Space Applications for Civil Protection

A Roadmap for Civil Protection with Particular Interest to SatCom as Contribution to the Polish EU Council Presidency in 2011

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Erich Klock
Mildred Trögeler

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European Space Policy Institute, ESPI
Schwarzenbergplatz 6 • 1030 Vienna • Austria
http://www.espi.or.at
Tel. +43 1 7181118-0; Fax -99

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Executive Summary

Background

Space-based applications, i.e. earth observation, navigation and SatCom, are crucial to increasing the efficiency and effectiveness of operations conducted by the European Civil Protection (CP) community. Major emergencies, in particular, have exposed shortfalls in the availability of telecommunications capacity in their aftermath (e.g. Hurricane Katrina, the Haiti earthquake and the Pakistan floods). Terrestrial communications are often unavailable during such emergencies. In rescue and relief operations, early response capability and the re-establishment of telecommunication links are of utmost importance for saving lives. Satellite communication systems provide a robust network that is largely unobstructed by events on the earth's surface. In both coverage and capacity, they can respond to disaster situations more flexibly than terrestrial systems. Thus, the use of satellite communications allows CP agencies to improve their overall operational capabilities. Nowadays satellite communications are widely recognised by CP agencies as providing a resilient, complementary solution that can increase their effectiveness not only for command and control but also for delivering information derived from Geographical Information Systems (GIS). In addition, satellite communications can contribute to asset tracking systems, which in turn depend upon the use of satellite earth observation and navigation services. Even though a previous ESA survey of European CP agencies confirmed the value of satellite services, various practical problems have restricted their wider use. Firstly, there are difficulties in obtaining sufficient bandwidth at short notice, due in part to competition with other customers (e.g. the media) and difficulties in coordinating multiple users and suppliers. Secondly, the costs of satellite services are often considerably higher than those of terrestrial telecommunications, making the use of satellite services unaffordable for many emergency response teams, especially when requesting high speed data and video services. Thirdly, the equipment used by European civil agencies consists mainly of commercial devices that vary at national and local level. This leads to problems of interoperability between different task forces. Furthermore, ease-of-use is insufficient, especially for high speed data services, given the limited training and expertise of CP staff in using the equipment. Finally, at the current state of the art no institutional satellite service is available that can satisfy the security, QoS and availability requirements of CP users.

To overcome these shortcomings and to improve the overall operational capabilities of CP agencies in Europe, the European Space Agency (ESA) has initiated a considerable number of user driven activities. In 2006, it proposed and introduced a Short Term Action Plan. This comprises the selection and implementation of pilot projects showing a clear Pan-European interest, as well as the establishment of an Advisory Board with the task of monitoring these pilot projects and making recommendations on the scope of any subsequent programme. The Short Term Action Plan has further developed into a long term programme proposed by ESA. This proposal pursues the objectives of: achieving joint SatCom procurement; lobbying on regulatory and licensing issues; and training and standardisation by creating a permanent Satellite Forum and a Centre of Expertise. However, as the "critical mass" of participating States has not been able to approve this programme, it remains a draft document for the time being.

This study reflects the outcome of an ESPI workshop organised in the framework of the ESA Integrated Applications Promotion (IAP) programme, in which experts from national CP agencies in Eastern and Central European countries discussed possible ways of enhancing existing services and developing new services in the field of CP through the use of satellite-based services.

The study is presented in four main parts, the first of which provides an overview of the current status of CP in Europe, including the drawbacks of the current systems and ESA's past user-driven activities to overcome these shortcomings. The second part delineates the national strategies and perspectives of CP agencies of selected European States with the focus on satellite-based applications that were presented during the workshop. Based on the summary of the roundtable discussions, the current shortcomings in the use of satellite-based services and the user re-

quirements of the CP community are identified in a more general manner. The third part of the study assesses whether the international and European regulatory framework effectively meets the needs and requirements of the CP community and how it should be shaped to guarantee not only legal certainty but also an effective mechanism to respond to disasters in a timely and flexible manner. This part reviews recent developments at EU level with respect to the review of the EU CP legislation. Finally, recommendations focus on measures to improve the overall operational effectiveness of CP users through the use of SatCom.

Workshop

On 5 and 6 May 2011, ESPI, in its capacity as IAP Ambassador Platform for the Central and Eastern European region (APCEE), together with the Austrian Federal Ministry of the Interior (BM.I) and the Austrian Aeronautics and Space Agency (ALR) of the Austrian Research Promotion Agency (FFG) organised a workshop on "Space for Civil Protection". This workshop brought representatives of the Civil Protection community from different countries together with technical experts. The intention of this workshop was to identify user needs and gaps in existing services as well as the most appropriate way forward for generating space-based user-driven activities of direct benefit to the European CP community. The workshop reflected the national strategies and perspectives of several States in the field of CP and presented key examples from lessons learned. In most European States the Ministry of the Interior is the highest authority responsible for CP. The second part of this report contains a detailed summary of the two roundtable discussions between speakers at the event. The outcome of these discussions can be divided into four areas: the importance of satellite communication for CP; ESA's user driven approach to developing sustainable services; the usefulness of lessons learned and their active information flow; and the importance of interoperability and standardisation for CP operations.

The roundtable discussions underpinned that satellite-based applications are crucial to enhancing the operational capabilities of CP. Telecommunication is of paramount importance as CP agencies and especially field workers are reliant on obtaining a wide variety of information from central facilities. Terrestrial communications may fail or may have been destroyed in a major disaster. Moreover, their capacity is often inadequate during emergency situations. In this context, satellite communication is an important asset in assuring a robust and reliable communication system for CP authorities. Because of the high costs of space-based services, satellite communication is mainly used as a back-up and for voice communication. Nevertheless, the transmission of massive amount of data in real or near-real time is becoming more important for future CP operations. The transmission of relevant data is crucial for effective emergency management as it also improves the monitoring of emergencies.

A user driven approach is necessary to meet the needs of relevant users and to overcome the current gaps in services. Moreover, it helps in understanding the needs of both users and industry as there is still a lack of communication between the different stakeholders. To do this, CP actors have to clearly formulate their requirements for services in order for them to be provided with appropriate satellite-based solutions. The way forward for improving the use of satellite-based services by the CP community does not necessarily lie in the development of new satellites. ESA's IAP programme promotes a user driven approach contrary to the traditional technology pushed programmes. The programme aims to provide solutions to the various user communities rather than to develop new technologies. One way to identify the needs of CP actors and the gaps in existing services is to analyse the lessons learned from previous disasters. But even if there is enough information available, a systematic approach is missing to communicate the problems to all actors involved. The lessons learned show that in many large scale disasters telecommunication was a major problem.

A key issue for CP agencies, especially in the case of cross border operations, is interoperability. Since the equipment of CP agencies varies at country and even local level, problems arise related to interoperability between different task forces. Especially at the command and control level, it is important to ensure communication and information exchange between forces from different countries. Therefore, a federated European approach is necessary to resolve this issue.

At the end of the second part, the report provides an overview of the actual shortcomings in the use of satellite services as well as the requirements of the CP community. It reflects the main issues which were discussed during the ESPI workshop, underlining that dedicated efforts are needed in interoperability, availability, cost effectiveness, and best practice in the use of satellite-based services by the CP community.

International and European Civil Protection Regulatory Framework

A sustainable regulatory framework is a pre-requisite in effectively meeting the needs and requirements of the users of the CP community. While the International Charter Space and Major Disasters is a well-proven Charter for the use of earth observation satellite services for disaster and emergency response, it does not include an effective mechanism for the provision of SatCom during and after disasters. Even though the Tampere Convention is a multilateral treaty with legally binding effect that facilitates the use of telecommunication resources for disaster and relief, it does not respond to the needs of Civil Protection agencies in Europe, nor does it provide for a joint preapproved chain of command and procedure during disasters. The new regulatory framework must be shaped in a way that its provisions translate into effective and practical arrangements for delivery of capacity. European States are interested in the provision of assistance in the form of SatCom on a cost effective basis. The best way to reach this goal is to federate demand of national CP agencies to strengthen their bargaining position towards satellite operators. Taking into account the different economic, social and political circumstances, the federation of demand as well as joint procurement of satellite capacity could be achieved on a European level rather than a global level

Disaster management is primarily the responsibility of the Member States. However, Article 196 of the TFEU provides for an EU role to encourage cooperation between Member States with the aim of improving the effectiveness of systems for preventing and protecting against natural and man-made disasters. The overall objective is to promote swift, effective cooperation between CP agencies in Europe and to promote consistency in international CP operations. To achieve this goal, the EU has developed the Community Mechanism for Civil Protection, which pools the CP resources of the participating States to make them available to disaster-stricken countries. The EU CP regulatory framework is currently under review. There seems to be a move from an ad hoc response system to an arrangement allowing for more pre-planning and predictability. This shift could be done through a series of proposed measures, including regular risk assessment, mapping of assets and contingency planning.

Recommendations

Action Lines

- *Development of a user-driven set of tools*
  As noted in the report, the CP community faces considerable practical problems such as affordably obtaining sufficient bandwidth at short notice and these restrict the wider use of satellite services in the field of CP. The development of new services that integrate existing space capabilities would make CP operations more effective. This does not necessarily mean the development of new technologies. User-driven initiatives that better represent the interests of CP users to the industry would lead to the development of satellite-based services designed to meet the specific needs of the community. The commitment of CP agencies as users is of paramount importance to validate the concept and to indicate the direction of specific projects, resulting in improved or new services for the community on a regional, European and global scale.
- *Federation of demand*
  One way to overcome the high costs of satellite communication is to share satellite capacities between the CP agencies. From an organisational point of view, this approach would result in economic benefits, as it would decrease the cost of the satellite resource for each CP agency thanks to stronger negotiation power. A user-driven initiative should include a mechanism to federate CP users' demand and to articulate their requirements.
- *Enhanced international cooperation*
  Taking into account the differences between Eastern, Central and Western European countries, international cooperation should be improved in order to facilitate the use of satellite and terrestrial telecommunication equipment. Some existing mechanisms allow the disaster management community to have efficient and simple access to space assets. However, a clear articulation of the specific needs of the CP community is necessary to enable owners of space assets to develop resources that cater for those needs. This requires an effective information flow. A systematic approach is still missing to communicate the problems, requirements and possibilities of European CP between the different actors.

Regulatory Framework

- *Pre-arranged capacity and prices.*

Unlike the EO sector, where the International Charter on Space and Major Disasters and associated operational structures already exists, the SatCom sector has only individual, ad-hoc arrangements for the use of space capacities in response to major disasters. It is therefore indispensable to shape a legal framework that guarantees the availability of satellite capacity on a cost-effective basis in disaster situations. The new legal framework should create a mechanism to coordinate procurement of satellite communication capacity and associated services for Civil Protection, with the overall intent being the guarantee of rapid and affordable availability during and after disasters. Due to economies of scale, this approach would also lead to the provision of SatCom on a cost-effective basis. One way could be to pre-book SatCom capacity through provision and pricing arrangements with major satellite operators, starting with a small number of willing partners and building these arrangements in an incremental and standardised manner.

- *Collaboration between the parties*.
  The new regulatory framework should also define collaboration with the Commission, ESA, the Member States and the relevant stakeholders to promote optimum use of existing and future solutions and telecommunication capacity to facilitate the development of services for citizens in the fields of public security and emergency response. Building on this, the new regulatory framework should regulate bandwidth pre-emption, cross-border movement of equipment, integration with legacy systems and availability of spectrum in the event of disasters. Furthermore, it should be assessed whether the “Emergency.lu” type of model could be implemented at a European level. One idea could be to establish a competitive Public Private Partnership (PPP) for a dedicated satellite-communication for CP using the existing tools.

1. Introduction

Civil Protection exists to protect citizens' lives, health and property from natural and man-made disasters. Civil Protection activities also cover the protection of cultural heritage, historical buildings and monuments, environment, resources and infrastructure. In general, the main tasks of Civil Protection lie along the Emergency Management cycle which involves four phases: Preparedness, Response, Recovery, and Mitigation. All phases are important to reduce the impact of disasters, to react during and immediately following a disaster, and to recover after a disaster has occurred. The response phase is particularly critical for Civil Protection and requires immediate actions to be performed, such as, for instance, disseminating warnings, surveying and evaluating the emergency situation, and mobilising necessary resources.

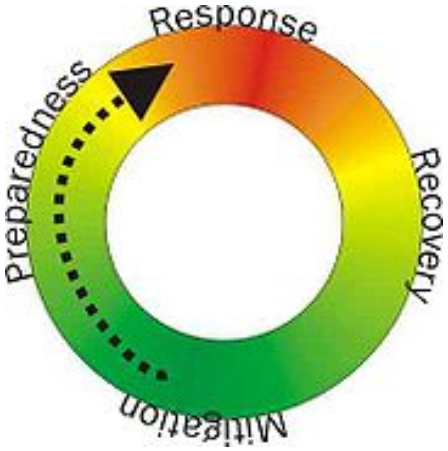


Figure 1.1: Phases of Emergency Management[1]

The *Preparedness* phase takes place before a disaster occurs in order to build emergency management capacity. This phase consists of planning, training, and plan evaluation and improvement in order to ensure effective coordination in a time of crisis. The preparedness phase anticipates problems, and develops solutions that are intended to minimise disaster damage.

The *Response* phase provides immediate assistance to those affected by a disaster by mobilising necessary emergency services in the affected area, in order to save lives. It may involve initial repairs to damaged infrastructure. Emergency responders try to reduce the probability of additional injuries or damage and to start recovery activities as soon as possible.

The *Recovery* process involves restoring an affected area to its previous state. Some activities, e.g. adding gravel to washed out roads, can be accomplished in the short term, whereas other activities, e.g. replacing bridges over major rivers, take years.

Mitigation activities attempt to reduce the effects of disasters, and include building levees, zoning and land use management, implementing building use regulations and safety codes, and educating the public. The primary purpose of mitigation is to eliminate or reduce the probability of future disasters.

The impact of both natural and man made disasters is increasing dramatically. In Europe the type of catastrophe mainly depends on the geography and climate of the individual countries affected. Whereas in some cases countries are able to cope with disasters on their own, Civil Protection agencies often have to deal with cross border operations to provide emergency assistance to other nations within or outside Europe. The support provided by Civil Protection includes alerting the public as well as assessing and intervening when a disaster occurs. The complexity and the multidimensional scale of disasters require a comprehensive Europe wide approach. In this context, the European Commission Humanitarian Aid and Civil Protection department (ECHO) plays an important role in the provision of humanitarian aid at the European level. Another fundamental mechanism is the Monitoring and Information Centre (MIC), operated by the European Commission. It is available on a permanent basis and provides countries access to the community Civil Protection platform that collects information from all the participating states. Assistance through the MIC can be requested by any country, inside or outside the EU, that is affected by a major disaster. Furthermore, the MIC can send experts to affected areas in

[1] "Search & Rescue." 11 July 2011. Science Daily <http://www.sciencedaily.com/articles/s/search_and_rescue.htm>.

order to assess needs and to coordinate operations at the field level.

In the last two decades operational space systems such as satellite navigation and communication as well as remote sensing capacities have become an indispensable part of our daily lives. In this context, integrated space-based applications support Civil Protection activities and increase the efficiency and effectiveness of operations conducted by the community during a disaster. The development of new applications is necessary by utilising and integrating different space assets, resulting in improved or new services for the Civil Protection community. The fragmented nature of both demand (structure of Civil Protection) and supply (the many satellite service providers and systems) results in high costs, problems of interoperability due to lack of standardization, poor mutual awareness of needs and capabilities and inadequate security and quality of service. As a result, consolidation is needed to ensure that the development of new generations of services is in line with the CP environment. The CP agencies have clearly articulated both the desirability and the feasibility of improving their efficiency through better co-ordination at the European level. This would lead not only to improved interoperability and operational effectiveness but also to increased demand for satellite equipment and services, which would in turn bring about improved supply.

Telecommunications are of paramount importance in responding to and mitigating the effects of disasters, but terrestrial networks are often disrupted or destroyed at the onset of a major disaster. Almost by definition, disasters and other crisis situations are unpredictable in nature and extent. Therefore, it is important that any emergency telecommunications system should be able to cope with variable requirements for coverage area and capacity. Civil protection agencies and their field workers rely on telecommunications to obtain and transmit a wide variety of information between central facilities and the field to coordinate the complicated logistics of rescue and aid operations. This includes accurate information such as maps of the area, architectural plans of buildings and the location of hazardous materials. Their capacity is also often inadequate in disaster situations. A survey of Civil Protection authorities in 2005 revealed that satellite communications are not regarded as complete alternatives to terrestrial systems but as complementary solutions for overcoming some important limitations of land-based technologies. In particular, all participants recognised the need for a Europe-wide approach to obtaining the potential benefits of satellite systems, with harmonisation between different projects and transmission technologies. Satellite communications systems can provide a robust network largely unaffected by events on the earth's surface. In both their coverage and their allocation of capacity they can respond flexibly to disaster situations.

The present report seeks to provide an overview of the current situation of Civil Protection in Europe. It analyses problems with currently used services and the demand for new innovative services for Civil Protection as well as the need to provide an adequate regulatory framework in this field. Finally, the report aims at providing a way forward in improving the overall operational capabilities of European Civil Protection agencies through the use of satellite communication based services. The report is a joint effort between ESPI, the IAP Ambassador Platform for the CEE region, hosted by ESPI, and ESA. This Ambassador Platform has the mandate to inform users on the opportunities available within ESA's IAP programme, to collect their needs, and to encourage involvement of all relevant service stakeholders.

2. Previous User-Driven Activities Initiated by ESA

In 2005, a survey of European Civil Protection authorities revealed that satellite communications could be complementary to terrestrial technologies and an effective means to address the shortcomings. In the field of Civil Protection in particular, reliable and effective communications are indispensable to respond to disasters, but terrestrial networks are often rendered inoperable. Civil Protection authorities recognised the need for a Europe-wide approach to enhance the use of satellite communications in this field not only to obtain economies of scale leading to less expensive satellite capacity and equipment but also to achieve the required harmonisation between different technologies and operational procedures. To achieve this objective, activities should focus on the Civil Protection agencies in Europe as the actual users. European Civil Protection agencies should extend their influence over the systems, services and standards that are made available to them.

2.1 ESA Short Term Action Plan

At the beginning of 2006, an initial meeting of major Civil Protection authorities in Paris led to the establishment of an Advisory Board. Additionally, ESA proposed and introduced a Short Term Action Plan aimed at realising the benefits of satellite communications for Civil Protection. The ESA Short Term Action Plan was prepared with the active involvement of major European Civil Protection agencies. It defines what Civil Protection agencies require from satellite-based systems and what needs to be done to meet those requirements.

The objective is to improve the overall operational capabilities of Civil Protection agencies in Europe, particularly their communication capabilities, by encouraging the use of satellite communication. A user-driven approach can achieve substantial economies of scale by combining the needs of various countries and Civil Protection agencies. The users would benefit from standardisation, reduced unit costs of equipment, services and satellite capacity, and avoidance of unnecessary duplication of resources. It would also give European Civil Protection agencies the possibility of influencing the future development of satellite communications systems and services, so as to better meet their needs. In the short term, the action plan comprises both the selection and implementation of pilot projects showing a clear Pan-European interest, as well as the establishment of an Advisory Board with the task of monitoring these pilot projects and making recommendations on the scope of any subsequent programme.

The Short Term Action Plan is designed to meet specific requirements expressed by the interested Civil Protection agencies of the European Union. It was envisaged that these Civil Protection agencies would also contribute materially to the programme. In the short term, their contribution consists of the provision of assistance in the implementation of pilot projects. If Civil Protection agencies wish, they may also receive financial contributions provided by other agencies. In the longer term, the implementation of the full programme requires the commitment of funds by at least some of the participating Civil Protection agencies. Furthermore, they shall commit to take part in one or more pilot projects, selected according to their own priorities. In concrete terms, contributions shall mostly take the form of the provision of experts for short periods, typically to take part in demonstrations and field exercises, or to assess products, services, applications and reports generated by the pilot projects.

