents of accidental activations and prevent malicious attempts to issue false alerts to a population.

The report also recommended that "[a] standard method should be developed to collect and relay instantaneously and automatically all types of hazard warnings and reports locally, regionally and nationally for input into a wide variety of dissemination systems."[3] In response to this recommendation, an ad hoc working group with the participation of some 130 experts from a range of backgrounds began work in 2001 to draft a "Common Alerting Protocol" based on identified best practices in warning message design. In its most basic sense, CAP represents a collective effort by experts of different nationalities in the field to develop a content standard that "defines a single message format with the essential features to handle existing and emerging alert systems and sensor technologies".[4]

In 2003, a draft version of CAP was endorsed by a Group of Partnership for Public Warning, which then led to a detailed review by the Organization for the Advancement of Structured Information Standards (OASIS) Emergency Management Technical Committee.[5] OASIS first adopted CAP as a standard in 2004, publishing the current CAP version 1.1 in 2005. In 2006, ITU-T and OASIS organized a joint workshop and demonstration where CAP was presented and discussed by various stakeholder groups. ITU then resolved to promote implementation by appropriate alerting authorities of the Common Alerting Protocol as the international content standard for all-media public warning[6] (see Annexes II and III for the texts of the ITU Resolutions).

2.5 The CAP message format

Effective warning systems need to reach everyone who is at risk, wherever they are and whenever the event occurs, yet must not alarm people unnecessarily. Systems must be easy to use, reliable and secure. An effective warning message delivered by such a system must be accurate, specific and action-oriented. And,

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[2] "Effective Disaster Warnings" (p. 18-19).

[3] Quoted in the "CAP Fact Sheet" (2005, June 30). CAP Cookbook. Retrieved Jan., 2007. Available at:
http://www.incident.com/cookbook/index.php/CAP_Fact_Sheet.

[4] CAP Fact Sheet. (2005, June 30). CAP Cookbook. Retrieved Jan., 2007. Available at:
http://www.incident.com/cookbook/index.php/CAP_Fact_Sheet.

[5] Organization for the Advancement of Structured Information Standards (OASIS). (2006). Emergency Management Technical Committee. Retrieved Feb. 1, 2007. Available at: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=emergency.

[6] Joint ITU-T/ OASIS Workshop and Demonstration of Advances in ICT Standards for Public Warning (19-20 October, 2006). See: http://www.itu.int/ITU-T/worksem/ictspw/; Final Acts of the Plenipotentiary Conference (Antalya, 2006), Decisions and Resolutions. See: http://www.itu.int/plenipotentiary/2006/pd/final-acts.doc.

warning messages must be understandable in terms of languages and special needs, with attention to the prior knowledge and experience of the receivers. It is also critical that times, places and instructions are easily understood. The CAP format is designed to contain a broad range of information about the alert message, the specific hazard event and appropriate responses.

Each CAP message includes information that describes the message itself. Messages have unique identification numbers, and may reference other, related, CAP messages. Identifying information about the message also includes the status and time sent, allowing messages to serve as updates and cancellations of previous messages. Messages are identified by source, and are compatible with digital encryption and signature techniques that ensure the reliability and security of the message.

Information about an event in a CAP message may be contained in multiple informational segments. Each informational segment includes a description of the event in terms of its urgency, severity and certainty. CAP has separate descriptions for each of these three characteristics. *Urgency* describes how much time is available to prepare; *Severity* describes the intensity of the impact; and *Certainty* is a measure of confidence in the observation or prediction being made. The event may be assigned to a category (e.g., geophysical, meteorological, safety, security, rescue, fire, health, environmental, transportation, infrastructure), and is described in text as well. CAP also supports the inclusion of associated digital images and audio. Including an audio message, for example, allows a warning to be broadcast directly on radio, without requiring an announcer to read the message.

Multiple informational segments allow the message to be transmitted in multiple languages or to multiple audiences. Because each segment is associated with a geographic description, the multiple segments may also be used to convey information about bands of intensity. For example, an industrial fire might develop the potential for a major explosion. The incident commander needs to specify several components: evacuation of the area within half a mile of the fire; shelter-in-place instruction for the dispersion plume; and a request for media and aircraft to remain above 2500 feet in the vicinity of the fire. Using CAP, the incident commander can send one message including the appropriate message elements for each area. The incident commander may designate the geographic areas using latitude, longitude and altitude by outlining a polygon on a displayed map when entering the CAP message.

2.6 Extensive Markup Language (XML) structure of a CAP message

The basic XML structure of a CAP message consists of four primary elements (also referred to as *segments* in the CAP data dictionary) arranged in a hierarchical structure:

a root element `<alert>`, which may contain one or more

`<info>` elements, each of which may contain one or more

`<area>` and `<resource>` elements

Each of the primary elements within the CAP document contains a number of nested elements (referred to as *sub-elements* in the CAP data dictionary). Each of these sub-elements is defined as a container for text and/or attributes that together provide the specific contents of the alert message. As defined in the CAP data dictionary, some sub-elements such as `<sender>` or `<msgtype>` are "required" while others are "optional" or "conditional".

