Telecommunications and Information Technology standards for disaster relief and early warning

Simão Campos – simao.campos@itu.int
ITU Telecommunication Standardization Bureau

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Outline

- Introduction
- ITU work, present and future
  - Radiocommunication Sector
  - Telecommunication Standardization Sector
  - Future work
- Non-ITU activities
- Conclusions

→ *Additional material*

Introduction

ITU Overview

Helping the World Communicate

191 Member States
700+ Sector Members
100+ Associates

ITU-T

Telecommunication standardization of network and service aspects

ITU-D

Assisting implementation and operation of telecoms in developing countries

ITU-R

Radiocommunication standardization and global radio spectrum management

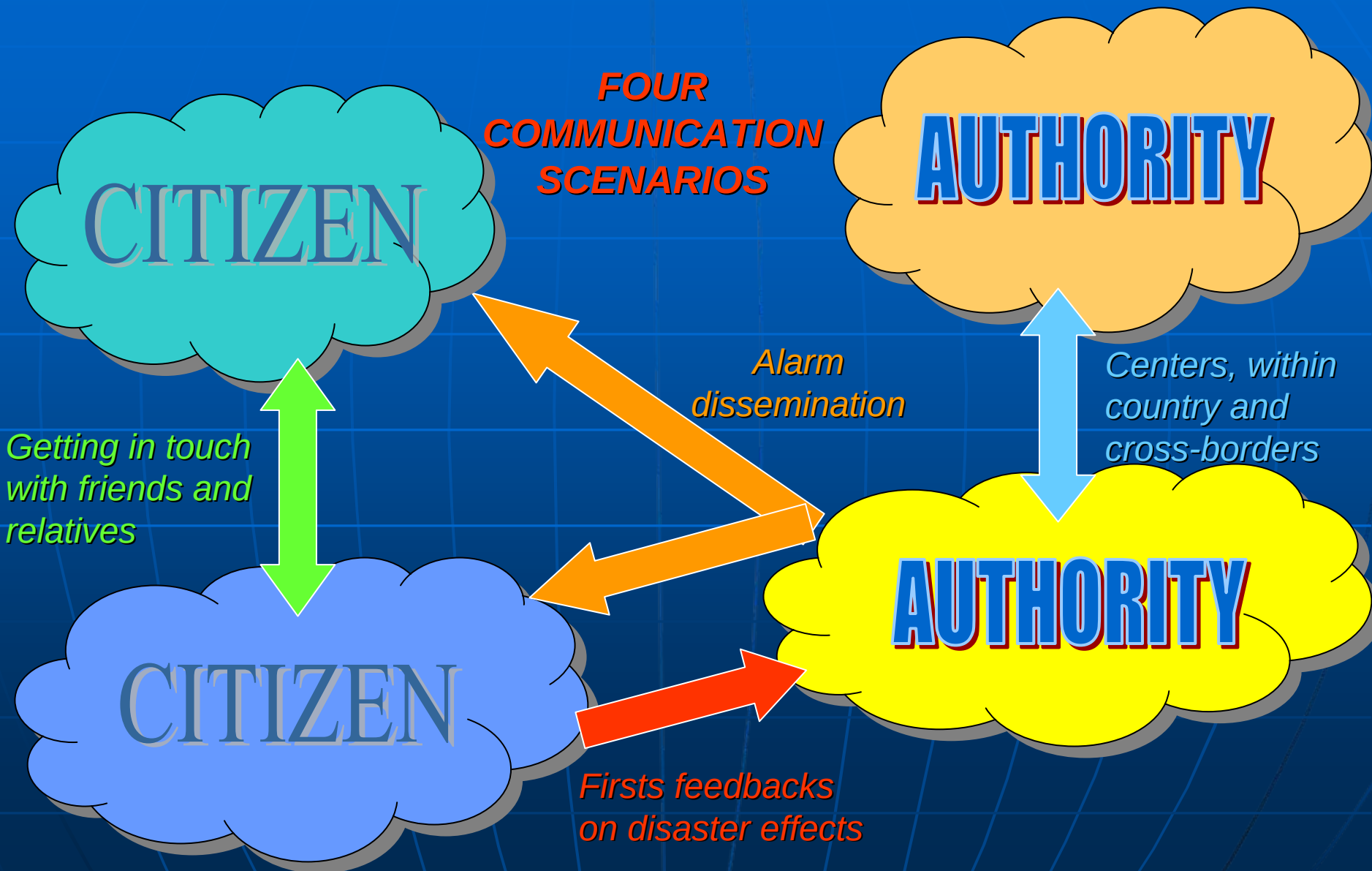
Helping the world communicate

Four committing words in TDR/ETS/EWS, even more so in distress situations!

- Long-time work on telecom for emergency situations
  - *Morse code …(it was a long time ago…)*
  - *GMDSS (Global Maritime Distress and Safety System)*

- Recent examples (non-exhaustive)
  - *Tampere Convention*
  - *Deployment of free satellite terminals after the Tsunami (Dec 04), Pakistan earthquake (Oct 05), Suriname floods (May 06)*
  - *WTDC-06 (World Telecom. Development Conference) Res.34 and PP-06 (Plenipotentiary Conference) Res.36: specific instructions*
  - *WRC-03 (World Radiocommunication Conference): reserved spectrum for emergency communications*
  - *Ongoing work on WSIS follow-up implementation for Action Line C-7*
  - *Standardization work on call priority and message broadcast*

Scenarios during disasters



Standards: centered on the user

- Solutions need to be engineered taking into account user's behavior
- Ease: systems easy to use, messages easy to understand
- Accessibility: Multilingual support, multiple output method (e.g. text-to-speech)
- Security: systems robust against tampering, message reliability (need for corroboration, safeguard against false alarms)
- Action oriented: messages should be accurate, specific

Caveat emptor: What are “standards”?

- ISO definition for (Formal) Standards
  - Standards are documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines or definitions of characteristics, to ensure that materials, products, process and services are fit for their purpose