The Advisory Board has been set up to provide a platform where the participating Civil Protection agencies can contribute to the definition, implementation and assessment of the Short Term Action Plan. It foresees one representative per participating country and carries out three main tasks. Firstly, the participating Civil Protection agencies shall provide inputs and advice to assist ESA in developing the draft statement of work for each pilot project, and in identifying useful project elements, methodologies and success criteria without affecting ESA's managerial responsibility in these areas. At meetings of the Advisory Board presentations shall be given on the progress of each pilot project, and the Board shall also be invited to observe field trials and to review technical reports and other outputs from the projects. Secondly,

the Board forms an observatory on the worldwide application of satellite communications for Civil Protection. This will include not only drawing on lessons from the short term pilot projects, but also monitoring developments elsewhere, including those outside Europe. These observations will feed into the Board's conclusions and recommendations on future actions. Thirdly, in parallel to the Short Term Action Plan, the Advisory Board supports ESA in defining and developing the longer term programmatic framework. It is by this means that lessons drawn from the Short Term Action Plan may be turned into the basis for a large-scale implementation programme.

The role of ESA in this programme is to provide its technical capabilities and its expertise in conducting large-scale, Pan-European projects. ESA will fund the short term actions through its existing programmatic infrastructure. If national Civil Protection agencies have particular projects that they wish to include in the Short Term Action Plan and which they are able to partly fund, these would be accommodated and thus increase the total number of projects that could be undertaken. ESA shall be responsible for issuing bids, preparing statements of work, selecting industrial offers, and managing contracts from a technical and administrative perspective, according to the rules of its programmes. Likewise, ESA shall report on contractual progress to its own governing bodies. ESA shall also be responsible for liaison with national space agencies and industry.

In implementing this Short Term Action Plan, the staff of the Monitoring and Information Centre (MIC) participated in the Advisory Board meetings, providing expert advice on Civil Protection. Austria, Belgium, Czech Republic, Germany, Spain, France and Italy, as participating countries, agreed to contribute to the action plan. In the framework of this action plan, ESA provided the funding for the launch of four projects addressing, inter alia, the reinforcement of satellite communications to improve interoperability in the field of Civil Protection, standardisation, and the development of new SatCom services in order to demonstrate and promote the full potential of satellite-based services.

These four projects were supported by some participating countries, which took part in demonstrations and assessed products as well as services. A collaborative working tool for the Advisory Board was set up to facilitate communication and interaction between the different parties. This tool encourages other European Civil Protection authorities to announce formal declarations of interest, to be actively involved in the Advisory Board, and to cooperate with pilot projects.

2.2 ESA Proposal for a Satellite Communication Programme in Support of Civil Protection

Another major step was taken during the 4th Advisory Board meeting in February 2008, hosted and co-chaired by the Civil Protection unit. ESA put forward a proposal to provide a more robust and long-term satellite communication programme in support of Civil Protection. The overall objectives of this programme are to achieve joint SatCom procurement, lobbying on regulatory and licensing issues, and training and standardisation, by creating a permanent Satellite Forum and a Centre of Expertise.

The ESA proposal seeks to transform the current ESA Short Term Action Plan into a long-term programme comprising six activity streams. Firstly, the procurement of a coordinated satellite communication service capacity should be pursued to improve availability and price by achieving economies of scale, better negotiation power and ensuring more efficient capacity use. Secondly, regulatory and licensing issues must be subject to intense lobbying to reduce barriers to the use of satellite equipment and services used by the Civil Protection community. Thirdly, there is a need to promote training, education, and technical support with the intention of disseminating best practice solutions, including pilot projects on improved interoperability and for implementation of IP services over satellite. Moreover, satellite communication should be integrated into national emergency communication systems, including technology development trials in order to ensure that new satellite-based services meet Civil Protection requirements in areas such as broadband, next generation mobile and navigation. Fourthly, the definition and promotion of Civil Protection QoS requirements for existing and new SatCom services is envisaged, notably to improve interoperability between legacy systems during cross-border deployments both within and outside Europe. Fifthly, the proposal highlights the support of standardisation committees relating to next generation international standards that include satellite-terrestrial integration. The final activity emphasised is the provision of rapid access to Earth Observation (EO) and location-based information in emergencies.

The programme proposes three structural components. The creation of a permanent "Satellite Forum" for Civil Protection agencies in Europe, building on the Joint Advisory Board already set up by ESA's Short Term Action Plan, comprises the first element. This steering committee would monitor the technical activities and the framework contract, keep Member States abreast of technical developments, and lobby both government and industry on Civil Protection requirements in the areas of regulation, standards, and technology development. The current Advisory Board already demonstrates how this can work in practice. Meetings of four Advisory Boards have taken place, hosted by Civil Protection agencies or the EC. Industry and third-party contractor presentations have been included without compromising Civil Protection interests. Even if participation varied, it was always able to achieve a quorum. In particular, strong participation by Civil Protection agencies underpinned the success of pilot projects and demonstrations focused on improved interoperability. To create an effectively functioning Forum, some formal delegation of decision-making authority to the Forum is recommended as well as formally distributing key roles such as the Secretariat, lobbying activities and public relations.

The second component is a Centre of Expertise that will support the steering committee through a network of experts across the EC, ESA, Member States and the satellite industry. Its activities would include the procurement and management of dedicated bandwidth and end-to-end solutions based on the framework contract. It would also provide training capabilities to experts of Member States; participate in technology development trials; represent Civil Protection interests in technical and regulatory forums; and would support the development of standardised promotional and informational resources, including the recent launch of a dedicated website (http://cpboard.esa.int). The Short Term Action Plan is already an example that demonstrates how the Centre of Expertise could work in practice. Four field or research projects have been run through in-kind contributions by Civil Protection agencies and ESA with third party contractors. The Civil Protection cooperative working tool, namely the website, has been set up and managed by ESA, involving contributions from multiple participants. Based on this experience, it is recommended that the commitment of a larger amount of total resources be required, preferably through the involvement of more players, and that sufficient funding of third-party contractors be assured.

The third component provides a funding mechanism including joint monetary funding by ESA and the EC, with an initial funding commitment per annum for four years to support covered activities, with further extension linked to a performance review conducted by ESA, the EC and the Civil Protection agencies, and reported to the relevant institutional bodies. In addition, ad-hoc funding from other ESA budgets is foreseen for specific technology development projects and the procurement of satellite capacity where applicable. This is complemented by in kind contributions such as manpower, expertise and technical facilities from the European Commission or the Member States, as a natural enlargement of the contributions already being provided in the Short Term Action Plan. The existing Short Term Action Plan already contains some of the necessary funding arrangements. For instance, ESA provides financial support from existing programme budgets, mainly directed towards R&D activities. An ongoing programme will require a larger commitment to support both regular activities such as the Satellite Forum and technical trials and ad-hoc activities such as joint capacity procurement or pilot projects. Additional ESA and EC funding relies upon an increase in the total commitment of resources by Civil Protection agencies and their practical demonstration of support for an ongoing joint programme. Nevertheless, the ideal funding solution is financial support from the Member States.

As far as the joint procurement of satellite capacity is concerned, this process requires, first and foremost, an estimation of future Civil Protection demand for each type of service. This needs to be linked to a commitment in principle by each actor of the Civil Protection community interested in participating. One mechanism could be that the Satellite Forum develops and reviews a generic outline contract, to set out the elements that need to be specified as a basis for negotiation, whereas the authority to negotiate would then be delegated by the Civil Protection agencies. ESA or an industry player could take care of the management of the contracted capacity or service. ESA is in the process of making capacity available to Civil Protection agencies for R&D purposes. Such a capacity provision scheme has been previously used in ESA pilot projects and will now also be available for R&D projects aimed at enhancing existing Civil Protection telecommunications systems by improving their interoperability during national and/or multinational deployments both within and beyond Europe. This will enable the development of practical solutions and implementation to address some of the issues such as capacity

sharing and the assessment of overall demand by European Civil Protection agencies.

In conclusion, the European Commission and the Member States would take care of the implementation and the management of the proposed programme. This coordinated approach would ensure, inter alia, the incorporation of innovative telecommunication technology solutions into existing programmes, for example, by enabling Member States to test such solutions within the context of Civil Protection projects, training activities or exercises. Member States' project proposals under the Civil Protection Financial Instrument could receive complementary funding under ESA telecommunications programmes if they contained such innovative telecommunications elements.

For the time being, this satellite communication programme remains a draft document, as the Advisory Board has not been able to approve the programme. The reason for this is that a "critical mass" of participating States, including Austria, Belgium, Czech Republic, France and Italy, were not present during the meeting and approval would have required detailed information on this subject matter provided by these participating States and the European Commission. Nevertheless, this draft document reflects the common requirements of the Civil Protection agencies and shows the way forward to ensuring the use of satellite applications to enhance the overall effectiveness of Civil Protection. Hence, it is the basis on which coordinated European-wide actions should build.

2.3 CiProS Project

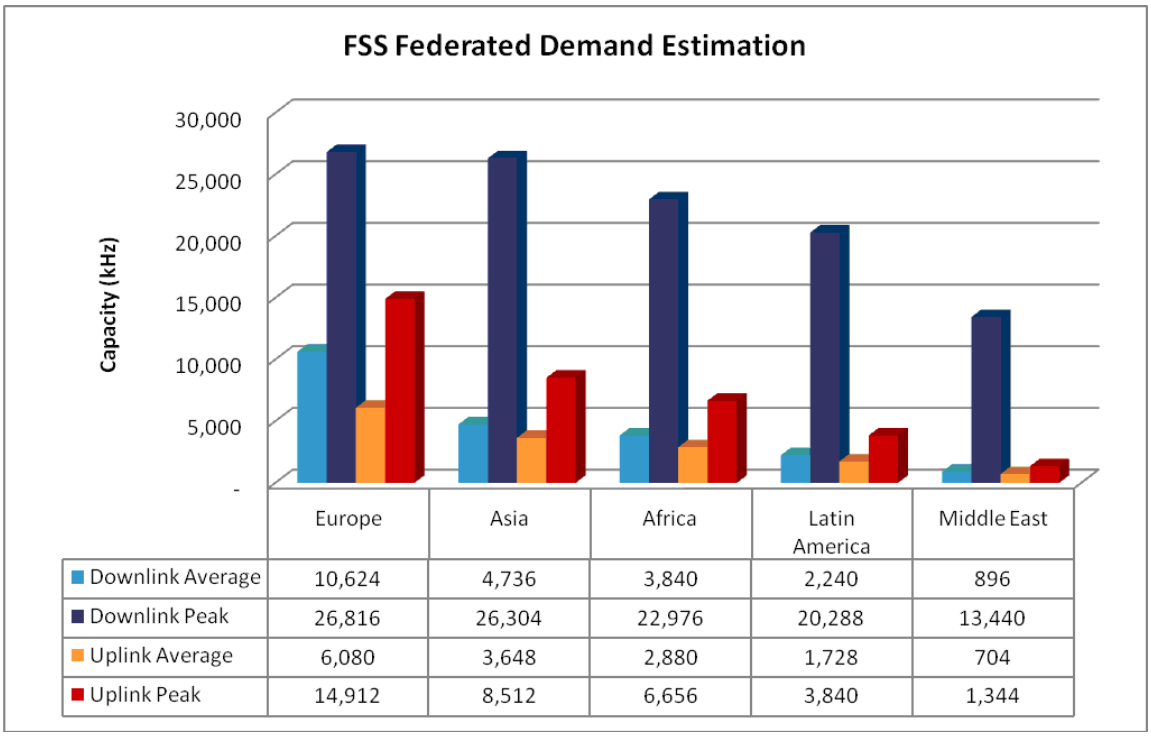
The main purpose of the CiProS project was to provide a Pan-European definition of Civil Protection agencies' requirements for satellite-based services with the aim of investigating the strategic importance, feasibility, and most suitable content of a future European SatCom programme dedicated to Civil Protection.

One of the major points of the CiProS project was the involvement of the user community, in order to lay the foundation for a user-centric joint programme. Civil Protection agencies have provided guidelines to identify services meeting interoperability, standardisation, security, flexibility, sustainability, and overall socio-economic benefit criteria.

Since 2007, the CiProS project has involved two surveys of European Civil Protection agencies participating in the Community Mechanism for Civil Protection. The first survey and related bilateral meetings was launched to assess the current use of satellite services and the main shortcomings, and to investigate and analyse the community users' needs, technical requirements, and the Civil Protection agencies' interest and support in a European satellite services activity dedicated to them. The second survey was aimed at selecting the satellite services to be developed in the near, medium and long term and assessing the actual need for a joint programme focusing on the development of satellite services for the use of Civil Protection agencies. Most of the Civil Protection agencies interviewed indicated a long-term vision to secure the development of satellite systems and services. This does not necessarily mean they need dedicated satellites, but it does mean there is a need to represent their interests towards the satellite industry in order to federate their demand, enabling them to negotiate better availability and price from satellite operators, as well as to rationalise, standardise and optimise the different equipment and services to be deployed.

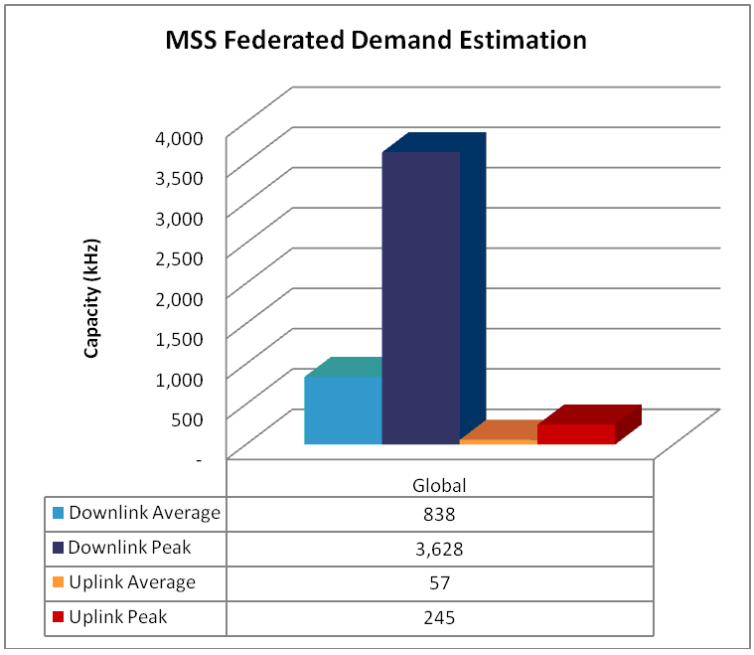
Based on these two surveys, the proposed solution focuses on the development of a set of common tools, driven by the requirements of Civil Protection agencies. It is also stressed that their demand should be federated to enhance negotiation power with satellite operators. In this context, the outcome of the survey and the results from ongoing pilot projects have highlighted some additional applications that would make Civil Protection more effective if satellite-based services were used widely, where currently they are used little or not at all. One example is the development of a quickly deployable IP network for broadband services, allowing team members to make telephone calls, to access the internet and to exchange data with other Civil Protection actors operating in any location as well as with the headquarters. Another tool to improve Civil Protection operational effectiveness is the Civil Protection common Geographic Information System (GIS), allowing for the integration of geo-referenced data from different sources, both remote as well as from field personnel.

The main weakness of fixed SatCom services currently in use is their lack of availability during emergencies, reducing the interest for satellite connection during the first days of the emergency management when the most critical operational needs emerge. In particular, capacity requests by media in the case of major crises often drain the capacity market. As a consequence, the current delay between request and actual allocation of satellite bandwidth is unacceptable for Civil Protection agencies which must intervene within the first hours of an emergency alert. This is a



	Europe	Asia	Africa	Latin America	Middle East
Downlink Average	10,624	4,736	3,840	2,240	896
Downlink Peak	26,816	26,304	22,976	20,288	13,440
Uplink Average	6,080	3,648	2,880	1,728	704
Uplink Peak	14,912	8,512	6,656	3,840	1,344

Figure 2.1: Average and peak capacity for FSS (source: ESA)



	Global
Downlink Average	838
Downlink Peak	3,628
Uplink Average	57
Uplink Peak	245

Figure 2.2: Overall demand for MSS (source: ESA)

very significant drawback for crisis applications. Therefore, as compared to the current procurement process, a federated approach would improve flexibility, responsiveness and cost effectiveness. A framework contract at the European level for satellite-based services dedicated to Civil Protection could provide end-to-end solutions and a complete range of tailored services procured on-demand with high responsiveness and at a lower price, thanks to better negotiation power and economies of scale. From an organisational point of view, this solution would have economical benefits as it would decrease the cost of satellite resources for each Civil Protection agency thanks to better negotiation power. The common procurement of satellite bandwidth would lead to a reduction of cost by 10 to 20%. A further step would be joint procurement of a shared satellite capac-

ity, which would decrease current costs by up to 50% for each Civil Protection agency and would also improve service availability. Through federation of the demand of Civil Protection agencies, they could reach a "critical mass" justifying a permanent booking of capacity. Furthermore, Civil Protection agencies that subscribe to this process would share a common set of resources, resulting in improved interoperability between them.

As part of this project a preliminary estimate was made of the future demand for satellite capacity for the European Civil Protection agencies if the set of tools were to be adopted. The following figures show the results of this analysis, characterising average and peak capacity for Fixed Satellite Services (FSS) in several regions and the overall demand for Mobile Satellite Services (MSS).

In conclusion, the main results achieved in the CiProS project were the wide involvement of the user community as well as the improved understanding of how space-based technologies could support European Civil Protection entities in the present and future with special emphasis on telecommunication but considering also other satellite-based services considered necessary by the Civil Protection agencies, like, for instance, Earth Observation and Navigation services. The CiProS project not only provides a comprehensive analysis of user needs and technical requirements but also identifies an optimised use of satellite services for the European Civil Protection community. To respond to user needs and to improve the effectiveness of operations, a set of tools dedicated to the Civil Protection agencies should be developed in a joint framework. All in all, the conclusion that can be drawn is that a federated approach is indispensable to meet the common needs of the Civil Protection community in Europe. The first step would be to agree upon best practices that should be applied by the Civil Protection community across Europe. For the time being, no institutional, established European mechanism is in place to allow the community to have efficient and simple access to space assets, nor is there any clear enunciation of the specific needs of users in the field of Civil Protection that would encourage owners of space assets to develop resources that cater for those needs. As a consequence, a joint European programme with the aim of developing a set of tools and services, and federated procurement of space resources to overcome the current shortcomings, is a desirable solution.

2.4 IP-based Services via Satellite for Civil Protection

The ESA initiative on *IP-based Services via Satellite for European Civil Protection* is part of a first phase that intends to pave the way to a potential ESA Civil Protection satellite communications programme. The main objective of this phase is to illustrate how satellite systems can improve the effectiveness of European Civil Protection agencies as well as encourage the use of satellite IP-based services across all the different national Civil Protection networks in order to reduce costs and improve interoperability between and within those networks. With this in mind, a consortium team led by Indra Espacio, Spain, was awarded a contract in December 2006 to investigate the current status of the use of satellite IP services for European Civil Protection, identify and assess the best practices of their use and to promote and demonstrate these best practices to European Civil Protection agencies. This project is based on the participation of many Civil Protection agencies in order to study a wide variety of current services and systems and to promote the best implementation of satellite IP-based services for Civil Protection.

The overall objective of this project is to identify, assess and demonstrate how Civil Protection bodies can benefit from satellite IP-based communications as a valuable tool that can help them in building integrated, cost-effective and reliable networks for daily and emergency communications as well as promote interoperability between different Civil Protection agencies. Particular emphasis is placed on using Voice over Internet Protocol (VoIP) and IP within Virtual Private Networks (VPN). The convergence of data services over a unique transport protocol is clearly advantageous for Civil Protection users. The adoption of standardized technologies allows interoperability among different devices. The convergence of data, voice and other applications over IP enables the deployment of a unique network in the intervention theatre, reducing deployment time, cost and personnel. IP is supported by nearly all satellite and terrestrial telecommunication providers, enabling worldwide deployment of emergency IP communication links.

A list of the major IP-based services currently used by European Civil Protection agencies is shown in Table 2.1. This list provides an approximate percentage of use of each service in routine operations and emergency situations, in order to show the importance of each service in both situations. The data are

based on the results of the ESA project and show that the adoption of IP services for Civil Protection is still very poor. Thus only basic IP services are widely used in both routine and emergency operations.