The `<alert>` segment contains sub-elements that provide fundamental information about the message, including the sender, the time it was issued, the status of the message (e.g., actual, exercise, test), the type of message (e.g., alert, update, cancellation), as well as the intended distribution of the message (e.g., public, restricted). CAP version 1.1 defines six required, two conditional and five optional sub-elements within the `<area>` segment.

Each `<info>` segment contains sub-elements to provide further details for the message. These include its urgency, severity and certainty; instructions for appropriate response by recipients, the nature of the hazard event, and other details including a `<description>` sub-element containing a human readable text description of the hazard or event. Multiple `<info>` segments may be used to describe details in different languages, or to provide the ability for emergency managers to issue a single alert with different parameters

such as intensity bands or probability factors for different geographical areas. CAP version 1.1 defines five required and 14 optional sub-elements within the `<info>` segment.

Each `<resource>` segment is an optional reference that contains sub-elements with additional information related to the `<info>` segment within which it appears. Typically, these resources will take the form of an image or audio file, such as a map, photo, website, or a recorded spoken word description of the message. Spoken messages are particularly useful where the natural language text is not well supported by technology, and for reaching anyone who is unable to read at that moment. The `<resourceDesc>` sub-element provides a human readable description of the resource (e.g., "map of evacuation routes"), while other sub-elements may be included to describe the specific file type, the file size, or the hyperlink location for retrieving the file from the Internet if it does not accompany the message itself. CAP version 1.1 defines one required, one conditional and four optional sub-elements for the `<resource>` segment.

Each `<area>` segment is an optional reference that describes the geographic coverage for the specific `<info>` segment in which it appears. The values describing the geographic area must include a human readable text description using the `<areaDesc>` sub-element (e.g., "Coastal regions of Sumatra"), but may also include recognized geocodes (e.g., postal code regions) or geospatial shapes using the `<polygon>` or `<circle>` sub-elements. Other sub-elements include descriptions for altitude and ceiling. CAP version 1.1 defines one required and five optional sub-elements for the `<area>` segment.

3   Case study: Implementing a Content Standard for Alert and Notification in Sri Lanka

3.1   Background

In January 2006, LIRNEasia[7] – in conjunction with the non-governmental organization Sarvodaya[8] – launched the HazInfo Project to evaluate technologies for last-mile hazard notification. The project, funded by Canada's International Development Research Centre, involves 32 coastal villages that had been affected by the 2004 tsunami, and incorporates a cross-section of communication technologies that are being assessed for their potential to distribute hazard information to rural and remote communities.

To facilitate interoperability across these multiple technologies, the project has implemented a content standard known as "Common Alerting Protocol" (CAP). CAP is an open source, XML-based standard that provides a semantic structure for composing warning messages, which can then be quickly and consistently relayed across multiple technology platforms. It also provides the capability for adding new technologies to the project as they come along. Information is gathered at a central Hazard Information Hub then codified into XML using CAP before it is relayed across a number of different technologies that make up the last-mile network. At present, this network consists of mobile and fixed telephones (including a specialized remote alarm system based on GSM), addressable satellite radios, and a small number of Internet terminals.

3.2   Procedural and prioritization matters

The first step when using CAP is to create an implementation profile that is suited to local conditions and constraints. In the case of the HazInfo Project, there were several factors that needed to be taken under consideration. For example, the administrative guidelines establish a procedure that requires staff members to monitor a number of reliable information feeds and to log any "Events of Interest (EOI)", such as large magnitude earthquakes in the region that might generate tsunamis. Each EOI is assigned a unique identifier for record-keeping purposes, and this identifier is used to populate the CAP <incidents> element when messages are issued. This procedure provides a basis for relating multiple messages to a common event.

_____

[7]   LIRNEasia is a regional information and communication technology (ICT) policy and regulation capacity-building organization active across the Asia-Pacific region.

[8]   Sarvodaya is Sri Lanka's largest broadly embedded people's organization, with a network covering 15 000 villages, 345 divisional units, 34 district offices, 10 specialist development education institutes; over 100 000 youth mobilized for peace building under Shantisena; the country's largest micro-credit organization with a cumulative loan portfolio of over LKR one billion (Sarvodaya Economic Enterprise Development Services, or SEEDS); a major welfare service organization serving over 1000 orphaned and destitute children, under-age mothers, and elders (Sarvodaya Suwa Setha); and 4 335 pre-schools serving over 98 000 children; among others.

Information is collected about the EOI and the staff members consult with senior staff as to whether to issue a notification to the community or communities at risk.

Another influential factor in the CAP profile relates to the prioritization of messages. The Hazard Information Hub is experimenting with a system that combines the CAP elements `<urgency>`, `<severity>`, and `<certainty>` in a bundled configuration. This means that these elements are used together in combination to create a profile for the message rather than asking recipients to evaluate each element separately, which was felt would complicate the message. In effect, each message priority is defined by preset values for each of the three CAP elements as noted in the following table.