  - Developed by Consensus
- Standards in *Lattu sensu*: dominant designs are frequently called as “standards”, but they are **not** open standards
- Need clear distinction when talking about standards
  - In this presentation: “Standards” → “Formal Standards”

→ Note: ITU standards are called “Recommendations”

ITU work to-date – Radiocommunication Sector

Disaster phases and the radio services involved

- **Disaster prediction and detection** – meteorological and Earth exploration satellite services
- **Disaster alerting** – broadcast, fixed, mobile and related satellite services
- **Disaster relief** – amateur, earth exploration, broadcast, fixed, mobile and related satellite services

ITU-R Existing material

- Cross-border circulation of radio equipment:
  - WRC-03 Res. 646
  - ITU-R Rec. M.1637
- Global circulation of 3G terminals
  - ITU-R Rec. M.1579
- Regionally harmonized frequency bands for emergency / TDR
  - WRC-03 Res. 646's *Region 3*:
    406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz,
    4 940-4 990 MHz and 5 850-5 925 MHz;
- Amateur and amateur-satellite services
  - ITU-R Rec. M.1042-2
- Objectives and needs for future PPDR systems circa 2010
  - ITU-R Report M.2033

ITU work to-date – Telecommunication Standardization Sector

ITU-T existing material [1]

- *A lot of emphasis on protecting the infrastructure*
- Installation, Maintenance, Protection and Restoration techniques for a sturdy outside plant
  - (Handbooks and L-series Recommendations)
- International Emergency Preference Scheme (IEPS)
  - E.106: Call preference scheme over the PSTN
  - H- and Q-series *Signaling* requirements to support IEPS
  - H-series protocol support for IEPS (H.246, H.248.44)
- Preference scheme defined for two families of IP-based systems standardized by ITU:
  - H.323 Multimedia & VoIP (ITU-T H.460.4 & H.460.14)
  - IP-Cablecom (ITU-T J.260)
- Message broadcast capability for IP-based systems
  - Done for H.323 Multimedia & VoIP (ITU-T H.460.21)
- Media-coding Recommendations
- Q-series Supplement 47 (2003) for emergency services for IMT-2000 networks
- X.805 to provide security architectural framework applicable to TDR/EW systems