IP Service	% Used in CP agencies in emergency operations	% Used in CP agencies in routine operations
Voice Over IP (VoIP)	35%	50%
Virtual Private Network (VPN)	60%	60%
Web Browsing	90%	100%
E-mail	75%	100%
Remote Shell/Desktop	60%	75%
File Transfer	65%	65%
File Sharing/Network File System	50%	75%
Remote access to GIS/Map services	75%	65%
Tracking and location services	40%	50%
Remote access to Database	60%	60%
Multicast audio/video streaming	25%	25%
Unicast audio/video streaming	40%	40%
Chat/Instant Message	35%	50%
Audio/Video conference	35%	40%
Audio/Video multi-conference	35%	35%

Table 2.1: IP-based services usage (source: ESA)

Intervention by Civil Protection agencies commonly involves terrestrial radio networks (e.g., PMR in UHF or VHF bands) for field units and sometimes the use of public mobile networks (such as GSM/GPRS) for communication, all of which can be integrated in a VoIP network. A VPN (Virtual Private Network) allows users to communicate and access information securely over the public Internet and other IP based networks. VPNs operate as seamlessly and securely as a private network. A VPN can provide secure communications means for the CP community over a common IP based satellite network infrastructure.

Objectives will be developed in three phases. The first phase investigates the current status of IP services for European Civil Protection (focusing on satellite IP-based services), future expected trends and perceived problems. The second phase identifies and assesses, both technically and financially, the best practices of IP services implementation for Civil Protection utilization. The third phase promotes and demonstrates these best practices to European Civil Protection agencies. This project builds on strong collaboration with many Civil Protection agencies in two ways: firstly, by informing the consortium of Civil Protection agencies current use of communications services, their perceived problems and future needs. Secondly, the attendance of Civil Protection agencies at consortium demonstrations and promotional events of best practices in satellite IP-based implementations is useful for rapidly increasing understanding and paving the way toward widespread adoption.

2.5 The "Decision" Project: Multinational Telecoms Adapter

Enhancing interoperability during European Civil Protection operations is the objective of a project named "Decision", conducted under the ESA initiative "Transition Phase Action 2". The Decision Consortium is composed of Infoterra France, as project leader, TRADIA Spain, Astrium Satellites France, EADS Secure Networks France, and Skysoft Portugal.

In the context of this project, field trials were held on 20 and 21 November 2007 in Char-

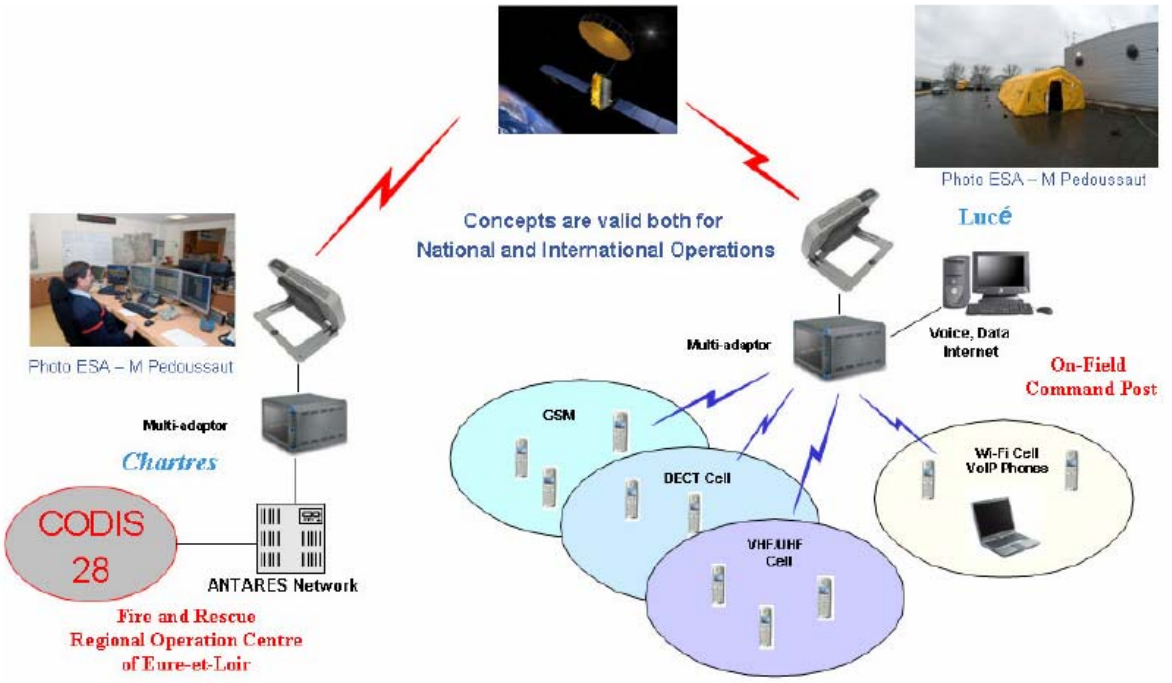


Figure 2.3: DECISION field trial - national intervention (source: ESA)

tres, France, focusing on satellite solutions to improve cooperation between Civil Protection agencies in crisis theatres, whether they occur in Europe or elsewhere. The "Decision" project: "Development of Civil Protection satellite communication services: enhancing interoperability during deployments outside Europe", also referred to as "Multinational Telecoms Adaptor", aims to increase the efficiency of cooperation between different national CP units working within the same foreign crisis theatre, and between members of national teams and their respective headquarters. The technical objective of the project is to develop a multi-adaptor, allowing interoperability between Civil Protection communication systems.

The demonstration covered two intervention scenarios. The first focused on a national situation where an industrial disaster has occurred and, as a consequence, the terrestrial communications infrastructure has been destroyed. In this instance, satellite telecommunication links are used to support coordination between the command post in the field and the regional crisis operations centre (Figure 2.3).

The second scenario dealt with an intervention outside Europe, such as an earthquake or a tsunami, involving a number of different Civil Protection agencies. For international disasters, rescue activity coordination needs to be performed between units in the field, as well as between national centres in Europe. In this situation, telecommunication satellites are needed to ensure communication among field units and between those units and their respective national centres (Figure 2.4).

Field trails assessed the Multi-Service Adaptor Communication Facilities, including the use of communications services for operational evaluations, the ANTARES network deployment and extension by satellite and the TETRA/TETRAPOL interoperability. The Chartres trial enabled the validation of the satellite multi-adaptor use concepts, which are applicable both in a national and an international context. It also helped to assess the added value of the multi-adaptor in a joint operation between different Civil Protection agencies in the same foreign crisis scenario. The results demonstrated the need for SatCom solutions to on-field mission needs and objectives. For instance, a BGAN like suitcase is better adapted to disaster assessment missions or first rescues that last for days or weeks. Light weight embedded applications included the exchange of mails, voice communications, sending of text reports, and photos. On the other hand, VSAT solutions are more appropriate for rescue missions or reconstruction efforts that last months or years. The embedded applications covered are heavier, and include connection to an information management system for larger file transfer and map updates. Both solutions are complementary with regard to

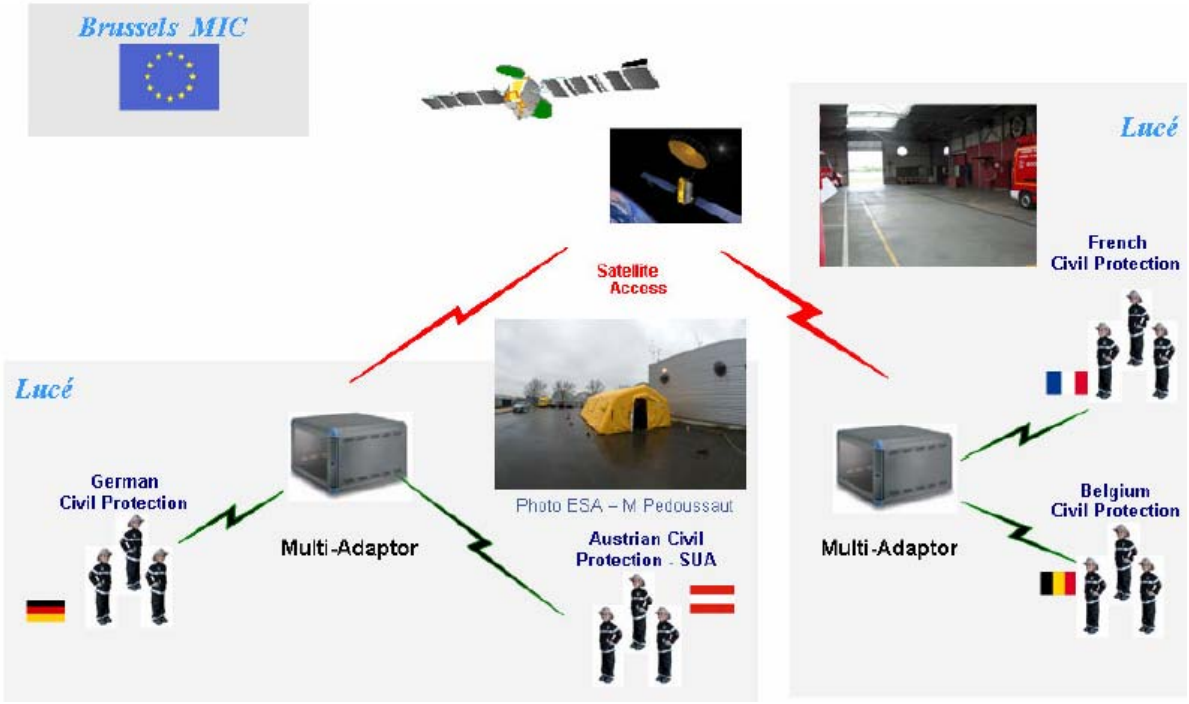


Figure 2.4: DECISION field trial – outside Europe intervention (source: ESA)

the crisis phases and the application types. These SatCom solutions can enhance the work of Civil Protection field units. Their field trial also showed the importance of developing interoperability solutions that are adapted to field needs and constraints and to the MIC organisation scheme for joint operations.

The involvement of Civil Protection agencies as end users was of primary importance since, by nature, the project has a user-need oriented approach rather than that of technology-push. The field trial was conducted with a cooperative spirit and a complementary contribution, through which fruitful results and end-user feedback were collected.

The results unquestionably demonstrated the need for adapted tools such as the "Multi-Service Adaptor Communication Facilities", and some tracking facilities. These technical assets can ease the work of agencies in emergencies and they also showed the importance of developing interoperable solutions adapted to the needs and constraints in the field. The field trial benefited from the attendance and involvement of the French authorities and the French Civil Protection Agency (Direction de la Défense et de la Sécurité Civiles, DDSC), the German Technical Relief Agency (Technisches Hilfswerk, THW), the Belgian Civil Protection Agency, and the Austrian Civil Protection Support Unit.

2.6 Multinational Pan European Satellite Telecommunication Adapter

The MTA Project led by Telespazio, which was responsible for an industrial team composed of Thales Alenia Space France, Indra and Hispasat from Spain, aims to make ICT networks interoperable among the European Civil Protection agencies when cooperating in the "operations theatre", both inside and outside the EU. The guidelines adopted follow a user-need oriented approach to comply with European and national standard procedures, and to maintain a non-invasive approach, thus using existing or planned telecommunication means as much as possible and rendering them interoperable through a Pan European Adaptor (PEA), designed by the Industrial Consortium on the basis of EU Civil Protection agencies requirements. As some national satellite infrastructures already exist within the Member States, the project baseline was to make such National Satellite Adaptors (NSA) interoperable, namely the Skyplexnet solution adopted by the Italian CP, the Recosat System in use by Spanish CP and a European DVB-RCS standard solution. Each NSA is required to be interoperable with the commonly used field standard Civil Protection telecommunication equipment such as VHF/UHF radio, WiFi enabled Notebook/PDA's and other equipment.

After the preliminary study phase, simple satellite solutions were inserted in the final integrated operational scenario, making them interoperable through the PEA and introducing the "shared NSA" concept (where a single satellite infrastructure is shared among several national teams). An overall consensus was then reached among the Civil Protection agencies on the target interoperability objectives to be implemented at the demonstration level: a "controlled voice and data interoperability matrix", able to ensure full respect of EU and national communication rules while allowing both "horizontal communication", among field Liaison Officers, and "vertical communication", between each Liaison Officer and his national hierarchical command chain. The MTA Demonstration took place at the French – Spanish border (Pas de la Casa, Andorra), on 14 May 2008, involving the Catalan, French SDIS09, Italian and Slovenian Civil Protection agencies. In addition, the Spanish Civil Protection agency made the Recosat network available. The Trial was intended to primarily demonstrate the interoperability between the Skyplexnet, Recosat and DVB-RCS solutions. Concerning voice service, this implies interoperability of VHF/UHF/Tetra Radio, GSM and Telephone over IP (ToIP). With respect to IP Data service, WiFi-enabled PCs & PDAs were used, allowing sharing of information through basic Internet applications complemented with video-streaming and collaborative working applications.

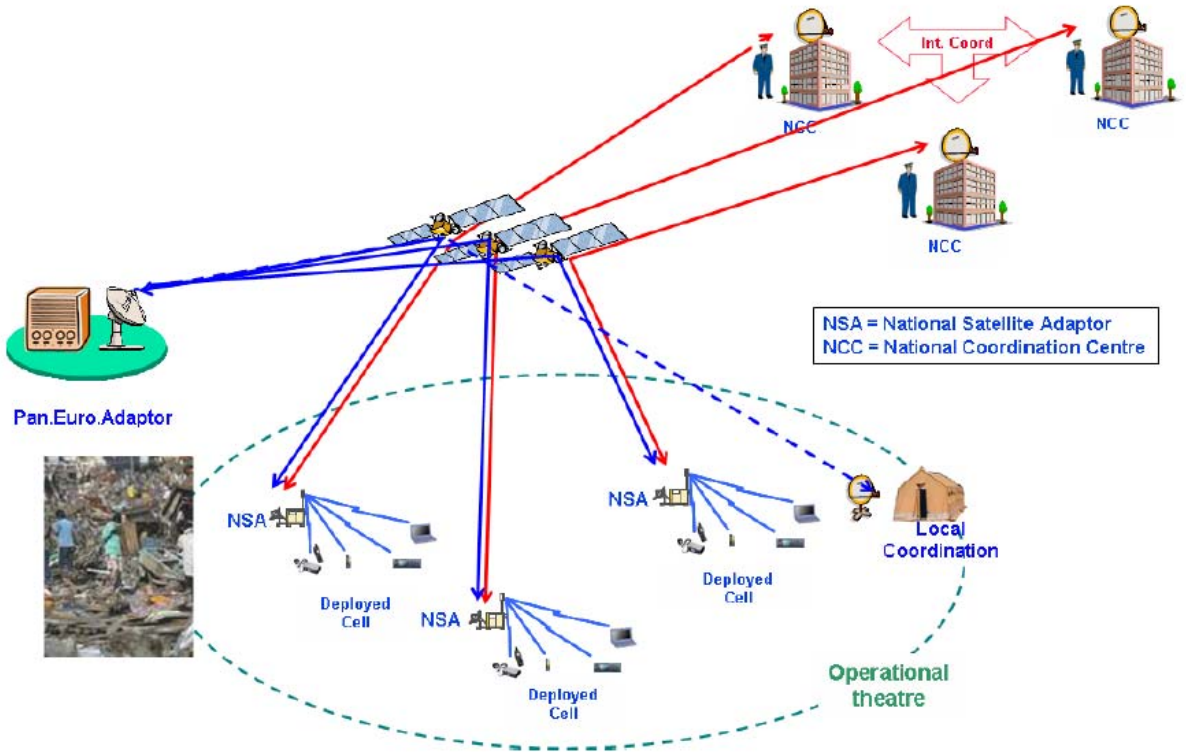


Figure 2.5: Field teams supported by National Satellite Adaptors (source: ESA)

3. ESPI Workshop "Space for Civil Protection"

3.1 Workshop Description

On 5-6 May 2011, ESPI organised a workshop on "Space for Civil Protection" together with the Austrian Federal Ministry of the Interior (BM.I) and the Austrian Aeronautics and Space Agency (ALR) of the Austrian Research Promotion Agency (FFG), in the framework of the ESA-IAP programme.

The ESA-IAP programme, also called ARTES 20, aims to develop sustainable services in strong cooperation with end users and relevant stakeholders (http://iap.esa.int). The IAP programme supports the development of new applications by utilising and integrating different space assets, resulting in improved or new services for citizens on a regional, European and global scale. It does not advocate any particular technology, but responds to users' needs. IAP is already active in diverse application fields ranging from energy grid management to aircraft safety, facilitating novel and innovative solutions and services that previously were unimaginable. Integrated applications are thus already benefiting European industrial competitiveness, while serving the needs of European societies and global communities. Based on its user-driven nature, the main focus of the IAP programme is to establish relationships with user communities in order to collect their requirements on new (or improved) services and to aggregate their demand so as to obtain the critical mass to enable sustainable services.

In order to multiply the outreach to users, ESA IAP is networking a growing number of Ambassador Platforms whose objectives are to inform users and stakeholders on the potential and opportunities of the IAP programme, to uptake user's needs and to foster stakeholder engagement. ESPI has been tasked with the role of the IAP Ambassador Platform for the Central and Eastern European region, in order to support the IAP programme by raising awareness and stimulating projects in the region of Central and Eastern Europe (CEE). One key awareness activity is the organisation of workshops within the CEE region in order to promote IAP to relevant decision-makers and user communities, define gaps in existing services that can be filled by space assets, and present new applications and services. An important goal of these workshops is to bring the various users and stakeholders together as well as to inform them about IAP funding possibilities.

The workshop "Space for Civil Protection" addressed various issues dealing with possible ways to enhance existing Civil Protection solutions and develop new services via the use of satellite-based applications from a European and national perspective. When developing new services, the commitment of Civil Protection agencies as a user is of paramount importance to validate the concept and to indicate the direction of a dedicated project. The development of a satellite-based Civil Protection service requires a thorough assessment of the users' demands, making the participation of Civil Protection agencies indispensable in all stages of the service development cycle, from specification to operational implementation. This approach will lead to several benefits for the Civil Protection community in the use of satellite-based services including cost reduction, improved interoperability of satellite communications devices across networks and services, and improved availability of dedicated service in times of need. Therefore, the intent of the workshop was to identify the most appropriate path forward, and to set up a roadmap for generating space-based user driven activities of direct benefit to the European CP community. It was an excellent opportunity for end-service operators from the Civil Protection community to present key examples of lessons learned from past disasters. Furthermore, it reflected the strategies and perspectives of several countries and Civil Protection agencies.

Civil Protection representatives from Austria, France, Germany, Hungary, Italy, Poland, and Romania participated in the ESPI event. On the first day, the workshop reflected on preliminary activities at the European level. Two presentations from ESA representatives, which considered potential future activities in the field of Civil Protection at the European level, followed a set of key note addresses by authorities from the different countries. The keynote speakers were then invited to a roundtable discussion in order to debate the

benefits of the use of satellite-based services to the Civil Protection community.

The second day of the workshop provided the opportunity for practitioners from the CP community in Central and Eastern European countries to share their experience and lessons learned from previous disasters. In the subsequent roundtable discussion they reviewed their national approaches to improve operational capabilities through satellite applications. A detailed summary of the roundtable discussions from both workshop days is in Chapter 3.3 of this report.

3.2 National Strategies and Perspectives

3.2 1 Austria

Since May 2003, the Austrian Ministry of the Interior has been responsible not only for coordinating civil disaster protection management but also for matters concerning civilian crisis management and international disaster relief.

Responsibilities for coordinating supra-regional/international incidents in Austria have therefore, for the first time, been unified under one roof, the National Crisis and Disaster Protection Management in the Federal Ministry of the Interior of the Republic of Austria, which allows improved and, more importantly, faster response and assistance in emergency situations.

Furthermore, the BM.I acts as the national competent authority for international disaster relief and all areas of international and cross-border cooperation.

The Federal Alarm Centre as the national 24/7 point of contact ensures communication without undue delay, as well as the coordination of the necessary action, as an essential requirement of effective crisis management or emergency relief. It is a permanently staffed information centre serving National Crisis and Disaster Protection Management as well as supra-regional and international civil and disaster protection purposes.

The Federal Alarm Centre forms part of an information network also comprising the Regional Alarm Centres, the relevant 24 hour services of the Directorate General for Public Security, the regional alarm centres, all competent authorities at the federal and regional levels, emergency and rescue services including fire brigades, the Red Cross, the Mountain Rescue Organisation etc. as well as focal points on the bilateral (neighbouring countries), supra-national (EU), multinational (NATO Partnership for Peace) and international (UN) levels.