Table 1: Message prioritization with bundled CAP elements

`<urgency>immediate</urgency>` `<severity>extreme</severity>` `<certainty>observed</certainty>`	`<urgency>expected</urgency>` `<severity>severe</severity>` `<certainty>observed</certainty>`	`<urgency>expected</urgency>` `<severity>moderate</severity>` `<certainty>observed</certainty>`
This bundle means "Urgent" priority	This bundle means "High" priority	This bundle means "Low" priority

Urgent priority messages are issued when the life or safety of a community is at immediate risk and when the danger is of catastrophic proportions. First responders are encouraged to immediately activate local response plans according to the threat. Tsunami reports demonstrate the need and importance of issuing an urgent priority message.

High priority messages are issued when the safety of a community is possibly at risk and when first responders must be informed of the situation. Communities are encouraged to stand by to activate local response plans. Reports of a large earthquake off the coast of Indonesia, for example, would be cause for issuing a high priority message, possibly followed by an urgent priority message if a tsunami was later reported.

Low priority messages are issued when a community may be at risk due to a developing hazard and when local first responders need to be made aware of the situation and provided with information to relay to their communities. A contagious disease outbreak in a nearby district might be cause for a low priority message to be issued.

The aim of bundling of CAP elements into message profiles is to relieve local first responders of the burden of translating three separate variables into meaningful action. While these elements are clearly important to give precision to warnings, conditions in Sri Lanka with the HazInfo Project are such that this requirement in the CAP standard might be confusing for local first responders and lead to delays or misinterpretations of messages. Instead, software at the Hazard Information Hub or elsewhere in the system can be programmed to interpret the messages for the first responders and to automatically codify them according to the priority intended. Codification could be done either by alarm tone, colour, or with written text indicating the priority of the message.

3.3 The issue of languages

The HazInfo Project must relay messages in three languages, imposing another consideration on the CAP profile. Sarvodaya's communications are in English, Tamil and Sinhalese and warning information should be sent in all three languages. To address this requirement, each message is issued with three `<info>` blocks, identical in content with the human-readable elements in each of the three languages. The element `<language>` is defined by ISO 639-2 codes into en/si/ta (English, Sinhalese, Tamil). For the time being, all elements in the `<alert>` block are in English only. Figure 2 shows the CAP message structure proposed for the HazInfo Project.

Translation can be predefined in most of the CAP sub-elements; however, any text to be used in the <description> element will require some translation by hand. To complicate the situation somewhat is the

fact that both Sinhalese and Tamil do not use standard character sets and require special treatment for presentation on user devices. The company Microimage has specialized in this requirement and has been working with Dialog Telekom to enable mobile phones and other devices to handle the special scripting of the local languages. Dialog Telekom is providing wireless and mobile technology support for the HazInfo Project, and linguistic interoperability is being assessed as one of the effectiveness indicators in field trials with the Hazard Information Hub.

Figure 2: CAP message structure for the HazInfo Project

```
                          ┌──────────────────────────────────┐
                          │ alert                            │
                          │ <incidents>                      │
                          │ <identifier>                     │
                          │ <sender>                         │
                          │ <sent>                           │
                          │ <status>                         │
                          │ <msgtype>                        │
                          │ <scope>                          │
                          └──────────────────────────────────┘

  ┌─────────────────┐  ┌─────────────────┐  ┌─────────────────┐
  │ info            │  │ info            │  │ info            │
  │ <language> "ta" │  │ <language> "si" │  │ <language> "en" │
  │ <category>      │  │ <category>      │  │ <category>      │
  │ <event>         │  │ <event>         │  │ <event>         │
  │ <urgency>       │  │ <urgency>       │  │ <urgency>       │
  │ <severity>      │  │ <severity>      │  │ <severity>      │
  │ <certainty>     │  │ <certainty>     │  │ <certainty>     │
  │ <description>   │  │ <description>   │  │ <description>   │
  │                 │  │                 │  │                 │  ┌──────────────────┐
  │                 │  │                 │  │                 │  │ resource         │
  │                 │  │                 │  │                 │  │ <resourceDesc>   │
  │                 │  │                 │  │                 │  └──────────────────┘
  │                 │  │                 │  │                 │  ┌──────────────────┐
  │                 │  │                 │  │                 │  │ area             │
  │                 │  │                 │  │                 │  │ <areaDesc>       │
  └─────────────────┘  └─────────────────┘  └─────────────────┘  └──────────────────┘
```
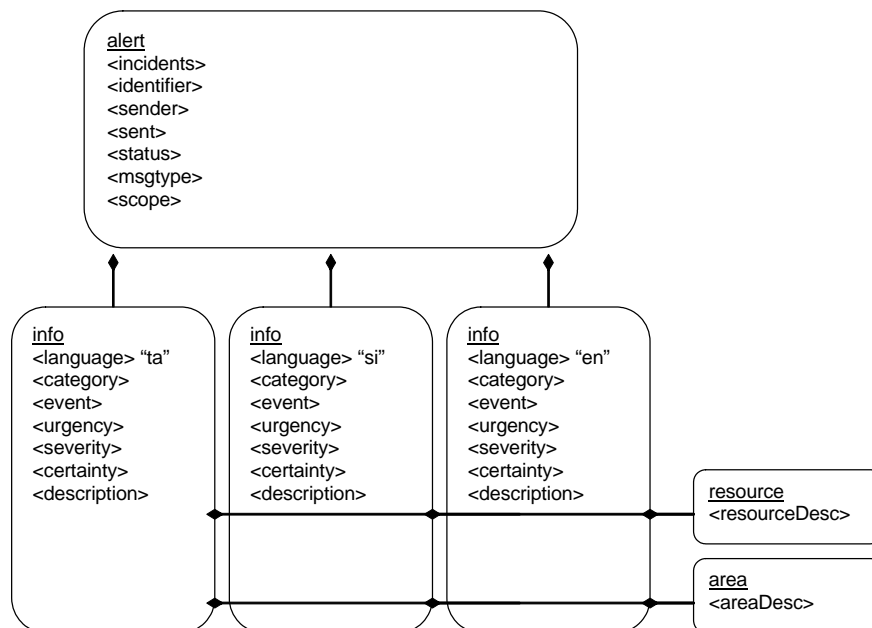
3.4   Preliminary results and discussion