ITU-T existing material [2]

- E.409 incident organization and security incident handling: guidelines
- Security Manual
- Discussion on extension of the preference scheme to packet technologies (IP in particular)
  - Workshop held in February 2002
  - Creation of an electronic joint panel with industry, governments, intergovernmental organizations and NGOs called “PCP-TDR” (Partnership Coordination Panel of Telecom for Disaster Relief)
  - Creation of work items in the technical committees (“Study Groups”)
- Overview of the basic requirements, features, and concepts for emergency telecoms for NGN (ITU-T Y.1271)
- ITU-T TDR/EW Standardization Action Plan

ITU-T Study Groups – main issues on the way ahead

- Identify existing ITU-T resources in support of TDR/EW, e.g. Recommendations, handbooks, manuals
- Identify areas for extension of existing systems and respective Recommendations
- Promotion of the existing resources and of future activities
- Encourage participation of users in the ITU-T standardization work
- Promotion of the PCP-TDR "Partnership coordination panel on telecommunications for disaster relief and mitigation"
- Definition of ITU-T Study Group 2 "Operational aspects of service provision, networks and performance" as Focal Point for TDR/EW issues

Future ITU Work

How the work progresses?

- ITU's work is contribution driven:
  no contributions → no progress
  - *Contribution: technical proposals from varied sources that are discussed and integrated towards full / complete system specifications*
- Trend for initial focus to be on improving what already exists, in order to be implementable in a short time-frame
- Governments, users (*including intergovernmental agencies and NGOs*), manufacturers need to bring in proposals and requirements to enhance the features of existing systems
- **Requirement inputs from user groups are needed and very much welcome**
  - **Guide and focus ITU's work**

Radiocommunication

- Study the protection and spectrum needs of advanced meteorological/Earth exploration satellite systems (WRC-07)
- Study implementation technologies for disaster alerting and disaster relief communications solutions
- Revise and update the Report on PPDR (Public Protection and Disaster Relief) systems and characteristics in line with operational and technology developments

Radiocommunication Services

- Predominantly mobile services operated mainly by government public protection agencies but also by commercial service providers
  - WP 8D is in the early stages of drafting a Recommendation on use of Mobile Satellite Services for emergency communications
- Fixed Services
  - Point-to-point applications
  - Fixed-wireless access type applications
- Amateur Services long history in assisting during emergencies and disaster events

Standardization Sector

- Add-ons to existing system specifications:
  - System override for emergency message broadcast: audio, audiovisual, text
    - First version done for H.323 VoIP/Multimedia systems → H.460.21
  - Extension of short text messaging to fixed telephones (circuit-switched and IP/soft-phones)
  - Definition of methods to address multiple languages and communication for people with disabilities, in particular for IP-based systems
- Framework for interconnection of priority schemes across the different systems (PSTN and different IP platforms, e.g. H.323, IP-Cablecom, SIP) and across proprietary/ privileged systems
- Adoption and support of the Common Alert Protocol (CAP)
- Definition of a E.164 special country code for emergency communications under the responsibility of the UN

Common Alert Protocol (CAP)

- Standard alert message format that can be used for a wide range of alert types
  - Including early warning and dissemination
- Developed originally by OASIS
  - Good acceptance by industry and user communities
- Currently: work item to be formally accepted within ITU-T SG 17 (*Security, languages and telecommunication software*)
  - Approval expected early 2008
- Next:
  - Support of CAP in ITU-T defined systems
  - Refinements to the spec