The Ministry of Interior acts also as the national focal point for the International Disaster Charter and for the initial operations within GMES, and represents Austria at the European level within the framework of the EU Civil Protection Mechanism. Within this framework the Ministry contributes to EU interventions, for instance if activated, the Ministry organises and facilitates the deployment of national experts for European coordination and assessment missions. To date, Austria has registered five Civil Protection modules for EU interventions, among them a technical assistance team for communication, the Support Unit Austria, which has experience in several international exercises.

Since 2003, Austria has contributed to around 60 European and international disaster relief operations after major disasters by sending experts, intervention teams or in kind donations and relief assets (for example to Haiti, Chile, Pakistan and several European countries). Although Austria has been playing an active role in European Civil Protection in recent years the experience of national authorities with satellite services is still limited. Satellite based telecommunication devices for instance, are mainly used by Civil Protection forces as a backup system and not on a regular basis. The reason for this might be that Civil Protection is mainly organised at local and regional levels in Austria.

When discussing possible ways to enhance the use of satellite-based services in the field of Civil Protection it is necessary to look at all activities in all four phases of disaster management, which comprise prevention, preparedness, response and recovery. Satellite-based emergency mapping for instance, is widely recognised by Civil Protection agencies as supporting their operations in all four phases. The experience of recent years has shown that there is a need for structured cooperation in satellite-based mapping to avoid a “mapping disaster”, as happened during the major disaster in Haiti in 2010. In this case, a large number of organisations provided satellite mapping and analysis in a poorly coordinated way, resulting in an overflow of mapping information and different representation of the scale of damage. Nevertheless, even if Civil Protection agencies use satellite data in a critical manner, they need more than raw information. Reliable services are required that are affordable, timely, and usable by people who are not experts in the field.

In the response phase, telecommunication is of paramount importance as Civil Protection agencies and field workers rely on obtaining a wide variety of information from central facilities. This includes accurate information, which is typically stored in databases at headquarters, such as maps of the area, plans of buildings, and the locations of hazardous goods. Moreover, when disaster relief workers arrive at the scene there is an urgent need to establish effective communication links between different teams inside the affected area and with national disaster response facilities. Terrestrial communications may fail or be destroyed at the onset of a major disaster and their capacity is often inadequate during emergency situations. This underpins the importance of satellite communications in this area to provide a robust network largely unaffected by events on the Earth's surface.

A crucial aspect in telecommunication is the understanding and definition of user needs. The dialogue between users and other stakeholders in this field is still absent. The barriers and opportunities should be clearly identified in order to fully exploit the benefits of satellite-based technology and to enhance the use of innovative services.

3.2.2 France

French Civil Protection is organised in different hierarchical levels from national to local scale. The use of space technologies is mainly driven by the Civil Protection Directorate which is developing and implementing new tools in this field within its GIS unit.

This national directorate is attached to the Ministry of the Interior and is responsible for central management of current risks and major disasters in France. Its fields of competence are current risks (e.g. accidents), natural risks (e.g. earthquakes or floods), technological risks (e.g. nuclear or chemical disasters), health risks, and terrorist threats. This national directorate runs the Joint Emergency Management Operational Centre (COGIC) that is tasked with the permanent monitoring of CP issues within an inter-ministerial framework. The centre is linked to the regional and local operational centres as well as to the European Monitoring and Information Centre (MIC). The main missions are to inform governmental authorities, such as the Ministry of the Interior, about all events that could affect the population, as well as to respond to reinforcement requests from the regional level and from foreign countries during emergency situations by mobilising all necessary means.

Space technologies are mainly used in the field of Earth Observation with the support of some international services (Disaster Charter and EU Emergency Response Service). Space technologies are also used for real time location of ground forces (human and material resources) as well as for telecommunication and data transmission to and from the national joint operational centre. The interest in geo-localisation and communication tools is magnified in the context of missions in foreign countries, for example the recent earthquake and tsunami in Japan.

In the context of crisis management, the key factor underpinning the interest in space technologies, especially in the field of Earth Observation, is the timely availability of information. Indeed, the main objective of Civil Protection authorities is to provide a fast and efficient response in order to reduce the effects of a disaster. The operational use of space technologies still needs improvements that can be achieved optimally by pooling available resources. The Disaster Charter and the GMES Emergency Response Service (GMES-ERS) are good examples of global cooperation in the Earth Observation domain.

It would be interesting to take the example of these existing tools in order to develop other space-based services for Civil Protection. For example, there are many improvements that need to be made in the fields of telecommunication and geo-localisation concerning the cost and the efficiency of these tools.

3.2.3 Germany

In Germany, the Federal Government is responsible for Civil Protection, while the States are in charge of disaster protection. Both work closely and efficiently with different aid organisations and fire services. The major types of disasters Germany has to deal with are plain floods, such as the floods in Eastern Germany in 2010, storms like "Kyrill" in 2010, and to a lesser extent localised landslides. The responsibility for flood prevention rests at State level with the Ministry of Transport and Environment.

As part of its strategy to improve the Civil Protection system and to elevate Civil Protection as a key component of the national security system, Germany has created the Federal Office of Civil Protection and Disaster Assistance (BBK) that consolidates federal services related to Civil and Disaster Protection. This agency acts as a federal service provider for agencies and organisations involved in Civil Protection tasks. Along with the BBK, another important element in the overall system is the Federal Agency for Technical Relief (THW).

The THW was founded in 1950 as a public agency belonging to the Federal Ministry of the Interior to provide direct disaster assistance in Germany and abroad. The field work of the THW is mainly done by volunteers. Besides Civil Protection, its mandates are local and national disaster relief on request of local authorities as well as international operations on behalf of the Federal Government.

Civil Protection agencies in Germany, such as the THW, use satellite applications mainly for international aid missions. In this context, Earth Observation as well as navigation and satellite communication can all enhance the effectiveness of Civil Protection agencies. Satellite-based emergency mapping, for instance, is useful to provide the basis for decision making processes such as damage assessment and prediction as well as to create a situational overview of the disaster area. In the field of navigation it is of great benefit for operations personnel to have local road maps integrated into their GNSS devices. Furthermore, navigation services are necessary for unit movement monitoring which is of particular interest for headquarters and disaster management centres. Nevertheless, the most important issue for Civil Protection agencies is telecommunication as it is absolutely necessary for coordination tasks, wherein the reliability of communication systems is crucial.

The requirements for using satellite-based services in the field of Civil Protection are varied. For example, there is a big difference between national and international aid missions, given that for international missions the Civil Protection agencies may not have enough information on how the country is structured. Moreover, the requirements for satellite-based services depend highly on the disaster itself. During a forest fire the situation can change dramatically within minutes whereas in the case of floods the response time is much longer and the situation changes over a matter of hours. Another critical point is disaster response, as there is a significant difference if thousands of field workers are operating in an affected area who need to communicate and to be coordinated, as was the case during the disaster in Haiti in 2010, or if there is a disaster like in Chile in 2010 where just a few rescue teams were assisting. In the latter case, the requirements for communication systems are much lower since the amount of data transmission and voice communication is less.

All in all, satellite-based applications for Civil Protection have to be affordable, easy to set up and to use, versatile as well as adaptable and interoperable, reliable and independent, accepted and commonly used.

3.2.4 Hungary

Hungarian disaster management was established out of the fire service and Civil Protection organisations performing state functions. The consolidation was achieved as a result of a natural process, for the sake of greater efficiency, in which international effects and experience have also played a part. The National Directorate General for Disaster Management (NDGDM), headed by the Ministry of Interior, is responsible for Civil Protection and disaster management, the implementation of related tasks at all levels, and also provides support. In general, Civil Protection is organised on three different levels: national, regional and local.

Within the NDGDM, the Department of Telecommunication was restructured by forming a GIS unit and integrated as the Department of GIS and Telecommunication in the beginning of 2011. Its goal is to provide support to decision makers and end-users at all levels, serve as a national focal point for national and international programmes and projects (e.g. GMES ERS), and to plan and organise training.

The telecommunication system for Civil Protection agencies as well as other organisations such as police and fire fighters is based on the terrestrial TETRA system that provides unobstructed communication between users. The system is managed by the government, which enables an effective joint response. Telecommunication is indispensable for command and control and therefore it is crucial to have a stable and effective system. In this context, the use of space-based solutions to support the operations of Civil Protection authorities is not integrated into the system in Hungary, mainly because of the high costs of satellite services. Therefore, satellite communication is only used as a complementary solution, and devices for SatCom (e.g. Iridium for voice communication or Inmarsat BGAN for data transfer) are mainly used for international missions.

NDGDM has created a Disaster Management Geographical Information System to facilitate the accurate and automatic flow of geographical data as well as to quickly provide information to decision-makers for effective emergency management. This system is currently under development in Hungary.

The European Civil Protection community needs to take a federated approach to overcome shortcomings such as interoperability and standardisation, which are of utmost

importance for cross-border disasters. Furthermore, there is need for effective information flow between Civil Protection agencies and other stakeholders like service providers, including updates on space related projects. This could be realised by newsletters or common platforms, as is being attempted through the UN-SPIDER knowledge portal. A systematic approach is still missing to communicate problems, requirements and possibilities through the entire value chain. In this context, an interesting idea raised during a workshop on integrated approaches to flood management, under the Hungarian EU Council Presidency in 2011, involves the use of social networks for information sharing, even by developing a new, secure system that can be used by Civil Protection agencies, fire fighters, disaster management units and even service providers.

Nevertheless, satellite communications are widely recognised by Civil Protection agencies as providing a resilient, complementary solution that can increase their effectiveness not only for command and control but also for delivering information derived from GIS. In addition, satellite communications can contribute to asset tracking systems, which in turn depend upon the use of satellite Earth observation and navigation services. An increase in the usability of satellite-based services could be attained through a decrease in the costs of such services as well as training in handling the devices and systems.

3.2.5 Italy

The role of the Italian Civil Protection system is to protect both people and national resources from natural and manmade disasters through preventative, preparatory, responsive, and recovery actions. The system cooperates with all levels of government and in case of emergency can include other national bodies, scientific and academic organizations, private industry, and volunteers. Led by the Institutional System of Civil Protection Authorities, emergency response is initiated by the “National Early Warning System”, as provided by the Civil Protection Authorities via the “Functional Centers Network”. This network manages all real time data related to potential disasters, which originates from the “National Competence Centres Network”, consisting of scientific institutions that provide preventative and real time hazard scenario assessments.

In spite of the organizational complexity, efficiency is achieved through coordinated action, and the use of Earth Observation data is critical in this respect. Many natural and manmade disaster scenarios have been tested as experimental applications of the system, through the coordinated actions of the Italian Space Agency (ASI) and the Civil Protection Department. With the Italian Civil Protection Department, the GMES European Emergency Response Service was developed initially to serve strictly in a responsive role, though it now addresses preparatory and long term responses as well. Satellite data enables both real time emergency mapping and emergency support mapping, a preparatory action to support relatively un-mapped areas. The European GMES Emergency Response Service is subsidiary to national competencies, manages information regarding trans-national events, and supports Europe’s worldwide activities, especially “extensive catastrophic” events for the purpose of humanitarian aid.

ERS users include Civil Protection agencies, Humanitarian Aid, and European Commission representatives in a collaborative approach, with Italy acting as a general coordinator through the SAFER project, which empowers the pre-operational version of the ERS. Thus far, requirements, infrastructure, and procedures have been established, and the pre-operational service activated for cases of emergency and international exercise, thus validating performance with respect to these requirements.

In general, the ERS, or any satellite based emergency management system, must be fast, available, and reliable; raw data must be easily distributed among all actors; user feedback must be encouraged; standardization is essential; and inter-programmatic cooperation must be encouraged, as with the SAFER establishment of cooperation between the ERS, Charter, and GMOSAIC. Lastly, there is need for some standardization of procedures to achieve the fastest and most efficient information exchange.

3.2.6 Poland

Polish Civil Protection has been using and experimenting with satellite applications for several years. Notable examples include the successful utilisation of GMES and GMES-derived products during the large scale floods in Poland in 2010 and deployment of information environment providing commanders with a common operational picture during the international exercise COOperation 2008. Use of satellite communication for strategic-level coordination is a relatively standard practice during a large-scale operation. Operational use of several satellite application-based systems is planned during the EU Carpathex 2011 exercise that will be organised during the Polish EU Presidency.

Areas of Interest

Analysis conducted by experts of the Polish Civil Protection has identified several areas where use of satellite technologies provides or can provide a clear added value for Civil Protection activities. They cover all segments of the crisis management circle.

Prevention

1. Risk assessment maps, taking into account environmental and human factors (i.e. possibility of the occurrence of the threat in certain environmental and human conditions)
2. Development of spatial information systems, i.e. as an input to damage assessment maps (i.e. density of population)
3. Development of satellite communication infrastructure for easier, faster and more reliable communication after disaster

Preparedness

1. The use of modern technologies during exercises
2. Proper training of emergency responders on the use of technologies

Response

1. Early warning and alerting systems – with information about: what has happened, what actions should be taken, location of safe zones, evacuation etc.
2. Disaster mapping (different scales and resolutions, with optical and radar mapping)
3. Further mapping of the event at agreed and acceptable intervals (monitoring of the disaster)
4. Damage assessment maps (determining damaged objects, areas, transport routes, calculating casualties)
5. Determining safe transport routes, with the ability to inform emergency responders about crossing the border of a safe zone (using maps, satellite communication systems, positioning)
6. Determining safe evacuation zones
7. Communication arrangements in case of destroyed ground infrastructure, data exchange in common networks (cooperation of all resources on the scene, communication with command centres)
8. Communication arrangements for citizens in the affected area, maintaining contact with the media

Post-disaster and recovery

1. Further mapping – monitoring of the disaster
2. Damage assessment and environment recovery maps, determining safe zones and transport routes
3. Further recovery of communication systems for citizens in the affected area – organising temporary communication
4. Preliminary risk assessment maps

Experience from Training Activities

In 2006 in Zegrze, Poland a large scale European demonstration of use of space applications for crisis management was organised as part of the Astro+ EU-funded project. The demonstration was evaluated by involved users from rescue formations and led to the formulation of several relevant observations.

The use of space technologies to gather, generate and disseminate information can significantly contribute to development of a rich and efficient information environment for the operation. Such an environment provides enhanced and up-to-date understanding of the broader, strategic situation for people operating in the field. This is of particular importance since during international humanitarian missions teams usually operate with a high degree of independence, a single chain-of-command does not exist and most decisions are taken by field commanders. Furthermore, the ability to know about activities conducted in the neighbourhood and to communicate directly may lead to much more effective horizontal coordination between different teams and increase the efficiency of the whole international effort.

Satellite technologies enable the use of a remote centre (Situation Centre in the exercise) to support humanitarian operations through information gathering and its analysis, providing recommendations and use of experts' knowledge. The centre can also generate a situation overview to brief top-level decision-makers and to facilitate strategic-level decisions on international humanitarian aid.

Supporting centres should provide local operation coordinators and international units in the field with a wide range of geospatial products, from digital maps of the area to damage assessments, evaluation of communication infrastructure, etc. Standards and

formats for such products should be predefined and when ready, they should become immediately available for units in the field. It is important to ensure that information provided for people in the field can be optimised according to their level of command in order to avoid information overload.

The ability to locate oneself on the map and particularly to observe/locate other units proved to be the single most useful functionality available during the exercise, both for units in the field and for the command centre thus giving better situation awareness. Furthermore, the ability to track/locate units from outside the chain-of-command (e.g. medical, NGO and other rescue teams,) may allow more effective coordination of activities between different actors engaged in operations. This would require the development of mechanisms to exchange information about position.

The use of Earth Observation data at the strategic level allows better situation awareness (and damage assessment in case of disasters) and may lead to more optimal allocation of resources. On and operational/local level this information may also be useful, but is supplementary. Priority needs are maps, if possible enhanced by additional information (e.g. passable/impassable roads). Paper maps have significant advantages and should be used in parallel to digital maps and terminals. Therefore operational teams (e.g. at the level of local headquarters) should have equipment for fast and easy printing of maps.

The usefulness of the information environment supporting large-scale international humanitarian operations will depend on the efficiency and reliability of communication infrastructure and the availability of sufficient broadband capabilities. Not surprisingly, satellite communication must be the backbone of such infrastructure.

Effective use of information tools will require easily deployable and re-deployable SatCom terminals assigned, optimally, to local commanders. They should have direct access to terminals to benefit from broadband communication. Units operating in the field would also need effective mobile communications systems. As long as satellite mobile communication is not economically feasible, “last mile” ground communication systems may be needed to provide communication between SatCom nodes and units in the field.

During international field training exercise “Cooperation 2008”, a dedicated information system was created for evaluation. It integrated a set of existing, commercially available off-the-shelf products. Its function was to provide better situational awareness for officers in headquarters (LEMA and OSOCC), visualising the area of operation, basic tactical information and location of different groups participating in the exercise.

During the exercise specialist tasks were undertaken by different units: fire fighters, medical units, search and rescue groups, police, military, chemical and biological teams, anti-terrorist units. Participants represented services of 7 different nations. The secondary function of the information environment was to create a common operational picture for different command structures and to facilitate exchange of information.

The experience clearly demonstrated the benefits that could be achieved through development and implementation of common standards for exchange of geospatial information between different actors in the crisis management community. As it is hard to predict which institutions will need to work in a specific crisis situation, such standards must be universally adopted.

Concluding, it is clear that it is not the unavailability of technologies that represents the main obstacle to implementation of satellite solutions. Satellite communication solutions are operational, even when they have some limitations. There are already several pre-operational services ready to provide satellite imaginary in cases of large-scale disasters. However there is still a limited number of users fully aware of such possibilities and prepared to effectively use them. At the same time, during crises there is no organised flow of the feedback information from users to the providers of the information. Another issue of growing significance is a lack of interoperability between different positioning systems in use by emergency services. That results in very limited use of such systems for coordination of units coming from different chains of command. This is already the case within many countries, but it is becoming particularly significant when provision of international assistance is concerned.

The main challenges can be categorised in the following order:

1. Raising awareness of available capabilities of integrated space systems
2. Developing operational procedures that take account of available space capabilities
3. Developing technical standards for interoperability of end-user systems
4. Integrating technologies

3.2.7 Romania

Romania is a large country, with around 21 million inhabitants and an area of approximately 260,000 km^2. There are many risks including potential earthquakes, floods, chemical and nuclear accidents, etc. The risk of an earthquake is especially prevalent in the country's South-east region, which includes the capital Bucharest with approximately three million people. The last major earthquake was in 1977, which resulted in the deaths of several thousand people. The number, significance, and potential of these risks force the Civil Protection community to be prepared, and to have a system that can respond not only to everyday emergencies around the country, but which can be mobilized at any time to respond to a major disaster outside Romania.

Integrated dispatch centres have long been used to provide emergency services – these centres are nodes for many organizations including fire & rescue, police, and ambulance response services. Formerly, these dispatch centres covered smaller areas, and thus communication was much easier (VHF radio was sufficient) and the communications infrastructure requirements were relatively simple. Nowadays, the centres are serving increasingly larger areas (perhaps some services will even accommodate multiple counties) with daily communication, and not only in the event of disaster. This trend of reducing the number of dispatch centres and extending the coverage area is not confined to Romania, and can be seen in many European countries; e.g. Finland used to have 21 centres and now has about five integrated centres serving the whole country. Therefore, communication becomes a very important and vulnerable point because with no redundancy in the system, a single point failure in a communication network terminates all communication between the control centre and the rescue teams. Thus the creation of redundant systems is critical, and especially ones that depend not only upon ground communications in countries like Romania where the likelihood of earthquakes is significant. Furthermore, the prevalence of rural regions in Romania presents a significant challenge to communication within the country. And, as the world becomes increasingly connected, a comprehensive communications solution encompassing voice and data is critical.

Years ago, Romania began reorganising the emergency management and response system. Given that the Ministry of the Interior had previously transitioned from VHF to the TETRA digital communication system, Romania recently unified its communications architecture by transitioning the Ministry of Health to TETRA as well. This presents a unique opportunity for the use of telemedicine. While it is obviously desirable to have a doctor in every ambulance, the use of telemedicine is an opportunity to bridge the impracticality of that desire. Over the last three years Romania has tried to provide a virtual doctor in every ambulance using telemedicine by equipping every new type B emergency ambulance with real-time telemedicine systems. Currently there is increasing use of real-time video streaming from those ambulances and, by the end of September 2011, 100 fire department based ambulances will also have video streaming systems installed. The impact is significant because the system is country wide and not simply regional.