Logistical problems delayed the initial distribution and activation of technology for some of the communities participating in the project but work continues and silent tests of the system began in September 2006. Early results with the satellite radio component show promise but reliability remains a concern and work continues on this aspect.

An important and unresolved need for the HazInfo project is the development of a CAP "broker" software that will provide a single portal for the dissemination of CAP messages across the network. At present, staff members at the Hazard Information Hub must enter the content of messages into multiple CAP software interfaces to ensure coverage for all last-mile technologies. However, the Lanka Software Foundation has made available an open source disaster management platform called Sahana, which includes a simple CAP module. This means that this new CAP module together with the other core modules of Sahana are now available for use in developing countries and may in fact be further improved over time as local developers, including those with the HazInfo Project, gain experience with the use of CAP for local hazard information systems.

Another central challenge for this grassroots-based initiative is that the community first responders working with the HazInfo Project are not professional emergency managers. As a result, implementations of the system including the CAP profile must take into account the limitations of message recipients. While CAP does afford considerable precision and flexibility in terms of handling various parameters associated with an alert message, this level of detail is not necessary for all cases. In fact, in some instances too much detail may result in problems for first responders trying to interpret and act on messages. Preliminary results indicate in fact that one of the most important features of the CAP standard is the optional <description> element. This

element can contain a simple text-based description of the event, which in most cases is all that is needed. However, it is also important to note that many last-mile technologies, such as mobile phones, have limited capability for displaying text, which means that descriptions must be carefully crafted if they are to be effective. In certain cases it may only be possible to provide a brief notification of a hazard using a CAP message, but using this to advise recipients to seek out another source (e.g., radio or TV) for more details.

Another significant challenge faced by community organizations such as Sarvodaya is identifying best practices and emerging conventions in the use of CAP. At the time the CAP profile was initially drafted for the HazInfo Project in mid 2006, it was difficult to identify documentation that would support the transfer of best practices for the project's unique institutional arrangement. Moreover, there is some concern about path dependency when implementing a CAP profile with little sense of how decisions today might constrain future efforts at regional expansion and future interoperability with other CAP-based systems.

In considering the long-term sustainability of the HazInfo Project, there is an opportunity to see the Common Alerting Protocol as one enabler in a self-organizing web of community-based hazard information networks in the region. CAP offers a sound framework for linking technological systems, but it must be married to a functioning governance structure if trust is to be established and if information is have credibility as it flows across borders and into community organizations. In this respect, administrative procedures and certification for user authorization and authentication are vital.

4 Suggestions for immediate actions to implement the Common Alerting Protocol (CAP) content standard

4.1 Introduction

In every society, at every level from local to international, actions to implement the CAP standard can be taken immediately: by government and other public sector agencies; by private sector and commercial organizations; by academic programmes; and by a broad range of non-governmental organizations. There is strong consensus on the usefulness of the CAP standard, and important sources of crucial alerts in CAP format are available as well (e.g., worldwide earthquake alerts published by the U.S. Geological Survey). Therefore, each implementation action will provide immediate benefit in its particular domain and locale, while each implementation action will also contribute to the build-out of a standards-based, all-hazards and all-media public warning infrastructure on local, national, international and global scales.

The following paragraphs in this section provide some suggestions for immediate action, presented separately by roles that organizations may have with regard to the use of ICTs in disaster management.

4.2 Policy-makers, regulators and telecommunication operators

There are many interacting parties involved in the provision of telecommunication services to modern societies, at all levels from local to national, international and global. These parties are affected by a broad range of law, policies, rules and business practices. Adoption of the content standard for public warning will proceed most quickly and smoothly wherever common policies can be attuned to promote the all-hazards and all-media approach to public warning.