CAP details

- Fields include:
  - Date/Time, sender, message type & status
  - Purpose (alert, update, error, cancel, etc)
  - Appropriate use (actual, exercise, test)
  - Dissemination scope (public, restricted, private)
  - Specific geographical distribution area(s)
  - Recommended action, supplemental information
- Multi-language, multi-discipline (geo, met, rescue, etc)
- 3D priority model: Urgency (timeframe)/ severity (importance)/ certainty (probability)
  - Timeframes for action (immediate, expected, past, future, unknown)
- Supports attachments, but URIs are preferred
- More information:
  - http://itu.int/ITU-T/worksem/ictspw/presentations/s1p1-botterell.pdf
  - http://oasis-open.org/specs/index.php#capv1.1

Non-ITU activities

Regional systems

- ETSI TETRA (*Terrestrial Trunked Radio*)
  - Tailored to Professional Mobile Radio applications (e.g. Public Safety, Utilities, Transportation, Commercial & Industry, etc)
- Partnership Project MESA
  - International partnership producing globally applicable technical specifications for digital mobile broadband technology, aimed initially at the sectors of public safety and disaster response
  - Organizational Partners: ETSI & TIA; Observers: TTA (Korea), ISACC (Canada)

Regional activities

- ETSI EMTEL (Emergency communications)
  - TS 102 181: Requirements for communications between authorities during emergencies
  - TS 102 182: Requirements for communications from authorities to citizen during emergencies
  - TS 102 410: Requirements for communications between citizens during emergencies
  - TR 102 444: Suitability of SMS and CBS for Emergency Messaging
  - TR 102 445: Requirements for Emergency Communications Network Resiliency
- TIA TR-8 (Mobile and Personal Private Radio Standards)
- TIA TR-45 (Mobile and Personal Comms. Systems Standards)
- IETF Ieprep – *Priority schemes over IP systems*
  - RFC 3523 – Internet Emergency Preparedness (IEPREP) Telephony Topology Terminology
  - RFC 3487 – Requirements for Resource Priority Mechanisms for SIP
  - RFC 3689 – General Requirements for Emergency Telecom. Service (ETS)
  - RFC 3690 – IP Telephony Requirements for ETS
  - RFC 4190 – Framework for Supporting ETS in IP Telephony
  - RFC 4375 – ETS Requirements for a Single Administrative Domain

ISO

- New technical committee established: TC 223 "Societal Security"
- **Goal:** International standardization in the area of societal security, aimed at increasing crisis management and business continuity capabilities using an all-hazards approach
  - Improved technical, human, organizational, and functional interoperability as well as shared situational awareness, amongst all interested parties.
- No outputs yet. Terminology issues need to be addressed. Some National Body inputs will be considered, e.g.
  - NFPA 1600 - Standard on Disaster/Emergency Management and Business Continuity Programs
  - HB 221 - Business Continuity Management
  - BS25999 - Draft British Standard on Business Continuity Management

Some web resources

Web resources

- ITU-R Publications
  → http://itu.int/publications/sector.aspx?menu=categories&sector=1
- ITU-T Recommendations
  → http://itu.int/ITU-T/publications/recs.html
- Main ITU emergency telecoms page
  → http://itu.int/emergencytelecoms
- ITU-T emergency telecoms page
  → http://itu.int/ITU-T/emergencytelecoms
- ITU-T Action Plan for Standardization in TDR/EW
  → http://itu.int/ITU-T/emergencytelecoms/actionplan.html
- ITU-T Study Group 2 home page
  → http://itu.int/ITU-T/studygroups/com02
- Joint ITU-T/OASIS Workshop and Demonstration of Advances in ICT Standards for Public Warning
  → http://itu.int/ITU-T/worksem/ictspw
- PCP-TDR homepage
  → http://itu.int/ITU-T/special-projects/pcptdr/
- ITU-D emergency telecoms
  → http://itu.int/ITU-D/emergencytelecoms
- Tampere Convention
  → http://reliefweb.int/telecoms/tampere/

Conclusion

Continued contribution

- ITU has historically played an important role in communications for disaster prevention and mitigation

- For the next steps:
  - Understand requirements at all levels
  - Identify sets of global and compatible standards
  - Develop appropriate documentation
  - Build on existing systems and networks when possible
  - Develop new systems and networks as required
  - Implement programmes for capacity-building
  - Review regulatory frameworks, as appropriate
  - Partnership between Member States, private sector, Government Agencies, NGOs, IGOs, and SDOs