The telemedicine system has two levels: pre-hospital (currently 800 ambulances equipped with this system), and the regional inter-hospital telemedicine system (which supplies smaller emergency rooms and hospitals with advice offered by regional university centres). Because there are some hospitals with no advanced emergency care facilities, and because there is no guarantee that every hospital has a specialist in every field, the inter-hospital telemedicine system is becoming increasingly important in providing counsel to hospitals lacking in certain areas of expertise. Existing inter-hospital telemedicine in Europe usually involves a telemedicine system for every specific topic. The system in Romania deals with every kind of pathology dealt within the field of emergency medicine. This type of system is extremely beneficial, as well, in the case of disasters, in order to transmit data from the scene to command and control centres.

To use this system in remote areas, terrestrial communications systems like GSM/GPRS (normally the ambulance telemedicine systems are equipped with GPRS) become less efficient and other methodologies such as satellite technology must be considered. This is not only relevant to remote areas, but also when ground-based systems are disrupted during a disaster.

The establishment of uniform digital communication throughout Romania takes the country one step further on a long path. The use of satellite technology could be a further step to provide redundancy in the communications systems, however, the cost of satellite-based communications is presently too great a hurdle. For example, the 800 vehicles equipped with the telemedicine system cost Romania around 1300 Euros per month, including all the data transfer, with thousands of transmissions taking place every month country wide. Transferring this service to satellite

communication would raise costs significantly. One potential method to reduce costs is to increase the number of countries using the system so that SatCom becomes the baseline, and not simply a redundant option. The path forward depends greatly on what kinds of operations will be needed and implemented in the future.

3.3 Summary of the Roundtable Discussions

The following chapter is based on two roundtable discussions. The first roundtable took place on the first day of the workshop and aimed at discussing the benefits for the Civil Protection community of the use of satellite-based services. It was moderated by Pierluigi Mancini (ESA) and Erich Klock (ESPI). The panelists, Raed Arafat (Ministry of Health, Romania), Amnon Ginati (ESA), Siegfried Jachs (Austrian Federal Ministry of the Interior), Tomasz Kolodziejczyk (National Headquarter of the State Fire Service, Poland), Marzia Santini (National Department of Civil Protection, Italy) and Tiphaine Schmitt (Ministry of the Interior, France), discussed the key issues raised during the presentations of the previous sessions.

3.3.1 Importance of Satellite Communication for Civil Protection

From an operational point of view telecommunication is one of the most crucial issues for Civil Protection followed by other applications such as mapping or monitoring. In this context, the focus should be on both fixed satellite services and mobile satellite services. CP authorities need a reliable communication system whether it is satellite based or terrestrial. Field teams depend strongly on reliable communication between themselves and operations centres as loss of communication capability implies loss of operational control. Due to the vulnerability of terrestrial services during disasters, there is an obvious need for a complementary or backup system. Moreover, the coverage by terrestrial systems is often confined to urban areas and there is rarely good coverage (in terms of available capacity) of rural or remote areas. In contrast, satellite communication provides a resilient, complementary solution that can increase the effectiveness not only of command and control but also in delivering information.

Mobile communication equipment used by Civil Protection agencies should be able to transparently utilize satellite communication infrastructure in case terrestrial communications fail or are not available at all. Even if nowadays satellite communication is mainly used for voice communications, the transmission of relevant data that could improve the monitoring and managing of emergencies has become more and more important. This implies also an increasing demand for increased telecommunication capacity. The transmission of massive amounts of data in real-time via current narrowband terrestrial CP systems like TETRA and TETRAPOL is difficult to implement operationally. For instance, when Romania developed its tele-medicine system it failed to transmit images in real-time through the TETRA network because of missing bandwidth.

The real-time transmission of data is an important issue for effective emergency management. Participants in the panel discussion agreed that in many cases there is modest operational effectiveness if the required information is transmitted too late. For example, from a doctor's point of view it is unacceptable to receive critical data several minutes later since the sampled vital data of a patient can change dramatically within this time. By contrast, within a tele-medicine system, doctors can take decisions and give advice on how to treat a patient if they receive the information immediately. Therefore, for effective use of such services it has become increasingly important that huge amounts of data are transmitted in real-time.

Space applications are indeed crucial to increase the efficiency of CP agencies but real-time data transmission from the headquarters to field rescue teams is still a problem the CP community is facing. Having a satellite communication system integrated with conventional terrestrial systems could be a solution to this issue. This implies a system in which satellite communication is used at least as backup to provide a robust communication system. However, a key problem that restricts the use of SatCom based services is its inherent affordability. Satellite communication services are mainly used for voice communication and only as backup systems in case of emergency or in a remote/isolated context given that terrestrial communication is more affordable. Therefore, it will be necessary to ensure competition among companies that are in a position to deliver such services on a cost-effective basis. A joint procurement approach would allow CP agencies to federate their demand and thereby reach a critical mass to justify permanent booking of capacity. Such an approach would also lead to reduced service costs for CP agencies. Furthermore, CP actors need to clearly formulate their needs and require-

ments for services. The more precisely the requirements of Civil Protection agencies are defined, the better the satellite-based services that can be provided to them.

3.3.2 ESA's User Driven Approach

With the Integrated Applications Promotion programme ESA is trying to promote a new user driven approach contrary to the traditional technology pushed programme in order to meet the needs and requirements of various users. This approach is in line with the Poland's ambitions for its EU Council Presidency in the second half of 2011. The goal is to voice the demand of the relevant users as well as the existing industry offers to generate the necessary market dynamic. In the field of Civil Protection Poland is focusing on bilateral communications between research centres and CP actors. A user driven approach is an effective means to improve communication and to understand the needs of both sides.

In this context, it is important to highlight the different landscapes. In general, there is a lack of dialogue between industries looking at their business and user communities who have a problem but do not have sufficient financial resources at their disposal to resolve it. Therefore, it is difficult to provide guaranteed services when CP institutions are not able to bear the costs for them. This situation is exacerbated by the fact that the media competes with them and they are in a position to invest significant sums in this field. The way forward does not necessarily lie in the development of new satellites; it is rather a question of affordability and interoperability. Therefore, a systematic dialogue should identify and formulate the needs of the CP community. A user-driven initiative would represent the interests of Civil Protection to the satellite industry, thereby achieving the development of satellite-based services and solutions designed to meet the specific needs of the CP community.

3.3.3 Active Information Flow of Lessons Learned

A possible way to enhance the exploitation of satellite based technology could be to exploit information on experiences from previous disasters (i.e. the lessons learned feedback loop). One of the key elements identified in the frame of this feedback exercise is the lack of a satisfactory telecommunication infrastructure. According to the panel, an analysis of the lessons learned series in 2002, done by Poland, has revealed that in many large-scale disasters telecommunication was one of the major problems.

One problem might be that the results of these feedback exercises are only distributed amongst the CP community. Nowadays, a systematic approach is missing to communicate the problems also to other actors, for example service providers. In many cases not even the national space agencies have rapid access to these kinds of reports. This means that there is a lack of communication between the different stakeholders.

In most countries, there is already a link between the national Civil Protection agencies and the national space agencies. For example in Poland the experts of the national space agency strongly support the CP authorities. Ranging from exercises to real rescue operations, the CP community receives feedback and reports from the technical experts on experience gained in previous disasters. Nevertheless, there is no mechanism that allows the European CP community to have efficient and simple access to space assets. Furthermore, there is not yet a clear articulation of the specific needs of the CP community that would enable service providers to develop services to meet these requirements. ESA can support cooperation between the CP agencies and the space sector by trying, together with the users, to define weaknesses in existing systems.

A related issue is the importance of awareness building and training of CP field operators on the installation and use of satellite equipment because often CP operators are not specialists. Therefore, CP agencies should be involved in satellite demonstration activities for training and awareness of the potential benefits they will receive from their use.

3.3.4 Interoperability and Standardisation

This section is based on the second roundtable discussion on the second workshop day. Its aim was to review national approaches to improve operational capabilities through satellite applications. Moderated by Pierluigi Mancini (ESA) and Mildred Trögeler (ESPI) the panelists Martin Keitsch (THW, Germany), Rene Kerschbaumer (Emergency Call, Lower Austria), Kinga Perge (National Directorate General for Disaster Management, Hungary), Michael Pregesbauer (Civil Protection Department, Lower Austria), Jakub Ryzenko (Space policy expert, Poland), and Juan Carlos Villagran de Leon (UN-SPIDER, Vienna), discussed their operational experience.

Another key issue is interoperability as CP teams from different countries often deploy across national borders and outside Europe.

The equipment and infrastructure selected by the CP agencies are mainly commercial devices and they vary not only on country level but also at local level, thus resulting in problems of interoperability between different task forces. The communication problems that CP agencies face during cross border disasters highlight the need for a federated approach. Problems occur for example when integrating information collected by different organizations, using various satellite and terrestrial tools that are stored in dispersed databases. Especially at the command and control level, it is important to ensure that different type of forces from different nations can communicate in a coherent form. Transition to Internet Protocol (IP) based services is happening in many individual CP networks. The use of IP services over satellite across all the different national CP networks could help to improve interoperability and to lower the cost of the service offered. During a disaster, satellite communication can help maintain links, for instance, between disaster response officials, the government and affected people. Hence, it is of utmost importance to achieve standardization across European CP telecommunications systems.

According to the panel there is a lack of standardization regarding the systems, techniques and technologies used by European Civil Protection. In the institutional sector, interoperability and standardisation between different systems is very low as different bandwidth, protocols and technologies are used. Several standards exist, but there exists no entity in Europe that is in a position to enforce or establish a common standard. Nevertheless, standardization activities would be necessary to overcome the current lack of interoperability. Even if a formal standardisation would technically be possible from a theoretical point of view, this would lead to difficulties on the operational side in practice. During the discussion on standardization and utilization of data the objection was raised that the provision of data should not be subject to discussion anymore as the issue is to provide services to users. In case of a disaster, there are a lot of entities involved (e.g. CP agencies, insurance companies, etc.) that need services and not specific raw data.

There is also a growing concern about security since CPs have to increasingly operate in regions with high threat levels. For example, the THW tries to conform to standards from international organizations like the UN system MOSS (Minimum Operating Security Standards) in which also communication devices are defined. Moreover, the adoption of security standards for reliable communication should be considered and CP agencies should be considered as ''premium" users, if necessary to the detriment of regular users. Therefore, security matters have to be considered when establishing common standards.

The panel also mentioned the gap in funding during the mitigation and preparedness phase of the emergency management cycle. When there is a major disaster, public and political interests are high and money is available. After the recovery phase the interest starts to decrease and less money is available for services. The roundtable discussions stressed the importance of space-based applications to increase the efficiency and effectiveness of European Civil Protection in the event of major disasters. The discussions brought together the views of CP experts from different countries, while highlighting some of the needs and requirements of the CP community. All in all, there is a need for a federated European approach to overcome problems like interoperability and standardization as well as to make SatCom based services affordable for CP agencies. Furthermore, the needs of the CP community should be clearly identified and formulated, and a better flow of information among the different actors in this field should take place.

3.4 Shortcomings and User Requirements

This chapter provides an overview of the requirements of the Civil Protection community, and some corresponding shortcomings of current satellite services. It reflects the needs and requirements that were discussed during the ESPI workshop, which, by the end confirmed that the participating Civil Protection community needs a set of tailored space-based applications to enhance its operational capability. Dedicated effort is needed in the following aspects of the use of satellite-based services by Civil-Protection end-service providers:

- Interoperability of communications equipment across different networks and services
- Availability of dedicated satellite-based services in a timely fashion
- Cost effectiveness of satellite-based communications services
- Best practice in the general use of satellite-based services for Civil Protection

Satellite-based services have the potential to support the full disaster management cycle, however previous ESA surveys as well as the ESPI workshop "Space for Civil Protection"

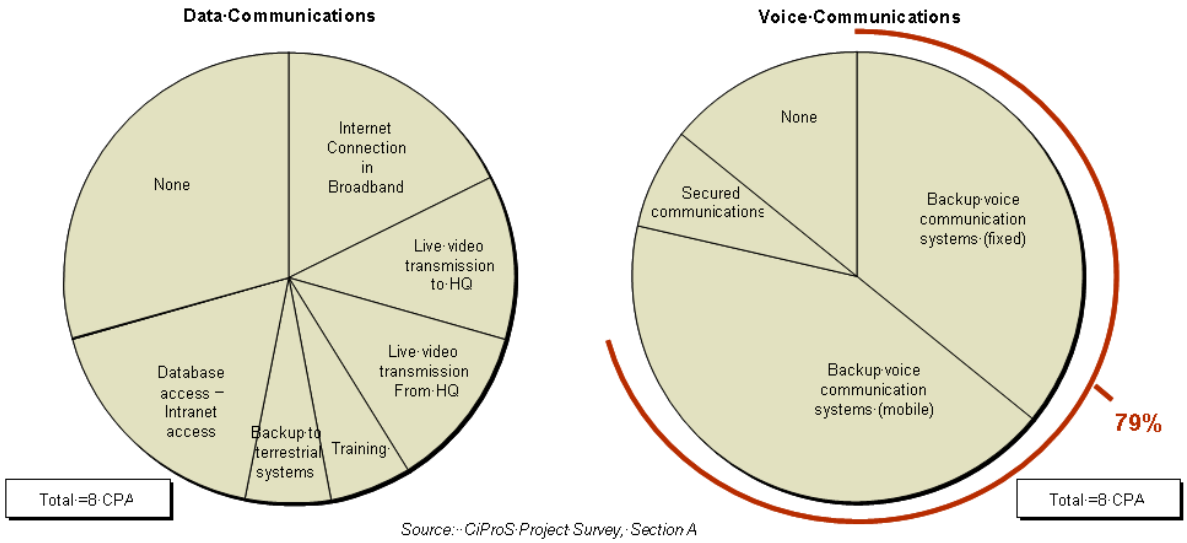


Figure 3.1: Satellite communications services currently used by interviewed CP agencies (source: ESA)

have underpinned that the current use of satellite services by Civil Protection agencies needs to be greatly enhanced. A main weakness of current satellite-based services is their lack of availability during different stages of the response phase, for example in cases of risk assessment, coordination, early warning, and search and rescue. The communication bandwidth required by CP agencies depends mainly on the number of active groups simultaneously operating in the field, and the amount of data being transferred. Normally, the required volume is small, but it peaks during disasters when a variety of data, such as damage reports, positioning information and images from affected areas must be available in real-time.

In an important study named CiProS (conducted by ESA) a survey of Civil Protection agencies from different countries highlighted the current use of space-based services.

Telecommunications are vital for Civil Protection, and major emergencies consistently expose a shortfall in the availability of telecommunications capacity (e.g. the Katrina hurricane, the Haiti earthquake and the Pakistan floods). Terrestrial-based communications are often unavailable during such emergencies and have limited capacity. In contrast, satellite communication systems provide a robust network that is largely unobstructed by events occurring on the earth's surface, thereby facilitating consistent and reliable communication. Concerning coverage and capacity allocation, satellite communication enables a more flexible response to disaster situations than terrestrial communication systems. In this respect, the use of satellite communications permits Civil Protection agencies to improve their overall operational capabilities.

As shown in Figure 3.1, satellite communication services serve mainly as a back-up to terrestrial communications, and this role is absolutely crucial in robust CP operations. And when these services are used, it is mostly for voice communications among local responders and local sites, as well as between local sites and national headquarters. The limited use is mainly due to the fact that data transfer rates have been very low in the past, as many procedures have used only orally communicated information. As the bandwidth of communications networks expands, relevant data that could improve the monitoring and managing of emergencies is being transmitted. For example, live video transmission is a key capability and is mainly used to report on the status at a site of emergency.

Some Civil Protection agencies are already equipped with different satellite-based communications systems, and look forward to satellite-based broadband service. This capacity allows more applications, for example, not only command and control but also for delivering information derived from Geographical Information Systems (GIS). Nevertheless, a critical limiting factor in the use of satellite communications services is their higher costs when compared to terrestrial communication systems.

Mobile satellite services are mainly used by local responders for voice communication with GPS integration in some cases for the transmission of position information via SMS. These services are provided by Globalstar, Iridium and Thuraya systems, and operate with small cell-phones with omni-directional antennas (possible due to LEO satellite constellation). Moreover, many devices are already compatible with terrestrial networks, as

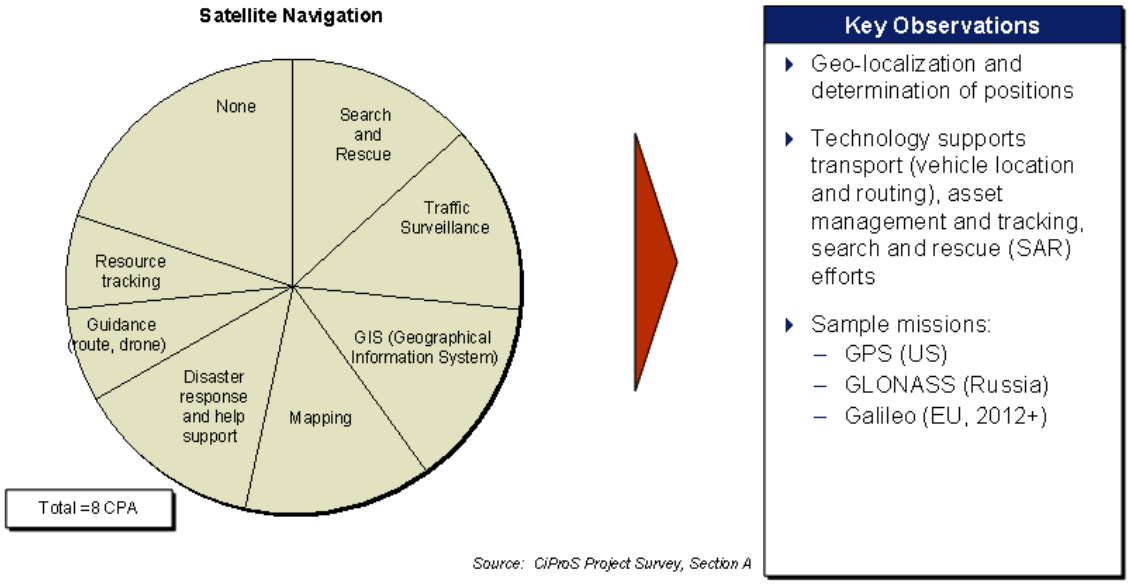


Figure3.2: Main satellite navigation services currently used by interviewed CP (source: ESA)

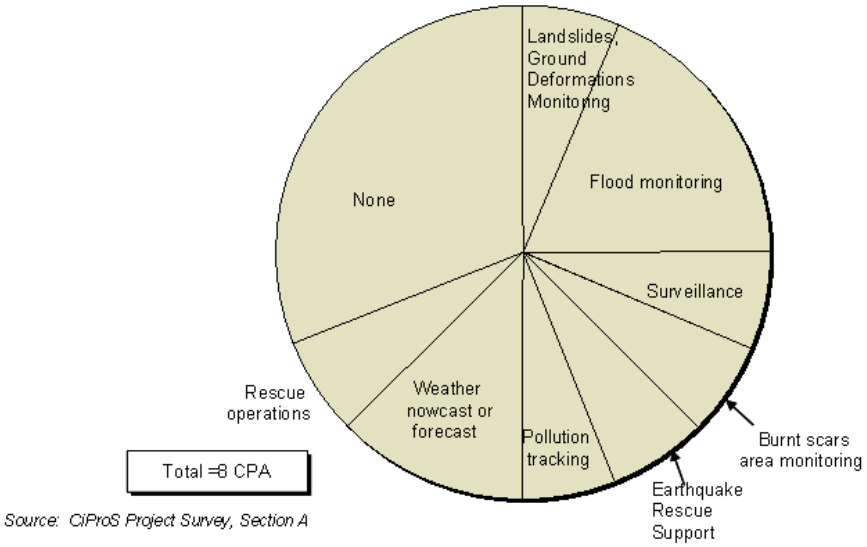


Figure 3.3: Main satellite Earth observation services currently used by interviewed CP (source: ESA)

CP operators prefer to switch to terrestrial wireless communication when available because of the lower usage costs.