Suggestions for immediate action: Explore policy actions that serve to promote the all-hazards, all-media approach to public warning, and specifically the dissemination of public alert messages in CAP format. In most cases, the immediate challenge will be to educate key organizations and agencies as to the potential of this approach, not only from a public policy perspective but from a market opportunity perspective as well. It may also be useful to form multiparty working groups at a regional level to coordinate among stakeholders.

4.3 Sources of public warnings

In the public sector, potential sources of public alert messages in CAP format include government agencies and other alerting authorities responsible for detection of natural and man-made hazard events. These authoritative sources are responsible for a wide range of alert messages, including but not limited to: weather, earthquakes, police and public protection, aviation, traffic and transportation conditions, health (medical emergencies, disease warnings, air quality, water quality, beach closings, ultraviolet warnings),

environmental (oil spills, beach closings, invasive species alerts). Outside of the public sector are many other potential sources of public warnings in CAP format, including utilities, ambulance services, hospitals, schools, insurance providers, hotel chains, and shipping companies, among others.

Suggestions for immediate action: Within existing policy mandates, implement dissemination of public alert messages in CAP format, typically on the public Internet and with a Rich Site Summary (RSS) news feed. Of course, other approaches may be needed for rapid dissemination of time-critical alerts, and each CAP implementation should supplement current dissemination methods of alerts. Provision of CAP alerts may be offered directly by the alerting source, or through intermediaries. In any case, subscriber access to the CAP alerts should include one of the common mechanisms to assure authenticated delivery and evidence of authority. It is important that sources are quite clear as to the extent of authority for issuing alerts to particular localities.

4.4 Receivers of public warnings

Potential receivers of public alert messages in CAP format include: emergency services and emergency equipment providers (siren and public address system vendors, vendors of components for Emergency Operations Centres); international and intergovernmental organizations, and non-governmental organizations (NGOs) involved in humanitarian response.

Suggestions for immediate action: Within existing policy mandates, implement procedures to receive public alert messages in CAP format. The implementation should supplement current dissemination methods, and should make use of the common mechanisms to assure authenticated delivery and evidence of authority.

4.5 Intermediaries for public warnings

Potential intermediaries of public alert messages in CAP format include parties operating on the local, national, international and global scales, including: news organizations; commercial television and radio networks; amateur radio operators; satellite broadcasters; cable networks; and a range of telecommunication service providers, including Internet service providers as well as wired or wireless telephone and related services.

Suggestions for immediate action: Add features and develop products and services that handle CAP alert messages, with mechanisms for authenticated delivery and automated processing. Network service and product providers may provide filtering and routing services or products that transmit public alert messages in CAP format from authoritative public alerting sources or authoritative retransmission agents.

4.6 Other infrastructure components for public warning

Potential providers of infrastructure for public alert messages in CAP format include: authorization and authentication service providers; ICT hardware and software vendors; ICT service providers; and vendors of mapping software, location-aware technology, and geographic information systems, among others.

Suggestions for immediate action: Authorization and authentication service providers may develop products and services that provide mechanisms for end-to-end assurance of authenticity and evidence of authority, validated for handling of alert messages in CAP format during emergency situations. ICT hardware, software and services vendors may add features that handle CAP alert messages, with mechanisms for authenticated delivery and automated processing where appropriate. ICT devices and software could feature geographic display of emergency information by targeted area using streams of alert messages in CAP format.

4.7 Other actors in disaster management

Certain communities may have an especially strong interest in the implementation of CAP. For instance, alert messages in CAP format are being used to create specialized warning messages for persons with disabilities. Other actors with a role in disaster management who may be involved to some degree with public alert messages in CAP format include: politicians, building code regulators, city planners and

academic programmes in research areas such as emergency management, public policy, social science, information technology and communications technology.

Suggestions for immediate action: The immediate challenge is to educate these other actors about the emergence of a standards-based, all-media, all-hazards public warning infrastructure on the national, regional, and global scales. There are many opportunities to leverage the warning infrastructure for commercial gain as well as for the public good.

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Annex I – Question 22/2: Utilization of ICT for disaster management, resources, and active and passive space-based sensing systems as they apply to disaster and emergency relief situations

I.1 Statement of the situation

In light of the recent natural and man-made disasters that have occurred, great attention and effort have been directed towards the application of radiocommunications for the purpose of disaster prediction, detection and mitigation.

On 14 February 2005, the Director of the Radiocommunication Bureau issued a letter to the chairmen of the ITU-R study groups noting the important role of radiocommunications, including remote sensing, in addressing disasters, and inviting them to review the activities within their study groups that have a bearing on the topic.

The Tunis Agenda for the Information Society, in § 91, recognizes and identifies many important elements that need to be addressed in the application of communications in the area of disaster prediction, detection and mitigation.

ITU-D has developed two products with regard with the subject of disaster mitigation and relief. The first is Recommendation ITU-D 13-1[A1], *Effective utilization of the amateur services in disaster mitigation and relief operations*. It recommends that administrations include the amateur services in their national disaster plans, reduce barriers to effective use of the amateur services for disaster communications, and develop memoranda of understanding (MoU) with amateur and disaster relief organizations.