- **Need to receive technical proposals!**

Standards-based solutions

- Standards-based solutions exist and are in place for 95%+ of needs
- Standards: really open standards!
  - → beyond dominant industrial designs
- Multiple solutions are possible
  - → possible incompatibility
- A common architecture is needed to ensure that the various players can perform efficiently the many roles
  - "Release" approach

ITU ready to contribute with its technical expertise

Thank you

simao.campos@itu.int
(T) +41-22-730-6805
(F) +41-22-730-5853
ITU / Place des Nations
CH1211 Geneva 20
Switzerland

Simão Ferraz de Campos Neto joined the secretariat of the ITU Standardization Sector in 2002, and is the Counsellor for ITU-T Study Groups 6 (for outside plant and indoor installations) and 16 (for standardization work on multimedia services, protocols, systems, terminals and media coding). He organized several workshops (e.g. Telecoms for Disaster Relief, RFID, Standardization in E-health; SIIT2005) and was the editor of the first version of the ITU-T Security Manual.

Prior to joining ITU in 2002, Mr Campos worked as a scientist in COMSAT Laboratories performing standards representation and quality assessment for digital voice coding systems.

A Senior Member of the IEEE, Mr Campos authored several academic papers and position papers, and served in the review committee of several IEEE-sponsored conferences.

EXTRA SLIDES

These slides provide some additional information and details

Early Warning

Elements for EW Systems

(UN-ISDR International Early Warning Programme)

- Risk knowledge
  - Prior knowledge of the risks faced by communities
  - Local and regional aspects
  - Needed for efficient warning service and dissemination
- Warning service
  - Technical monitoring and warning service
  - Data collection, transmission, analysis
  - Regional and national centers
- Dissemination
  - Understandable warnings delivered to those at risk
  - Cultural and infrastructure aspects
- Response capability
  - Knowledge and preparedness by those at risk
  - Capability building
  - Recognition of indigenous knowledge

Risk knowledge

- Findings in particular on the local level should be documented and shared
  - E.g. bathymetry maps
  - Traditional local knowledge
- Sharing:
  - Database matching hazards and response practices
  - Integral part of the architecture
  - Commonalities exploited in response training

Fundamental for early warning to be effective!

Warning service

- Common architecture for information flow
  - Standards-based → vendor-independent
  - Reusable infrastructure: multi-hazard, public networks
  - Real-time and offline components
  - Concept of "Releases" would be useful
- Redundancy needed in data collection, transmission to analysis center(s), and delivery of bulletins to authorities
- Reliable communication among analysis centers (raw data & bulletins) and between analysis centers and national authorities (bulletins)
  - Data pipe capacity
  - Reliability: availability & restoration provisions
  - Security (authentication, authorization, confidentiality, non-repudiation, etc)
  - Capability to deliver information using multiple channels (e.g. fax, email, SMS, voice announcements, etc)
  - Priority schemes

Dissemination

- Naturally multi-hazard
  - but: different timescales are involved (e.g. local tsunami versus cyclone)
- Redundancy to ensure message get to all involved
- Need to account for local reality
  - Populational density
  - Existing infrastructure
  - Multilingual needs (including sign language)
- Broadcast methods: most efficient
  - TV
  - Cell broadcast
  - Amateur radio
  - Newer technologies to incorporate natively broadcast features (e.g. multicast in IP)

Response capability

- Aspects:
  - Global planning & policy, local grind work
  - Build-upon indigenous knowledge
  - New technologies can pose difficulties to integrate, test and train
- Distance learning (e.g. e-learning) to connect localities with:
  - training centers
  - other localities

Fundamental for dissemination to be effective !