A second critical issue concerning the use of satellite services is their availability at different stages of the response, e.g. in cases of hazard identification, management, risk assessment, and search and rescue. Specifically, the delay between the request for a dedicated channel and the assignment of bandwidth is too great (typically one week) on satellite-based networks, reducing the interest in satellite connections during the first most critical days of emergency management. Moreover, difficulties often occur in obtaining sufficient bandwidth on short notice, due in part to competition with other customers such as the media, and with coordination of multiple users and suppliers.

The equipment and infrastructure selected by CP agencies are mainly commercial devices that vary not only between countries, but between localities, leading to problems related to interoperability between several task forces. As a result, CP agencies have frequently requested that the satellite industry satisfies their specific needs and lowers prices. There is no institutional satellite service that could satisfy security, QoS and availability issues. Indeed, it is the fragmented use of satellite-based services that has led to a lack of standardisation of equipment.

Satellite navigation services are commonly used for search and rescue as well as asset management and tracking, and less so for personal localisation than for vehicles.

The most significant application for Earth observation services is damage assessment through imaging prior to and following a disaster. Earth observation services are well recognised by CP agencies as an important tool, but the main shortcoming is the limited availability of real-time information for supporting CP activities during the response and damage assessment phase.

To overcome the shortcomings in the use of satellite applications, a Europe-wide programme is needed to present CP interests to the satellite industry and bring about satellite-based solutions customised to meet CP needs. Therefore, a desirable solution involves a joint European approach, dedicated to the development of a set of tools and services addressing CP agencies needs, with a consolidated procurement of space-based resources.

4. International and European Regulatory Framework

The rising number of natural and man-made disasters increases the need to establish a sustainable disaster management framework for the provision of assistance in the event of disasters. Space-based technologies, such as Earth observation and telecommunication satellites have a vital role in responding to and mitigating disasters in a timely and efficient manner. In this respect, the International Charter Space and Major Disasters[2] (the Charter) and the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation[3] (the Tampere Convention) are the most important cooperative agreements in this field at international level. They constitute a coordinated international effort to make critical space assets available to communities affected by disasters. Nevertheless, these international legal instruments as well as the European regulatory framework must be assessed as to their capacity to effectively meet the needs and requirements of the users of the Civil Protection community.

4.1 International Charter Space and Major Disasters

Following the Unispace III conference in Vienna, the Charter was established on the initiative of ESA and CNES (France's Centre National d'Etudes Spatiales) and signed on 20 October 2000.[4] Its purpose is to provide timely access to satellite-based data in the event of natural or man-made disasters, to promote cooperation between space agencies and space system operators and to enable participation in the organisation of emergency assistance or subsequent operations. Considering the different stages of disaster management, ranging from mitigation, preparedness, response and recovery the Charter deals with the response phase.[5] The Charter does not apply to armed conflicts, humanitarian actions not linked to a specific disaster, droughts, and routine epidemiological outbreaks. It cannot be activated more than 10 days after an actual crisis has started, as this would constitute a period beyond the emergency.[6]

The Charter establishes a process by which an authorised user can request mobilisation of space and associated ground resources by calling a confidential phone number. In general, an authorised user is defined as a Civil Protection, rescue, defence, or security body from a State Party to the Charter. Furthermore, relief agencies in States that are not signatories of the Charter are also able to activate the Charter by requesting assistance from similar agencies in their country or by asking for international aid from States Parties. Since 2003, the UN Office of Outer Space Affairs (UN-OOSA), in addition to UNITAR/UNOSAT, has become a cooperative body to the Charter enabling the request of Charter data on behalf of users from the UN. This has further expanded the scope of the Charter and has proven useful to users that are not familiar with the activation of the Charter. The principle underlying the Charter is that images and data acquired by Earth observation satellites should be made available without charge to the authorities responsible for organising relief operations in disaster areas. The Charter creates a unified and coordinated system of image and data acquisition and delivery to relief teams all over the world. The unique feature of the Charter is that, according to Article 3.1, no funds will be exchanged between parties in return for services provided through the activation of the Charter. Each space agency party to the Charter cooperates on a voluntary basis. The Charter is not a legally binding instrument imposing legal duties and obligations, but it builds on goodwill and best

[2] Charter On Cooperation To Achieve The Coordinated Use Of Space Facilities In The Event Of Natural Or Technological Disasters, Paris, done 25 April 2000, entered into force 20 October 2000, Rev.3 (25/4/2000).2. <http://www.disasterscharter.org/charter>.

[3] Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations, Tampere, done 18 June 1998, entered into force 8 January 2005, I-40906.

[4] "About the Charter." 28 May 2010. International Charter Space and Major Disasters 29 June 2011 <http://www.disasterscharter.org/about>.

[5] Holdaway, Richard. "Is Space Global Disaster Warning and Monitoring now Nearing Reality?" Space Policy 17.2 (2001): 127-132.

[6] "International Charter Space & Major Disasters, Annual Report, Period May-December 2002." 25 June 2003. International Charter Space and Major Disasters 29 June 2011 <http://www.disasterscharter.org/c/document_library/get_file?folderId=20227&name=DLFE-2505.pdf>.

endeavours of the members. The Charter Parties have committed resources to support the functioning of the Charter and know that they will not be compensated for their service. Each party bears the costs for acquiring the satellite image, processing the data, and producing products for delivery. All Parties to the Charter are part of the Charter Board responsible for the governance of the Charter. Each Party serves as a rotating host agency administering the obligations laid down in the Charter and coordinating with external partners.

The Charter implements principles set forth in the Outer Space Treaty[7] and the UN Remote Sensing Principles[8]. These principles consist of maintaining the freedom of outer space, using space for the common good of humanity, and promoting international cooperation. In line with these principles, the Charter provides remote sensing data to States stricken by disasters upon request at no cost, espousing the idea of conducting remote sensing activities for the benefit of all States. The Charter builds on international cooperation and the use of space for the benefit of humankind. The Charter even goes a step further than the requirements stipulated in the Remote Sensing Principles by providing the remote sensing data not for "reasonable cost terms" but free of charge.[9]

The Charter was declared formally operational on 1 November 2000. Since then, it has been activated more than 300 times and is an exemplary use of space systems to facilitate the work of relief teams on the ground. The large number of activations is also a testimony to the success of the Charter and the trust of the parties in the efficiency of this instrument.

However, the Charter itself is not free of shortcomings and could be improved. A major drawback is the lack of a binding nature of the Charter. It is desirable to make compulsory the provision of remote sensing data and images at no cost, given that thus far Charter operations occur on a merely voluntary basis. Through the establishment of state practice and the confirmation by *opinio juris,* the Charter could become customary law over time and therefore binding.[10] Another drawback is the desire of non-expert users to have not only the raw data but also the analysis of this data at their disposal.[11] Furthermore, services under the Charter are provided on a best effort basis, meaning that the signatories of the Charter take necessary measures in the provision of aid, but do not guarantee certain results. Thus, in Article 5.4, the Charter includes a waiver of liability for its Parties. As a consequence, the requesting party cannot take legal action against those providing the remote sensing data, for instance, when the use of erroneous data leads to damage or financial loss. However, there are legal aspects remaining to be resolved. Because of the limited number of countries involved in the Charter, it does not include all potential disaster victims, and the question arises whether the unilaterally declared waiver of liability still applies to victims who are not in one of the Signatory States during the disaster. In fact, the Charter only provides for a waiver of liability concerning cases arising between an affected State and those States Party to the Charter. There is a legal vacuum for cases concerning the potential liability of third parties. Additionally, the injured party cannot claim damages under the Liability Convention[12], as this would require compensation for physical damage directly caused by a space object's impact on Earth, which does not include damage from remote sensing activities. The misuse or misinterpretation of data provided through the Charter could not only lead to major damage but also to reluctance of States to activate the Charter due to a loss of confidence.[13]

Furthermore, previous studies, such as the CiProS study conducted for ESA, have demonstrated the importance of SatCom in the field of Civil Protection. According to the wording of the International Charter Space

[7] Treaty on Principles governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967, 610 UNTS 205, 6 ILM 386 (1967).

[8] United Nations General Assembly. Principles Relating to Remote Sensing of the Earth from Outer Space, Held in New York from 10 October to 11 December 1986. UN Doc. A/RES/41/65 of 3 December 1986. New York: United Nations.

[9] Atsuyo, Ito. "Legal Aspects of the International Charter on Space and Major Disasters." Presentation. Proceedings of the 47th Colloquium on the Law of Outer Space. International Institute of Space Law, Vancouver, Canada. 4-8 Oct. 2004: 236.

[10] Atsuyo, Ito, Report: IISL/ECSL Space Law Symposium 2006: Legal Aspects of Disaster Management and the Contribution of the Law of Outer Space, 45th Session of the UNCOPUOS Legal Subcommittee (Apr. 2006), note 41.

[11] Voigt, Stefan, Kemper, Thomas, Riedlinger, Torsten, Kiefl, Ralph, Scholte, Klaas and Harald Mehl. "Satellite Image Analysis for Disaster and Crisis-Management Support." IEEE Transactions on Remote Sensing 45.6 (2007): 1520-1528 <http://ieeexplore.ieee.org/iel5/36/4215027/04215094.pdf?tp=&arnumber=4215094&isnumber=4215027>.

[12] Convention on International Liability for Damage Caused by Space Objects, New York, done 29 November 1971, entered into force 1 September1972, 961 UNTS 187 (1972).

[13] Beets, Josie. "The International Charter on Space and Major Disasters and International Disaster Law: The Need for Collaboration and Coordination." The Air & Space Lawyer 22.4 (2010): 12-15.

and Major Disasters it is possible to request telecommunication services. This is to support the emergency response phase of the risk management cycle. In practice, the Charter delivers EO data, which is sometimes supported by telecommunication assets. Hence, the Charter does not include an effective mechanism for the provision of SatCom during and after major disasters. The International Charter is a well-proven Charter for the use of earth observation satellite services for disaster and emergency response, but its scope is limited. The Charter addresses funding and data availability, but not the integration of its results into either a central information management system or the daily command chain of Civil Protection and humanitarian teams.

4.2 The Tampere Convention

The importance of telecommunication, in particular SatCom, in the event of an emergency has been generally recognised, but prior to the enactment of the Tampere Convention its wider use by humanitarian organisations was restricted. While the deployment of satellite technology has been improved in recent years, regulatory barriers have hindered the transportation and utilization of telecommunication equipment by organisations in third-world countries stricken by disasters. The trans-border use of telecommunication equipment by humanitarian organisations was often impeded by regulatory barriers, making it extremely difficult to import and rapidly deploy telecommunications equipment in an emergency without prior consent of the local authorities. For instance, relief teams were required to obtain operating licenses before making use of their telecommunication equipment,[14] and thus they were not in a position to rapidly reconstruct and rehabilitate destroyed telecommunication devices and networks. Deficits in telecommunication can cause fatal delays, as the first few hours after the disaster has occurred are the most critical for saving lives. In addition, international telecommunications policy prior to the Tampere Convention faced problems with respect to the security and safety of relief teams in the field. For instance, UN staff were killed or disappeared while on duty, some were taken hostage, assaulted or raped due to the fact that they were unable to communicate for lack of radio equipment.[15] Because of these shortcomings, relief teams were unable to provide adequate assistance needed in countries affected by disasters. Therefore, the Civil Protection community stresses the need for a long term vision to overcome these issues.

4.2.1 The Scope and Mechanism of the Tampere Convention

The Tampere Convention resulted from the need to address the predictable and prevalent barriers encountered by international disaster relief teams using telecommunication. The International Telecommunications Union (ITU) has taken initiatives providing a platform for discussion of how to improve the situation for relief teams deploying telecommunications facilities and services. Under the auspices of the ITU the Tampere Declaration on Disaster Communications was issued in 1991, which was intended to ensure the provision of reliable telecommunications systems for disaster mitigation and disaster relief operations.[16] This Declaration also recommended an international agreement aimed at facilitating and coordinating international telecommunication resources to be used in natural disasters. The suggestions made in the Tampere Declaration were then integrated into the Tampere Convention adopted on 18 June 1998 by the delegates of the 75 countries that attended the Intergovernmental Conference on Emergency Telecommunications (ICET-98). Even though the successful adoption of the Tampere Convention was regarded as a milestone for disaster mitigation and relief operations, it took seven years for this crucial Convention to come into force. With the ratification of 30 countries, it entered into force on 8 January 2005, shortly after the Asian tsunami devastated countries bordering the Indian Ocean.

Unlike other documents on disaster management, the Tampere Convention is the first legally binding multilateral treaty facilitating the use of telecommunication resources for disaster and relief. The Convention recognises the essential role of telecommunication during and after emergencies because the reliable and expeditious availability of such sources is the basis of other mitigation and

[14] "Tampere Convention on Emergency Telecommunications Comes into Force." 8 Feb. 2005. International Telecommunication Union 29 June 2011 <http://www.itu.int/newsroom/press_releases/2005/01.html>.

[15] Ryszard, Struzak. "Evaluation of the U.N. Office for the Coordination of Humanitarian Affairs Project on Emergency Telecommunications With and In The Field." 31 July 2000. United Nations Office for the Coordination of Humanitarian Affairs 29 June 2011 <http://www.ryszard.struzak.com/UN_OCHA_Rprt_2000.pdf>.

[16] "Handbook on Disaster Communication." 2001. International Telecommunication Union 4 July 2011 <www.itu.int/itudoc/itu-d/question/studygr2/q016.pdf>

relief efforts. It calls on States to facilitate the provision of prompt telecommunication assistance to mitigate the impact of a disaster, and covers both the installation and the operation of reliable, flexible telecommunication services. The treaty simplifies the use of life-saving telecommunication equipment.

The Convention, consisting of 17 Articles, is designed to expedite and facilitate the use of telecommunications in the event of an emergency. The Preamble also recalls the crucial legal instruments in the field of disaster management, such as, inter alia, relevant UN resolutions and the Tampere Declaration. The Convention defines the overall framework for cooperation among State Parties, international organisations, and non-State entities in international humanitarian assistance. Both States and non-State entities are obligated to cooperate in deploying terrestrial and satellite equipment for the prediction and monitoring of hazards and disasters, to exchange information, and to install and operate reliable and flexible telecommunications resources for humanitarian relief and assistance organisations. According to Article 4.1, a State Party may request, either directly or through the operational coordinator, the provision of telecommunication assistance, specifying the scope and type of assistance required. The requested State then decides whether it will provide telecommunication equipment and determines under which conditions, terms, restrictions and costs this assistance would be provided.

The removal of regulatory barriers has been the key objective for the adoption of the Tampere Convention. As Article 9 obliges States to adopt means to reduce and remove regulatory barriers to the use of telecommunications resources, it is considered as one of the core provisions. The Tampere Convention refers to certain practices, such as revising national regulations, streamlining the license application procedures, and granting temporary waives of the regulations for specific telecommunication resources. It also recommends the recognition of foreign type-approval of telecommunication equipment and operating licenses. In addition, States grant pre-clearance to telecommunication resources. To ensure effective implementation of this provision, States shall inform signatories about measures taken for removing regulatory barriers and procedures available for the exemption of specific telecommunication resources for disaster relief. The implementation of this provision faced serious difficulties as States are generally reluctant to subordinate themselves to supranational regulatory framework as they fear that their sovereign rights could be affected. Another concern is that foreign use of their telecommunication equipment could cause harmful interference in their domestic affairs.[17]

To dispel such fears, the Convention underlines that Member States are able to receive assistance without giving up their sovereignty, since States stricken by disasters maintain primary authority in relief coordination. According to Articles 4.8 and 6.1, the Convention allows the State requesting assistance to have control over the initiation and termination of telecommunications assistance. The requesting State also retains the right to reject any or all offers of assistance. In addition, all persons and organisations that are in charge of providing telecommunication assistance have a duty to respect national laws and regulations, and are obliged not to interfere in the domestic affairs of the State stricken by a disaster. A State affected by disaster will benefit from the provision of prompt and effective assistance while having the right to direct, control and coordinate assistance provided under the Convention within its territory. In fact, the Convention aims at fostering cooperation among State Parties by guaranteeing that States and organisations entering their territory respect their legal system and values.

Another significant stipulation in the Tampere Convention is Article 5, where it is pronounced that persons and organisations providing assistance shall be granted immunity from arrest, detention and legal process. They are also exempted from taxation and duties related both to disaster relief functions and those charges that may be incurred on telecommunications equipment. Finally, Article 5.8 stresses that nothing shall prejudice rights and obligations pursuant to international agreements or international law. The Tampere Convention is the first treaty dealing with disaster management that grants privileges and immunities to persons of non-governmental organisations and non-State entities.[18]

One of the fundamental differences between the Tampere Convention and the International Charter Space and Major Disasters is that the latter provides no exchange of funds between the requesting State and the State providing the service. Article 7 of the Tampere Convention, in contrast, deals with the payment and reimbursement of costs and fees. The rationale behind the provision could

[17] Rahrig, Allison. “Love The Neighbor: The Tampere Convention as Global Legislation.” Indiana Journal of Global Legal Studies 17.2 (2010): 273-288.
[18] Murphy, Sean. “Tampere Convention on Telecommunications Assistance, Contemporary Practice of the United States Relating to International Law.” The American Journal of International Law 93.2 (1999): 470-501.

be that whereas remote sensing data and information for disaster management are expected to be provided at no costs, telecommunication assistance, in particular SatCom, can obviously not be provided without remuneration due to its commercial nature. To this end, the parties negotiate the conditions of the provided assistance beforehand. The framework, including restrictions associated with the payment, the amount of payment or reimbursement and the currency to be paid, is then formalised through a written agreement. It is recommended that a model agreement that could provide the basis for negotiations be created.

4.2.2 Lessons Learned

Even though the Tampere Convention itself has, in theory, significantly improved the situations for relief teams using telecommunication equipment, it does not always work well in practice. The effectiveness of the Convention depends on the adoption of administrative procedures for its implementation on the part of the Member States. This is one of the major shortcomings of multilateral treaties.

Another significant aspect is the long delay between the adoption of the Tampere Convention and its entry into force. Indeed, it took seven years for this crucial Convention to come into force. What was the rational behind the decision not to ratify the Convention by the States that adopted it in 1998? It can be assumed that non-ratifying States do not see the need for implementing the principles set up in the Convention. Given that non-ratifying States like Germany, United States or the Russian Federation have created telecommunication resources to meet their own needs, these States are self-sufficient in respect to the use of telecommunication equipment in cases of emergencies. Thus, they have no incentive to extend their networks to less developed States that are not in the position to return the investment.[19] In this respect, the United States with its emergency telecommunication system consisting of multiple technologies, protocol and equipment would not be willing to change its existing system to meet the requirements of the Tampere Convention not least because of the additional financial burden.[20]

Furthermore, non-ratifying developed States have their own means to support reconstruction after disasters. Most of them, in particular in Europe, have their own disaster relief organisations and agencies. For instance, the German Red Cross consists of over 4.5 million members including 160.000 solely responsible for medical service.[21] Italy, one of the original signatory States, does not see the need to ratify the Convention due to the fact that Cesvi[22], a non-governmental international humanitarian organisation, provides assistance in the event of disasters. The non-ratifying, larger States know that disaster relief mitigation efforts would most likely be conducted by their own organisations or at least be headed by domestic actors, giving them less incentive to ratify the Convention.[23]

In conclusion, the Tampere Convention is an effective means to promote international cooperation in the field of disaster relief and mitigation. Due to its binding nature, it is regarded as "a milestone in the area of international law applicable to disasters."[24] However, the Tampere Convention merely establishes a framework for facilitating resources and minimising obstacles to telecommunication assistance. It contributes to the development of model agreements and best practices to improve negotiations and cooperation between State Parties, but it does not oblige these States to follow those practices. Instead, it requires that each State develops its own model in furtherance of the themes and ideals of the Convention. One of the major shortcomings of this Convention is that it does not provide for a joint pre-approved chain of command and procedure during disasters. Its provisions do not translate into effective and practical arrangements for the delivery of capacity, which is left to the initiative of signatory States. It also does not meet the needs of developed States in Europe that have the required telecommunication equipment during emergencies. These States are rather interested in the provision of assistance in the form of SatCom on a cost-effective basis. The best way to reach this goal is to consolidate the demand of national Civil Protection agencies to strengthen their bargaining position with respect to satellite operators. Taking into account the differing economic, social and political circumstances, it will be rather difficult to consolidate the demand and to achieve joint procurement of satellite capacity on a global level. It is therefore recommended to focus on an area with the same level of development and similar

[19] Rahrig, Allison. "Love The Neighbor: The Tampere Convention as Global Legislation." Indiana Journal of Global Legal Studies 17.2 (2010): 273-288.
[20] Ibid.
[21] Ibid.
[22] Cooperazione e sviluppo.
[23] Rahrig, Allison. "Love The Neighbor: The Tampere Convention as Global Legislation." Indiana Journal of Global Legal Studies 17.2 (2010): 273-288.
[24] Ferrari, Marco. "Easing the Way to Disaster Mitigation: The Tampere Convention." Presentation. World Summit on the Information Society. Swiss Agency for Development and Cooperation, Bern, Switzerland. 22 Feb. 2005.

needs and requirements. The way forward lies in the adoption of detailed and binding regulations at the European level, including a mechanism to coordinate procurement of satellite communication capacity and associated services for Civil Protection.