The second is the *Handbook on Emergency Telecommunications* published in 2005. This handbook summarizes technical issues that characterize the current field of telecommunications. The handbook is intended to be comprehensive and compact, and to provide useful factual information that is concise and organized for easy access.

There is a need for the development of a conceptual ICT disaster-oriented framework that will be used in the ITU-D studies related to disaster management, and in addition provide information on the effective use of ICTs and the efficient dissemination of disaster-associated information. Also, ITU-D has not yet examined the comprehensive use of ICTs, including active and passive space-based sensing systems, for the purpose of disaster prediction, detection and mitigation, although their potential is recognized at the following URL: http://www.itu.intITU-D/projects/environment/present.html.

Furthermore, developing countries and least developed countries are lacking in disaster management expertise. ICT development can be leveraged to assist in the mitigation of disasters and to assist in relief operations. ITU-D can assist and guide the developing nations in building a comprehensive disaster mitigation plan and promote international cooperation in the time of disasters through a coordinated effort at international level.

I.2 Question for study

1) Identification of the activities in relevant organizations related to the use of active and passive space-based sensing systems for the purpose of disaster prediction, detection and mitigation. Identification and examination of active and passive sensing system applications for their effect in enhancing disaster mitigation. Examination of ICTs and current and foreseeable active and passive space-based sensing operations, for the purpose of assisting affected countries with integrating their relevant products into a disaster prediction, detection and mitigation telecommunication infrastructure.

2) Examination of the role that administrations and relevant disaster mitigation organizations have in addressing disaster management and their effective use of ICT.

3) Examination of how ICTs can be utilized to develop disaster management plans for use in disaster and/or emergency situations. Furthermore, coordinating with ITU-T study groups and providing proposed recommendations/guidelines for a "Content Standard" to be used for all alerts and notifications regarding disasters and emergency situations. Working with the Working Group on Emergency Telecommunications

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[A1] Latest version of the Recommendation.

(WGET) to develop and propose suggestions/recommendations on the implementation of the Tampere Convention. Maintaining a minimum level of inventory related to telecommunications to be shared among countries when disasters strike.

I.3   Expected output

The output of the Question will provide administrations with information on the establishment or modernization of national or regional disaster management systems and plans. In collaboration with ITU-T, a report will be provided on guidelines for a "Content Standard". Working with the WGET, suggestions/recommendations will be developed and proposed on the implementation of the Tampere Convention. Annual progress reports will be made indicating the status of the selected topics and, where completed, an indication will be given of how the outputs can be obtained. A conceptual ICT disaster-oriented framework will be developed that will be used in the ITU-D studies related to disaster management and will provide information on the effective use of ICTs and the efficient dissemination of disaster-associated information. In addition, a report will be developed, providing a survey of active and passive space-based sensing systems and applications that can be used for the purpose of disaster prediction, detection and mitigation. Later, this report will be supplemented with an annex providing a review of the sensor applications for their usefulness for the administrations of ITU-D members. Lastly, the report will be followed by an additional report, summarizing options for making relevant remote-sensing products available in the most appropriate manner to administrations that would benefit.

I.4   Timing

I.4.1   Annual progress reports should be submitted to Study Group 2.

I.4.2   Draft final reports and any proposed draft recommendations/guidelines should be submitted to Study Group 2 within four years.

I.4.3   The Rapporteur's Group will work in collaboration with BDT Programme 6 and ITU-T.

I.4.4   The activities of the Rapporteur's Group will come to an end within four years.

I.5   Proposers

APT, CITEL, RCC

I.6   Sources of input

1)   As identified in Question 9-1/2.

2)   Examination of the activities of other relevant organizations such as, but not limited to, the World Meteorological Organization (WMO) and the Space Frequency Coordination Group (SFCG), with a view to monitoring those activities relevant to the use of active and passive space-based sensing systems for the purpose of disaster prediction, detection and mitigation.

3)   International and regional organizations responsible for disaster and emergency communications.

4)   Discussion in the relevant ITU-D study group.

I.7   Target audience

Due to the potentially far-reaching implications of the results of this Question, the entire audience matrix are targets.

a)   Target audience

Depending on the nature of the output, upper- to middle-level managers from operating authorities and regulatory bodies in developed, developing and least developed countries will be the predominant users of the output.

b)   Proposed methods for the implementation of the results

The results of the Question are to be distributed through ITU-D reports.

Target audience	Developed countries	Developing countries	Least developed countries (LDCs)
Telecom policy-makers	Yes	Yes	Yes
Telecom regulators	Yes	Yes	Yes
Service providers/operators	Yes	Yes	Yes
Manufacturers	Yes	Yes	Yes

I.8   Proposed methods of handling the Question

I.9   Coordination

The ITU-D study group dealing with this Question will need to coordinate with:

– Relevant ITU-R and ITU-T study groups

– Relevant focal points in BDT

– Coordinators of relevant project activities in BDT

– Working Group on Emergency Telecommunications (WGET)

– Regional and scientific organizations with mandates covering the subject matter of the Question.