Additional information on the TDR/EW studies in the Radiocommunication Sector of ITU

Disaster phases and the radio services involved

- Disaster prediction and detection – meteorological and Earth exploration satellite services
- Disaster alerting – broadcast, fixed, mobile and related satellite services
- Disaster relief – amateur, earth exploration, broadcast, fixed, mobile and related satellite services

Disaster prediction and detection

Meteorological and Earth exploration satellite services

- Operated in the main by government and international agencies
- Play a major role in prediction and detection of disasters (such as hurricanes, earthquakes and tsunamis, floods, fires, dangerous pollution, etc.)

Disaster alerting

- Alert the central/regional/local authorities responsible for warning the public – fixed, mobile, fixed/mobile-satellite

- Issue warnings to the people likely to be affected
  - broadcast, sound and television
  - mobile (such as SMS and cell broadcast)

Disaster relief

- Amateur – a long history of aiding with communications during disasters
- Earth exploration satellite – damage assessment
- Fixed/mobile satellite - to rapidly restore communications capabilities
- Fixed – transportable, higher capacity - point-to-point and local area
- Mobile – coordination of relief activities, both private and public systems used

ITU-R studies

WRC-03 agenda item 1.3

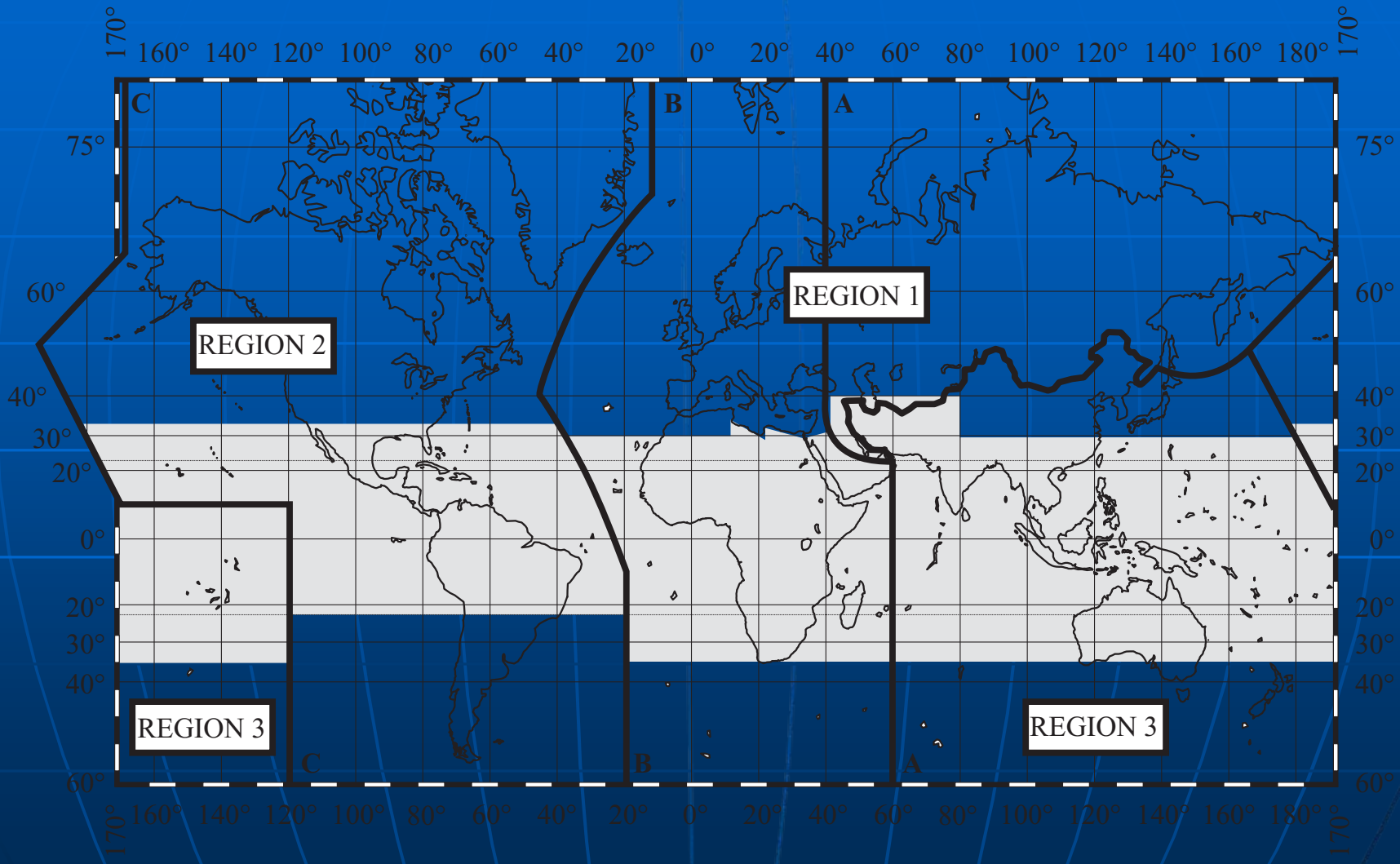
"... identification of globally/regionally harmonized bands ... for the implementation of future advanced solutions ..., including those dealing with emergency situations and disaster relief, ...;"