Recognising the need for collaboration in the field of telecommunication during and after disasters, a significant agreement paves the way for further arrangements at the international level. In March 2011, ITU, Intelsat S.A. and the International Telecommunications Satellite Organization (ITSO) reached a collaboration agreement with the objective of strengthening emergency telecommunication resources. This agreement is the result of the Hyderabad Plan of Action adopted by the World Telecommunication Development Conference in 2010,[25] which called for private sector participation to help close the gap in universal access to information and communication technologies (ICT) and to support emergency communications in particular. The restoration of vital communication infrastructure in the aftermath of natural disasters is one of the key aspects of this agreement. Following a request from a Member State for assistance in the aftermath of a natural disaster, the ITU will inform Intelsat of the request for satellite capacity and other related needs. Intelsat and ITSO will then consult about donating satellite capacity. The task of ITSO is to ensure that Intelsat complies with its contractual obligations to provide international public telecommunication services, including voice, data and video on a global and non-discriminatory basis. This agreement is a step in the right direction to ensure the rapid provision of telecommunication services. However, it is merely an agreement addressing collaboration between the actors without specifying particular services for end-users or providing concrete price arrangements.

To conclude, even though this agreement improves the availability of telecommunication resources for disaster mitigation and relief, it does not guarantee the provision of these services on a cost-effective basis. To guarantee an effective use of SatCom, arrangements should include a mechanism to coordinate procurement of satellite communications capacity affordable for Civil Protection users. The following section analyses whether the current EU Civil Protection regulatory framework addresses this problem or whether the existing legal instruments could be changed to regulate the provision of SatCom on a cost-effective basis.

[25] "Roadmap set for global development of telecommunications and ICT – Hyderabad Action Plan agreed at ITU World Telecommunication Development Conference." 4 June 2010 <http://www.itu.int/net/pressoffice/press_releases/2010/28.aspx>.

4.2.3 Current EU Civil Protection Regulatory Framework and Actions

Disaster management is primarily the responsibility of the Member States. However, Article 196 of the Treaty on the Functioning of the European Union (TFEU) provides for an EU role to encourage cooperation between Member States with the aim of improving the effectiveness of systems for preventing and protecting against natural or man-made disasters. The involvement of the EU shall support and complement Member States' action in risk prevention and in responding to natural or man-made disasters at the local, regional and national level. The overall objective is to promote swift, effective cooperation between Civil Protection agencies in Europe and to promote consistency in international Civil Protection operations.

Since its creation in 2001, the Community Civil Protection Mechanism (the Mechanism) has managed the consequences of disasters in and outside the EU.[26] In case of a disaster, the affected country can avail itself of the option to call upon the solidarity of the EU Member States and other States participating in the Mechanism, with the effect that those States will provide their Civil Protection assistance. The overall objective of the Mechanism is to facilitate cooperation between Civil Protection agencies in order to ensure that assistance needed in emergency and disaster situations is provided rapidly, effectively and in a coordinated manner. In 2007 the Council adopted a decision to recast the original Decision establishing the Mechanism in order to strengthen the Mechanism on the basis of lessons learned from previous disasters and to provide a legal basis for additional support and complementary action at EU level.[27] The Mechanism provides an effective tool to improve the preparedness of the European Civil Protection community for disasters by means of coordinating and facilitating the delivery of Civil Protection assistance.

The Community Mechanism for Civil Protection has a number of tools intended to facilitate both adequate preparedness as well as

[26] Council of the European Union. Council Decision of 23 October 2001 Establishing a Community Mechanism to Facilitate Reinforced Cooperation in Civil Protection Assistance Interventions. 2001/792/EC, Euratom, OJL 297 of 15 Nov. 2001, Brussels: European Union: 7

[27] Council of the European Union. Council Decision of 8 November 2007 Establishing a Community Civil Protection Mechanism. 2007/779/EC, Euratom, OJ L 314 of 1 Dec. 2007. Brussels: European Union: 9.

effective response to disasters at a community level. The MIC is the operational heart of the Mechanism; operated by DG ECHO of the European Commission, it is accessible 24 hours a day. It gives countries access to a platform, to a one-stop-shop of Civil Protection means available amongst all the participating states. Any country inside or outside the EU affected by a major disaster can appeal for assistance through the MIC. It acts as a communication hub at headquarters level between participating States, the affected country and dispatched field experts. Furthermore, the MIC also provides useful and updated information on the actual status of an ongoing emergency, and plays a co-ordination role by matching offers of assistance put forward by participating States to the needs of the disaster-stricken country. Another important tool is the Common Emergency Communication and Information System (CECIS) constituting a reliable web-based alert and notification application created with the intention of facilitating emergency communication among the participating States. It provides an integrated platform to send and receive alerts, give details of assistance required, make offers of help and view in an online logbook the development of the ongoing emergency as it happens. A training programme has also been set up to improve the co-ordination of Civil Protection assistance interventions by ensuring compatibility and complementarity between the intervention teams from the participating states. Moreover, it also enhances the skills of experts involved in Civil Protection assistance operations through the sharing of best practices. This programme involves training courses, the organisation of joint exercises and a system of exchange of experts from the participating States. Civil Protection modules consist of national resources from one or more Member States on a voluntary basis. They constitute a contribution to the Civil Protection rapid response capability called for by the European Council in the Conclusions in June 2005 and by the European Parliament in its Resolution in January 2005 on the tsunami disaster. Thirteen Civil Protection modules, which combine specialised personnel and equipment (e.g. search and rescue equipment, advanced medical posts, etc.), can be provided to the affected country. These countries can also apply for co-funding of the transport of assistance to the site of disasters. These modules are self-sufficient, interoperable and can be sent on very short notice, generally within 12 hours following a request for assistance.

The Mechanism also attempts to promote consistency between the disaster relief needs of third-world countries affected by disasters and the assistance provided to their national authorities.[28] These measures serve to promote European solidarity among Member States, all States participating in the Mechanism, and other States affected by disasters. Another important instrument in the field of disaster response is the Civil Protection Financial Instrument (CPFI), adopted by the Council in 2007, which regulates the funding of all operations based on the Mechanism. The scope of Civil Protection financial assistance has been extended to also cover preventive measures for all kinds of emergencies.[29] Building on this, concrete EU actions in disaster prevention proposed by the Commission in 2009[30] were endorsed by the Council in 2009[31] and the European Parliament in 2010.[32] This is the political framework for EU disaster prevention.

During emergencies inside and outside the EU, the Commission plays a key role in providing assistance to third countries affected by disasters. The provision of assistance includes a needs assessment, advising participating Sates on the required assistance and ensuring operational coordination of EU assets on the ground. Within the EU, national authorities ensure operational coordination, coordination with other policy areas such as humanitarian aid and consular support, and cooperate with other actors such as the EEAS. The main instruments established for responding to disasters are: the duty system and the operations room, which is active on a 24/7 basis and operated by the MIC. There is also a pool of national experts that can be dispatched by the Commission for assessment and coordination missions at the site of disasters.

These two Council Decisions establishing the Community Civil Protection Mechanism and the Civil Protection Financial Instrument are the main pillars of Civil Protection legislation.

[28] European Commission. Satekeholder Consultation Document, Proposal to Renew EU Civil Protection Legislation. Echo A/5 of 25 March 2011. Brussels: European Union: 2.
[29] Council of the European Union. Council Decision of 5 Mars 2007 Establishing a Civil Protection Financial Instrument. 2007/162/EC, Euratom OJ L 71 of 10 Mar. 2007. Brussels: European Union: 9.
[30] Commission of the European Communities. A Community Approach on the Prevention of Natural and Man-Made Disasters. COM (2009) 82 final of 23 Feb. 2009. Brussels: European Union.
[31] Council of the European Union. Council Conclusions on a Community Framework on Disaster Prevention within the EU. Doc.15394/09 of 30 Nov. 2009. Brussels: European Union.
[32] European Parliament. European Parliament Resolution on the Commission Communication of 21 September 2010: A Community Approach on the Prevention of Natural and Man-Made Disasters. 2009/2151(INI) of the 21 Sept. 2010. Strasbourg: European Union.

The Mechanism and the CPFI together cover three of the main aspects of the disaster management cycle – prevention, preparedness and response. The Mechanism itself covers response and some preparedness actions, whereas the Financial Instrument enables actions in all three fields. The two pieces of legislation are complementary, as the Financial Instrument finances the Mechanism. In addition, three Commission Decisions were reached soon after the issuance of the two Council Decisions, one of which provides for the implementation of rules of action in the field of transport eligible for financial assistance from the Community,[33] while the other two regulate the implementation of the modules concept.

4.2.4 Review of the EU Civil Protection Regulatory Framework

In 2009 the Commission revealed the results of a study titled "Strengthening the EU capacity to respond to disasters: Identification of the gaps in the capacity of the Community Civil Protection Mechanism to provide assistance in major disasters and options to fill the gaps – A scenario-based approach".[34] This study draws the conclusion that "the Community Civil Protection Mechanism currently facilitates assistance without guaranteeing European assistance; but that several options exist that have the potential to reform the Mechanism into a tool that guarantees European assistance".[35] In particular, gaps concerning the availability of existing resources, lack of sufficient quantities of major categories of resources, lack of sufficient quantities of specific equipment or expertise, lack of information on specific equipment or expertise as well as limited preparedness of major categories of response resources reduce the effectiveness of the current Civil Protection system.[36] In light of the increasing number and severity of disasters a key issue to be addressed in the evaluation will be how to reinforce and increase the effectiveness of EU action through the Civil Protection Mechanism.

The proposals for revising the current regulatory framework are based on two provisions in the Lisbon Treaty. Specifically, Article 196 TFEU creates a new legal base for the EU to support and complement Member States' action in international Civil Protection work. This new role of the EU has to be reflected in future CP legislation. Article 122 TFEU provides for the establishment of a solidarity fund, however one of the most important instruments in disaster response, the CPFI, which finances the operations based on the Mechanism, will expire in 2013, and therefore must be renewed. The new CPFI should be placed in the framework of the new Multiannual Financial Framework 2013-2020.

The revision of the current legislation was also supported by a Communication of the Commission "Towards a Stronger European Disaster Response: The Role of Civil Protection and Humanitarian Assistance",[37] subsequently endorsed in Council conclusions,[38] pointing out the shortcomings inherent in the *ad hoc* coordination in the field of disaster response. The Council conclusion proposed a shift from an *ad hoc* response system to an arrangement allowing for more pre-planning and predictability. This transition should be done through a series of proposed measures, including regular risk assessment, mapping of assets and contingency planning. The establishment of a European Emergency Response Capacity in the form of a voluntary pool of assets provided by participating States should improve the organisation and availability of assets in emergencies. The MIC functions should be continued in a reinforced European Emergency Response Centre. The Commission Communication was preceded by an impact assessment substantiating these proposals.[39] Per Article 222 TFEU, solidarity within the EU depends upon mutual assistance in emergency or disaster situations. Equally important are preventive measures, and thus it is crucial that the legal and policy framework for disaster prevention and pre-

[33] European Commission. Commission Decision of 8 August 2007 Laying Down Rules for the 15394/09 Implementation of the Provisions on Transport in Council Decision 2007/162/EC. 2007/606/EC Euratom of the 14 Sept. 2007. Brussels: European Union.
[34] ECORYS. "Strengthening the EU Capacity to Respond to Disasters: Identification of the Gaps in the Capacity of the Community Civil Protection Mechanism to Provide Assistance in Major Disasters and Options to fill the Gaps – A Scenario-Based Approach." 17 Sept. 2009. European Commission - DG Environment 29 June 2011 <http://ec.europa.eu/echo/civil_protection/civil/prote/pdfdocs/Final%20Report%20%20scenario%20study.pdf>.
[35] Ibid:10.
[36] Ibid: 5.
[37] European Commission. "Towards a Stronger European Disaster Response: The Role of Civil Protection and Humanitarian Assistance." COM (2010) 600 final of 26 Oct. 2010. Brussels: European Union.
[38] Council of the European Union. Conclusions on the Communication from the Commission to the European Parliament and the Council Towards a stronger European Disaster Response: The Role of Civil Protection and Humanitarian Assistance. 3060th General Affairs Council meeting of 14 Dec. 2010. Brussels: European Union <http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/EN/genaff/118460.pdf>.
[39] European Commission. Communication Staff Working Document – Impact Assessment accompanying document to the Communication "Towards a stronger European disaster response: the role of civil protection and humanitarian assistance." COM (2010) 1243 final of 26 Oct. 2010. Brussels: European Union.

paredness be developed in line with changes on the response side.

4.2.5 Next Steps

The review of the EU Civil Protection regulatory framework focuses on five key areas: transport assistance provisions, European Emergency Response Capacity, EU funded assets, prevention and preparedness measures. These key issues are subject to an impact assessment conducted by the Directorate-General ECHO, which also includes stakeholder consultations.

First, the existing transport arrangements for the immediate deployment of EU assistance need to be improved. The objectives of the review of these arrangements are to alleviate a transport bottleneck in the provision of assistance and to ensure that emergency assistance meets the most pressing priorities. Stakeholders have welcomed the idea of simplifying the existing rules and increasing co-financing rates for targeted and urgent assets.[40] These proposals should be included in new legislation in the field of Civil Protection.

Secondly, the new regulatory framework should include the development of a system based on a voluntary pool of pre-identified Member States' capacities on standby for deployment in EU operations, a so-called European Emergency Response Capacity. Human resources and assets would remain under national command and control, but Member States would commit to providing them for immediate action in EU Civil Protection operations. Member States may refuse these resources in case they need them for domestic emergencies. To guarantee a sufficient number of assets committed to the pool, it is of utmost importance to create incentives at EU level. The new EU Civil Protection legislation provides the opportunity to define the role of the European Emergency Response Centre in a way that covers not only MIC's activities, but also operates with the Civil Protection and humanitarian assistance authorities in the EU, and in coordination with the European External Action Service (EEAS) as well as EU delegations in the event of responses in third countries. The European Response Centre is to be set up within the Commission's Directorate General ECHO.

Thirdly, by reviewing the current legal framework, the possible development of complementary EU-funded assets for certain specific needs should be considered. The EU-funded assets would be in principle financed from the EU budget. This permits remedying shortcomings in an EU response in cases where action at the EU level would prove to be more cost-effective. Specific consideration in this regard should be given to assets performing horizontal tasks, such as assessment, logistics and coordination, technical assistance and support teams (TAST) and telecommunications equipment. In addition, the development of complementary EU-funded assets could also be an effective means of providing a specialised high value response such as aircraft or sea vessels, when burden-sharing arrangements at the EU level would result in improved efficiency through economies of scale. Member States would be entrusted with operational management, meaning that they will be responsible for maintenance and use. EU-funded assets are at the disposal of the Member States when they are not needed at EU level, however in case of competing needs their use for EU operations prevails. Within the new legal framework, it must be emphasised that EU-funded assets are only a small complementary part of all emergency response assets available across the EU.[41] Considering the principle of subsidiarity, the use of these assets does not exempt Member States from their national responsibility. In general, the new revised regulatory framework has to adopt measures that will ensure that EU funding leads to the development of additional capacities on top of the capacity available in Member States and thus increases the overall level of protection. To this end, the first step would be to analyse gaps in the Member States' capacity. This should be done by establishing a procedure and criteria for identifying which assets would be eligible for EU funding to fill these gaps. The criteria and procedures should be enshrined in the new regulatory framework.

Fourthly, the review of EU Civil Protection legislation provides the opportunity to implement prevention approaches; including considerations providing for an explicit reference of prevention measures in the future Civil Protection Mechanism. There is a common understanding among the EU Civil Protection community that there needs to be a more balanced approach with respect to Civil Protection cooperation and response actions and prevention measures. To implement the intended prevention measures, there are three options. The first option consists of the

[40] European Commission. Report from the 1st Stakeholder Consultation Meeting on the Preparation of Legislative Proposals Reviewing the EU Civil Protection Regulatory Framework, ECHO A/5. 6 Apr. 2010. Brussels: European Union: 3.

[41] European Commission. Stakeholder Consultation Note on EU Disaster Response – EU-funded assets. ECHO A/5. 9 June 2011. Brussels: European Union: 2.

development of disaster prevention on a purely national basis with only optional coordination among Member States, whereas according to the second option an increase of protection is achieved through supplementary financial assistance from EU instruments.[42] The third option involves Commission guidelines on the basis of a disaster risk management plan provided by the Member States.[43] In essence, effective prevention measures require coordination with other relevant policy fields, and they build on shared experiences and good practices. It remains to be seen whether a preventive culture shared by the Members States is feasible.

Fifth, the Civil Protection preparedness framework, which should be included in the new regulatory framework, strives to connect disaster prevention and response. The preparedness measures focus on supporting and complementing training for disaster management. A major shortcoming of the current legislation is that existing preparedness actions are not implemented under an overall policy framework. In order to guarantee a common approach in this field, an overall preparedness policy framework must be established. This framework should address, in particular, prevention training, preparedness and response activities, interoperability of equipment and experts, mutual recognition and quality labelling and a platform to share good practices and lessons learned from previous disasters.[44] Among the stakeholders, there is a common understanding that the further development of the training and exercise arrangement is generally demanded by the European Civil Protection community, but this does not necessarily mean a formal quality label for training centres.[45]

Considering the importance of the use of SatCom in the event of emergencies, new legislation should stress the need of rescue teams to have access to precise information so that they are able to provide adequate assistance. The most efficient tool to obtain precise information in a timely manner is through the use of SatCom, as conventional communication links and resources may be overwhelmed or destroyed during emergencies. Hence, the new legislation should enshrine the need to provide SatCom on a cost-efficient basis and should underline that SatCom is an indispensable element to ensure the rapid and effective response to disasters occurring inside and outside Europe.

The revision of the Civil Protection regulatory framework should not only focus on the five key areas but also on telecommunications, in particular SatCom. The use of SatCom permits an exchange of information with the On-Site Operation Command Centre as well as with the MIC. The use of SatCom is crucial in response to emergencies because SatCom is independent of fixed and potentially vulnerable wired infrastructure. Even though satellite capacity is generally available to European Civil Protection actors on the commercial market, and teams can deploy communication facilities on the field, emergency responders have no capacity pre-emption right over commercial use. Consequently, it is difficult to obtain sufficient bandwidth on short notice. In addition, the high costs of satellite communication services make these services unaffordable for many individual emergency response teams. Hence, the way forward lies in a coherent European programme to aggregate the needs of Civil Protection and to bring about customised satellite solutions.[46]

The “Emergency.lu” initiative can serve as an example for the development of a set of faster and more reliable telecommunication services with the objective to satisfy telecommunication needs of the international humanitarian community in the immediate aftermath of a major disaster.[47] In order to provide such an end-to-end solution for worldwide disaster relief, emergency.lu bundles the already available equipment and services from three different providers: Luxembourg Air Rescue’s (LAR) air transport capacity to reach any destination worldwide within less than 24 hours, HITEC Luxembourg’s portable Nomadic Satellite Communications system providing end user services for voice, data and video transmission via the internet (for on-site coordination between intervention sites and global transmission, respectively), and Société européenne des satellites’s (SES) global satellite capacities for satellite based broadband internet connectivity.[48] Through this project, the Government will be able to provide the international humanitarian community a globally deployable and reliable communication system. Under the coordination of the Luxembourg Ministry of Foreign Affairs (Directorate for

[42] Ibid: 4.
[43] Ibid.
[44] Ibid: 5.
[45] Ibid: 1.