I.10   Other relevant information

As may become apparent within the life of this Question.

Annex II – Resolution 34 (Rev. Doha, 2006)

The role of telecommunications/information and communication technology in early warning and mitigation of disasters and humanitarian assistance

The World Telecommunication Development Conference (Doha, 2006),

recalling

Resolution 34 (Istanbul, 2002) and Recommendation 12 (Istanbul, 2002) of the World Telecommunication Development Conference (WTDC),

considering

a)   that the Intergovernmental Conference on Emergency Telecommunications (Tampere, 1998) (ICET-98) adopted the Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations (Tampere Convention) and that this convention came into force in January 2005;

b)   that the second Tampere Conference on Disaster Communications (Tampere, 2001) (CDC-01) invited ITU to study the use of public mobile networks for early warning and the dissemination of emergency information and the operational aspects of emergency telecommunications such as call prioritization;

c)   that the World Radiocommunication Conference (Geneva, 2003) in its Resolution 646 encouraged administrations to satisfy temporary needs for frequencies in emergency and disaster relief situations, to utilize both existing and new technologies for public protection and disaster relief and to facilitate cross-border circulation of radiocommunication equipment intended for use in emergency and disaster relief situations through mutual cooperation and consultation without hindering national legislation;

d)   the potential of modern telecommunication technology as a basic tool for disaster mitigation and relief;

e)   the terrible disasters from which many countries suffer, in particular the tsunami disaster that struck many developing countries;

f)   that the next international conference on emergency communications 2006 (ICEC-2006) will be held in Tampere, Finland, 19-20 June 2006,

noting

a)   that activities are being undertaken at the international, regional and national levels within ITU and other relevant organizations to establish internationally agreed means to operate systems for public protection and disaster relief on a harmonized and coordinated basis;

b)   that the capability and flexibility of all telecommunication facilities depend upon appropriate planning for the continuity of each phase of network development and implementation,

further noting

the latest version of the ITU Telecommunication Development Sector (ITU-D) Handbook on Disaster Communications and the adoption of Recommendation ITU-D 13 (Rev.2005) on "Effective utilization of the amateur services in disaster mitigation and relief operations",

recognizing

that the recent tragic events in the world clearly demonstrate the need for high-quality communications services to assist public safety and disaster relief agencies in minimizing risk to human life and to cover the necessary general public information and communication needs in such situations,

resolves

to invite ITU-D to continue to ensure that proper consideration be given to telecommunications for disaster warning and disaster situations as an element of telecommunication development, including, in close

coordination and collaboration with the ITU Radiocommunication Sector (ITU-R) and the ITU Telecommuniation Standardization Sector (ITU-T) and other relevant international organizations, by facilitating and encouraging the use of decentralized means of communications that are appropriate and generally available, including those provided by the amateur radio service and satellite and terrestrial network services,

instructs the Director of the Telecommunication Development Bureau

1   to support administrations in their work towards the implementation of this resolution and of the Tampere Convention;

2   to report to the next world telecommunication development conference on the status of implementation of that Convention;

3   to support administrations and regulators in the recommended activities by incorporating appropriate measures during the implementation of the Doha Action Plan,

requests the Secretary-General

to continue to work closely with the office of the United Nations Emergency Relief Coordinator and other relevant external organizations with a view to further increasing the Union's involvement in, and support to, emergency communications, and to report on the outcome of related international conferences and meetings so that the Plenipotentiary Conference (Antalya, 2006) may take any action that it deems necessary,

invites

1   the United Nations Emergency Relief Coordinator and the Working Group on Emergency Telecommunications and the other relevant external organizations or bodies to collaborate closely with ITU in work towards implementing this resolution and the Tampere Convention, and supporting administrations and international and regional telecommunication organizations in the implementation of the convention;

2   administrations to deploy all necessary efforts to persuade telecommunication service providers to make available their infrastructure in the event of disasters;

3   regulators to ensure that disaster mitigation and relief operations include the provision of necessary telecommunications, through national regulatory rules;

4   ITU-D to expedite the study of aspects of telecommunications related to flexibility and continuity in the event of disasters;

5   administrations that have not yet ratified the Tampere Convention to take necessary action do so as appropriate.

Annex III – Resolution 136 (Antalya, 2006)

The use of telecommunications/information and communication technologies for monitoring and management in emergency and disaster situations for early warning, prevention, mitigation and relief