Resolution 646 (WRC-03)

Strongly recommends use of regionally harmonized bands :

- Region 1: 380-470 MHz as the frequency range within which the band 380-385/390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1;
- Region 2: 746-806 MHz, 806-869 MHz, 4 940-4 990 MHz;
- Region 3: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4 940-4 990 MHz and 5 850-5 925 MHz;

ITU Regions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Resolution 646 (cont'd)

- Encourages administrations to facilitate cross-border circulation of radio equipment intended for use in disaster relief situations

- Invites ITU-R to continue its studies concerning technical and operational implementation and possible additional identification of other frequency ranges for certain countries in Region 1

Status of studies – global circulation

Recommendation ITU-R M.1637

"Global cross-border circulation of radiocommunication equipment in emergency and disaster relief situations"

Recommendation ITU-R M.1579

"Global circulation of IMT-2000 terminals"

- Recognize the importance of the needs of organizations dealing with disaster relief

Status of studies – needs of future systems

Report ITU-R M.2033

"Radiocommunication objectives and requirements for public protection and disaster relief (PPDR)"

- Defines objectives and needs for the implementation of future PPDR solutions
- Focuses on operational needs around 2010

Status of studies – Amateur involvement

Recommendation ITU-R M.1042-2

"Disaster communications in the amateur and amateur-satellite services"

- Encourages the development of robust, flexible and independent amateur service and amateur-satellite service networks, capable of providing communications during disasters and relief operations
- Revision to be approved by end Feb 2007
  - Entry into force of Tampere
  - Modifications to ITU-D Res 34 (WTDC-05)

WSIS Tunis Agenda Action Lines

Action Line	Possible moderators / facilitators
C1. The role of public governance authorities and all stakeholders in the promotion of ICTs for development	ECOSOC/UN Regional Commissions/ITU
C2. Information and communication infrastructure	ITU
C3. Access to information and knowledge	ITU/UNESCO
C4. Capacity building	UNDP/UNESCO/ITU/UNCTAD
C5. Building confidence and security in the use of ICTs	ITU
C6. Enabling environment	ITU/UNDP/UN REGIONAL COMMISSIONS/UNCTAD
C7. ICT Applications ▪ E-government ▪ E-business ▪ E-learning ▪ E-health ▪ E-employment ▪ E-environment ▪ E-agriculture ▪ E-science	 ▪ UNDP/ITU ▪ WTO/UNCTAD/ITU/UPU ▪ UNESCO/ITU/UNIDO ▪ WHO/ITU ▪ ILO/ITU ▪ WHO/WMO/UNEP/UN-Habitat/ITU/ICAO ▪ FAO/ITU ▪ UNESCO/ITU/UNCTAD
C8. Cultural diversity and identity, linguistic diversity and local content	UNESCO
C9. Media	UNESCO
C10. Ethical dimensions of the Information Society	UNESCO/ECOSOC
C11. International and regional cooperation	UN Regional Comms./UNDP/ITU/UNESCO/ECOSOC