The Plenipotentiary Conference of the International Telecommunication Union (Antalya, 2006),

recalling

a)   Resolution 36 (Rev. Antalya, 2006) of the Plenipotentiary Conference on telecommunications/information and communication technologies (ICTs) in the service of humanitarian assistance;

b)   Resolution 34 (Rev. Doha, 2006) of the World Telecommunication Development Conference (WTDC) on the role of telecommunications/ICT in early warning and mitigation of disasters and humanitarian assistance;

c)   Resolution 48 (Doha, 2006) of WTDC on strengthening cooperation among telecommunication regulators;

d)   Resolution 644 (Rev.WRC-2000) of the World Radiocommunication Conference (Istanbul, 2000) on telecommunication resources for disaster mitigation and relief operations;

e)   Resolution 646 (WRC-03) of the World Radiocommunication Conference (Geneva, 2003) on public protection and disaster relief;

f)   the emergency telecommunication/ICT coordination mechanisms established by the United Nations Office for the Coordination of Humanitarian Affairs,

taking into account

Resolution 60/125 on International cooperation on humanitarian assistance in the field of natural disasters, from relief to development, adopted by the United Nations General Assembly in March 2006;

noting

a)   § 51 of the Geneva Declaration of Principles adopted by the World Summit on the Information Society (WSIS) on the use of ICT applications for disaster prevention;

b)   § 20 (c) of the Geneva Plan of Action adopted by WSIS, on e-environment, which calls for the establishment of monitoring systems, using ICTs, to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, least developed countries and small economies;

c)   § 30 of the Tunis Commitment adopted by WSIS, on disaster mitigation;

d)   § 91 of the Tunis Agenda for the Information Society adopted by WSIS, on disaster reduction,

e)   the effective coordination work of the Partnership Coordination Panel for Telecommunication for Disaster Relief and Mitigation (PCP-TDR), led by the ITU Telecommunication Standardization Sector;

considering

a)   the devastation suffered from disasters around the world, particularly in developing countries that may suffer disproportionately due a lack of infrastructure and, therefore, have the most to gain from information on the subject of disaster prevention, mitigation and relief efforts;

b)   the potential of modern telecommunications/ICTs to facilitate disaster prevention, mitigation and relief efforts;

c)   the ongoing cooperation between ITU study groups and other standards development organizations dealing with emergency telecommunications, alert and warning systems,

recognizing

a)   the activities being undertaken at the international and regional levels within ITU and other relevant organizations to establish internationally agreed means for the operation of systems for public protection and disaster relief on a harmonized and coordinated basis,

b)   the ongoing development by ITU, in coordination with the United Nations and other United Nations specialized agencies, of guidelines for applying the international content standard for all-media public warning in all disaster and emergency situations,

c)   the contribution of the private sector in the prevention, mitigation and relief of emergency and disaster situations which is proving to be effective;

d)   the need for a common understanding of the network infrastructure components required to provide rapidly installed, interoperable, robust telecommunication capabilities in humanitarian assistance and disaster relief operations;

e)   the importance of working towards the establishment of standards-based monitoring and worldwide early-warning systems, based on telecommunications/ICTs, that are linked to national and regional networks and that facilitate emergency disaster response all over the world, particularly in high-risk regions;

f)   the role that the ITU Telecommunication Development Sector can play, through such means as the Global Symposium for Regulators (GSR), in collecting and disseminating a set of national regulatory best practices for telecommunication/ICT facilities for disaster prevention, mitigation and relief,

convinced

that an international standard for communication of alert and warning information can assist in the provision of effective and appropriate humanitarian assistance and in mitigating the consequences of disasters, in particular in developing countries,

resolves to instruct the Directors of the Bureaux

1   to continue their technical studies and to develop recommendations, through the ITU study groups, concerning technical and operational implementation, as necessary, of advanced solutions to meet the needs of public protection and disaster relief telecommunications/ICTs, taking into account the capabilities, evolution and any resulting transition requirements of existing systems, particularly those of many developing countries, for national and international operations;

2   to support the development of robust, comprehensive, all-hazards emergency and disaster early-warning, mitigation and relief systems, at national, regional and international levels, including monitoring and management systems involving the use of telecommunications/ICTs (e.g. remote sensing), in collaboration with other international agencies, in order to support coordination at the global and regional level;

3   to promote implementation by appropriate alerting authorities of the international content standard for all-media public warning, in concert with ongoing development of guidelines by all ITU Sectors for application to all disaster and emergency situations;

4   to continue to collaborate with organizations that are working in the area of standards for emergency telecommunications/ICTs and for communication of alert and warning information, in order to study the appropriate inclusion of such standards in ITU's work and their dissemination, in particular in developing countries,

encourages Member States

1   in emergency and disaster relief situations, to satisfy temporary needs for spectrum in addition to what may be normally provided for in agreements with the administrations concerned, while seeking international assistance for spectrum coordination and management, in accordance with the legal framework in force in each country;

2   to work in close collaboration with the Secretary-General, the ITU Bureaux, as well as emergency telecommunications/ICT coordination mechanisms of the United Nations in the development and

dissemination of tools, procedures and best practices for the effective coordination and operation of telecommunications/ICTs in disaster situations;

3　　　　to facilitate the use by emergency organizations of both existing and new technologies and solutions (satellite and terrestrial), to the extent practicable, in order to satisfy interoperability requirements and to further the goals of public protection and disaster relief;

4　　　　to develop and support national and regional centres of excellence for research, pre-planning, equipment pre-positioning and deployment of telecommunication/ICT resources for humanitarian assistance and disaster relief coordination,

　　　　invites the Secretary-General

to inform the United Nations and the United Nations Office for the Coordination of Humanitarian Affairs of this resolution.