[46] Council of the European Union, Draft Council Conclusions on an Integrated Approach to more Effective Crisis Communication, Submitted by the Polish Presidency. 12942/11 of 27 July 2011. Brussels: European Union: Nr. 6.
[47] “Emergency.lu Solution – UN-Spider Knowledge Portal” 21Apr. 2011. UN-Spider. 09 Sept. 2011. http://www.un-spider.org/book/5110/4c-challenge-communication-coordination-cooperation-capacity-development.
[48] Ibid.

Development Cooperation and Humanitarian Action), Emergency.lu has been established as a Public Private Partnership. "Emergency.lu" will collaborate with UN agencies to integrate the solution into existing communications infrastructures used in humanitarian operations, such as the existing TAST and AHP modules proposed by the UN and ECHO.[49] The "Emergency.lu" example shows how, based on the needs of a government and a public agency, a commercial satellite provider can provide tailor-made globally available eco-system for emergency communications with a dedicated capacity which covers the every phase of the disaster management cycle.

The approach should be twofold. Firstly, the development of new services, which are currently unsatisfied by narrowband terrestrial CP systems like TETRA and TETRAPOL, is recommended. Second is the creation of a mechanism to coordinate procurement of satellite communication capacity and associated services for Civil Protection, with the overall intent being the guarantee of rapid and affordable availability during and after disasters. Due to economies of scale this approach would also lead to the provision of SatCom on a cost-effective basis. One way could be to pre-book SatCom capacity through provision and pricing arrangements with major satellite operators, starting with a small number of willing partners and building these arrangements in an incremental and standardised manner. The European Parliament Report on "Towards a stronger European disaster response: the role of CP and humanitarian assistance" therefore *"calls on the Commission to explore possibility of equipping the EU with a dedicated and secure telecommunications capacity and integrated crisis management solutions ranging from prevention to recovery*".[50] This amendment was included after the adoption by the Committee on Environment, Public Health and Food Safety. The next step is the vote on this text in the Plenary Session of the European Parliament on 27 September 2011. Furthermore, the new regulatory framework should define collaboration with the Commission, ESA, the Member States and the relevant stakeholders to promote optimum use of existing and future solutions and telecommunication capacity to facilitate the development of services for citizens in the fields of public security and emergency response.[51] Building on this, the new regulatory framework should regulate bandwidth pre-emption, cross-border movement of equipment, integration with legacy systems and availability of spectrum in the event of disasters. The overall objective is thereby to increase efficiency of Civil Protection operations and to facilitate the development of services in the field of emergency response.

[49] Ibid.

[50] European Parliament, Draft Report „Towards a stronger European disaster response: the role of Civil Protection and humanitarian assistance." (2011/2023 (INI)) of 30 Mar. 2011. Paragraph 17a (new), Brussels: European Union.

[51] Ibid.

5. Conclusions and Recommendations

CP operations can be conducted more efficiently by using integrated space-based applications. The way forward does not necessarily lie in the development of dedicated satellites, but in the identification of current needs and relevant necessary developments for end-to-end customised satellite solutions. In this context, a key element is to ensure the exchange of lessons learned from previous disasters on a regular basis among all the stakeholders.

From dedicated ESA funded past activities (i.e. annex: CiProS executive summary) it appears evident that tailored space-based applications capable of enhancing the operational effectiveness of the CP agencies are needed. In line with the preliminary conclusions of the workshop "Space for Civil Protection", a dedicated effort is specifically needed in the following domains:

- Interoperability;
- Availability;
- Robustness;
- Cost effectiveness;
- Best practice.

As satellite communication systems provide a robust network that is largely unobstructed by events on the earth's surface, their use is of utmost importance in rescue and relief operations. In both coverage and capacity, they can respond to disaster situations in a more flexible and effective manner than terrestrial systems. Satellite communications are capable of operating during such emergencies enabling users able to access cost effective, reliable and secure communication solutions in areas not served or underserved by traditional landline or wireless services, even during times of emergencies. However, one of the main weaknesses of SatCom fixed services currently in use is their availability during emergencies, thus reducing the interest in satellite connection during the first days of the emergency management where the most critical operational needs emerge. In particular, capacity requests by media in case of major crises often drain the capacity market. As a consequence, the current delay between request and actual allocation of satellite bandwidth is unacceptable for CP agencies that have to intervene on site within the first hours of an emergency alert. This is a very significant drawback for crisis applications.

Satellite communications are widely recognised by CP agencies as providing a resilient, complementary solution that can increase their effectiveness not only for command and control but also for delivering information derived from Geographical Information Systems (GIS). In addition, satellite communications can contribute to asset tracking systems, which in turn depend upon the use of satellite Earth observation and navigation services. Nevertheless, several potential applications, for which satellite communication could provide relevant support, are still not used, such as flexible terminals for disaster communications, quickly deployable IP networks, rapid mapping services, transmitters for urban/indoor positioning, etc. A key concern about the applicability of SatCom based services is its inherent affordability. For this reason the role often assigned to SatCom services is mainly that of back-up to the legacy infrastructure.

Another issue that restricts the wider use of satellite-based services is that the equipment used by European CP agencies is mainly commercial off-the-shelf devices that vary at national and local level. This tends to lead to interoperability issues between different forces deployed in the theatre of operation. To achieve true standardization across European CP telecommunications systems is a key goal. This is most likely to occur through the development of common standards for broadband communications, which will complement conventional narrowband systems such as TETRA and TETRAPOL, leading to a new set of dedicated equipment and services. In the consumer sector the telecommunication market is already involved in the standardization and interoperability process even if some gaps are still present due to different choices among the providers. In the institutional sector the interoperability and standardisation of different systems and applications are rather low as different frequencies, different protocols, different technologies are often used. The trend, nowadays, is to direct institutional users to mass-market solutions in order to reduce costs, take advantage of the interoperability already developed in the commercial sector as well as the user-friendly

interface and use which doesn't require technical expertise. It must be noted, however, that often the CP operators are volunteers not trained in the technologies. This implies that CP agencies should use commercial equipment not dedicated to their specific requirements.

Moreover, in general, in an operational context, institutional users only moderately utilise technological developments due to cost, the emergency context and personnel training. This implies that many solutions that could be adopted with the introduction of new technologies potentially leading to real advantages and improvement with respect to CP operations are not considered. It is necessary that solutions dedicated to CP follow a modular and scalable approach, including transparent technology (i.e. user friendly) for users who are less experienced and need technical support. Moreover, technologies and protocols should be adopted that take account of potential improvements and developments in an open architecture environment, in order to facilitate the migration between and integration of different solutions.

A consolidated European approach would indeed bring several benefits, since the CP community across Europe has real common needs. Furthermore, a proper dissemination of best practices would be beneficial to the CP community. For the time being, no institutional, established European mechanism exists to allow the European disaster management community to have efficient and simple access to space assets, nor is there any clear articulation of the specific needs of the disaster management community that would enable owners of space assets to develop resources that cater for those needs.

Recommendations

Action Lines

- *Development of a user-driven set of tools*
  As noted in the report, the CP community faces considerable practical problems such as affordably obtaining sufficient bandwidth at short notice and these restrict the wider use of satellite services in the field of CP. The development of new services that integrate existing space capabilities would make CP operations more effective. This does not necessarily mean the development of new technologies. User-driven initiatives that better represent the interests of CP users to the industry would lead to the development of satellite-based services designed to meet the specific needs of the community. The commitment of CP agencies as users is of paramount importance to validate the concept and to indicate the direction of specific projects, resulting in improved or new services for the community on a regional, European and global scale.
- *Federation of demand*
  One way to overcome the high costs of satellite communication is to share satellite capacities between the CP agencies. From an organisational point of view, this approach would result in economic benefits, as it would decrease the cost of the satellite resource for each CP agency thanks to stronger negotiation power. A user-driven initiative should include a mechanism to federate CP users' demand and to articulate their requirements.
- *Enhanced international cooperation*
  Taking into account the differences between Eastern, Central and Western European countries, international cooperation should be improved in order to facilitate the use of satellite and terrestrial telecommunication equipment. Some existing mechanisms allow the disaster management community to have efficient and simple access to space assets. However, a clear articulation of the specific needs of the CP community is necessary to enable owners of space assets to develop resources that cater for those needs. This requires an effective information flow. A systematic approach is still missing to communicate the problems, requirements and possibilities of European CP between the different actors.

Regulatory Framework

- *Pre-arranged capacity and prices.*
  Unlike the EO sector, where the International Charter on Space and Major Disasters and associated operational structures already exists, the SatCom sector has only individual, ad-hoc arrangements for the use of space capacities in response to major disasters. It is therefore indispensable to shape a legal framework that guarantees the availability of satellite capacity on a cost-effective basis in disaster situations. The new legal framework should create a mechanism to coordinate procurement of satellite communication capacity and associated services for Civil Protection, with the overall intent being the guarantee of rapid and affordable availability during and after disasters. Due to economies of scale, this approach would also lead to the provision of SatCom on a cost-effective basis. One way could be to pre-book SatCom capac-

ity through provision and pricing arrangements with major satellite operators, starting with a small number of willing partners and building these arrangements in an incremental and standardised manner.

- *Collaboration between the parties*.
  The new regulatory framework should also define collaboration with the Commission, ESA, the Member States and the relevant stakeholders to promote optimum use of existing and future solutions and telecommunication capacity to facilitate the development of services for citizens in the fields of public security and emergency response. Building on this, the new regulatory framework should regulate bandwidth pre-emption, cross-border movement of equipment, integration with legacy systems and availability of spectrum in the event of disasters. Furthermore, it should be assessed whether the "Emergency.lu" type of model could be implemented at a European level. One idea could be to establish a competitive Public Private Partnership (PPP) for a dedicated satellite-communication for CP using the existing tools.

	Short-Term Action Plan	Mid-Term Action Plan	Long-Term Action Plan
Measures	• Identification of CP users' needs and requirements within the ESA IAP programme • Setting up of a centralised user-driven activity within the ESA IAP programme • Promotion of technical standards • Creation of a platform to exchange lessons learned from previous disasters on a regular basis among the stakeholders • Facilitation of exchange of information with the On-site Operation Command Centre and the MIC • Definition of collaboration with the Commission, ESA, the Member States and the relevant stakeholders • Creation of effective prevention measures though the coordination with other relevant policy fields • Impact assessment of the implementation of a PPP model for a dedicated satellite-based communication at a EU level	• Development of a user-driven set of tools in form of end-to-end customised satellite-based services • Establishment of a European Emergency Response Capacity in form of a voluntary pool of assets provided by participating States ⇒ Within that pool pre-identification of Member States' capacities on standby for deployment in EU operations • Definition of interaction between the MIC, CP and humanitarian assistance authorities in the EU and with the European External Action Service (EEAS) and EU delegations in the event of responses in third countries • Creation of an overall European preparedness policy framework • Federation of demand to lower costs of SatCom due to better bargaining power	• Establishment of an institutional European mechanism to allow the European disaster management community to have efficient and simple access to space assets • Establishment of a mechanism to coordinate procurement of SatCom capacity and associated services for CP • Pre-book SatCom capacity through provision and pricing arrangements with major satellite operators • Legal framework that create a mechanism to coordinate procurement of satellite communication capacity and associated services for CP • Regulations on bandwidth re-emption, cross-border movement of equipment, integration with legacy systems and availability of spectrum in the event of disasters
Objectives	• Better overview of the current use of satellite-based services/applications by the CP community • A systematic approach to communicate problems, requirements and possibilities	• Coherent European programme to aggregate the needs of the CPS and to bring about customised satellite solutions • Strengthening international cooperation between the EU institutions, the CP agencies and relevant stakeholders • Development of tailored space-based applications capable to enhance the operational effectiveness of CPs	• A federated European approach in the use of SatCom capacity on a cost-effective basis in the event of disasters • Promotion of optimum use of existing and future solutions • Improved environment for the development of services for citizens in the fields of public security and emergency response

Table 5.1: Summary Table of Recommendations

List of Acronyms

Acronym	Explanation
AHP	Advanced Hydrological Prediction
ASI	Italian Space Agency
BBK	German Federal Office for Civil Protection and Disaster Assistance (Bundesamt für Bevölkerungsschutz und Katastrophenhilfe)
BM.I	Austrian Federal Ministry of the Interior (Bundesministerium für Inneres)
CECIS	Common Emergency Communication and Information System
CESVI	Cooperazione e sviluppo
CiProS	Civil Protection System & Simulation
COGIC	French Emergency Management Operational Centre (Centre Opérationnel de Gestion Interministérielle des Crises)
CNES	France's Centre National d´Etudes Spatiales
CP	Civil Protection
CPFI	Civil Protection Financial Instrument
DDSC	French Civil Protection Agency (Direction de la Défense et de la Sécurité Civiles)
DG ECHO	European Commission Directorate General for Humanitarian Aid
DVB-RCS	Digital Video Broadcasting - Return Channel via Satellite
EC	European Commission
EEAS	European External Action Service
EO	Earth Observation
ERS	Emergency Response Service
ESA	European Space Agency
ESPI	European Space Policy Institute
EU	European Union
FSS	Fixed Satellite Services
GIS	Geographic Information System
GMES	Global Monitoring for Environment and Security
GMES-ERS	GMES - Emergency Response Service
GMOSAIC	GMES services for Management of Operations, Situation Awareness and Intelligence for regional Crises
GNSS	Global Navigation Satellite Systems
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IAP	Integrated Applications Promotion

Acronym	Explanation
ICT	Information and Communication Technologies
IP	Internet Protocol
ITSO	International Telecommunications Satellite Organizations
ITU	International Telecommunications Union
LEMA	Local Emergency Management Agency
MIC	Monitoring and Information Centre
MOSS	Minimum Operating Security Standards
MSS	Mobile Satellite Services
MTA	Multinational Pan European Satellite Telecommunication Adapter
NATO	North Atlantic Treaty Organisation
NSA	National Satellite Adaptor
OSOCC	On-Site Operations Coordination Centre
PDA	Personal Digital Assistant
PEA	Pan European Adaptor
PfP	Partnership for Peace
PPP	Public Private Partnership
QoS	Quality of Service
R&D	Research and Development
SAFER	Service and Response for Emergency Response
SatCom	Satellite Communication
SES	Société Européene des Satellites
TAST	Technical Assistance and Support Teams
TETRA	Terrestrial Trunked Radio
TETRAPOL	Terrestrial Trunked Radio Police
TFEU	Treaty on the Functioning of the European Union
THW	German Federal Agency for Technical Relief
ToIP	Telephone ofer IP
UHF	Ultra High Frequency
UN	United Nations
UN-OCHA	United Nations Office for the Coordination of Humanitarian Affairs
UN OOSA	United Nations Office of Outer Space Affairs
UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response
VHF	Very High Frequency
WiFi	Wireless Fidelity

Annex

A.1 Organisation of Civil Protection Activities in Countries that Participated in the ESPI Workshop

A.1.1 Austria

Civil protection and crisis and disaster protection management is managed by Austria's Ministry of the Interior Department II/4 – Civil Protection, Crisis and Disaster Protection Management, which consists of two units: International Civil Protection and Disaster Relief Affairs, and National Crisis and Disaster Protection Management. The response to disasters affecting more than one of Austria's nine federal provinces, or Austria as a whole, are coordinated by this Department de facto, which consists of representatives from the federal ministries as well as officers from each of the provinces. In performing relief tasks, rescue services, fire brigades, other units and, if required, the Austrian Broadcasting Corporation and the Austrian Press Agency are also included in this body. The Federal Alarm Center of the Ministry of the Interior serves as an operational tool of coordination and information during emergencies both within Austria and abroad, acting as the focal point for the provinces, other countries, the EU, and international organizations. The provinces are mostly responsible for local disasters and emergencies, where operational responsibility falls upon regional alarm centers. Federal authorities will support provinces in disaster relief operation, though they chiefly rely upon volunteer organizations.

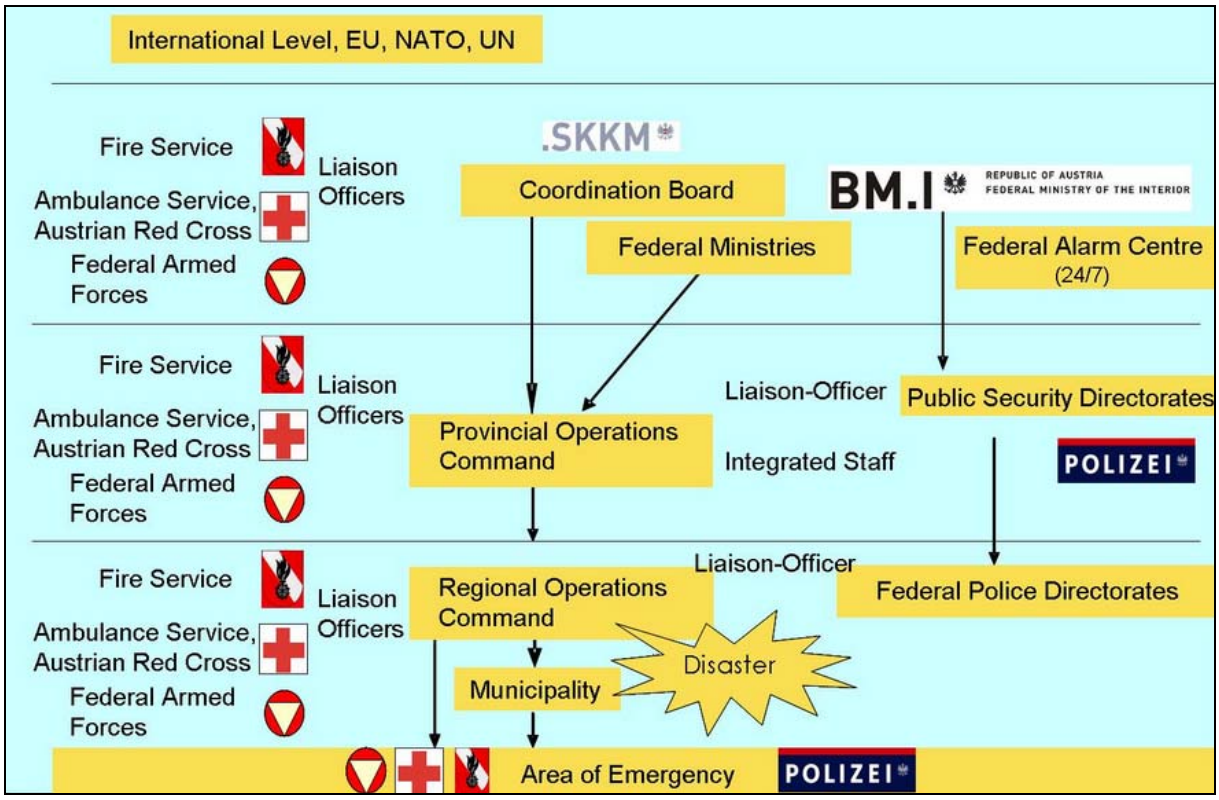


Figure A.1.1: Organisational chart of Civil Protection in Austria[52]

[52] „Austria – Disaster management structure; Organisational chart." European Commission 2 Sept. 2011 <http://ec.europa.eu/echo/civil_protection/civil/vademecum/at/2-at-1.html#orga>.

The national Law on Federal Ministries structures Civil Protection within the country. Most legal measures to prevent or address disasters exist within the provinces, which have adopted laws defining crisis management at community, district, and regional levels. At the international level, Austria holds bilateral agreements with several countries, especially in the area of "nuclear safety" and environmental protection. Taking part in the Central European Initiative's Working Group on Civil Protection, Austria participates in forecasting and mitigating natural and technological disasters.

A.1.2 France

French Civil Protection is organized at national, zonal, and departmental levels. In the event of a crisis, three operational centres are activated: one in the Ministry of the Interior, a Zonal Defence Operations Centre, and a Departmental Operations Centre.

National Civil Protection is headed by the Minister of the Interior, with support from senior defence personnel and civil servants and the Interdepartmental Crisis Management Operations Centre. The Directorate of Civil Defence and Security (DSC), attached to the Ministry of the Interior, protects the State, people, and property in response to threats from emerging dangers/risks of all kinds, including environmental. Its national operational centre (CODIG) ensures constant monitoring of large-scale rescue operations in France and abroad, and is responsible for informing the Minister of the Interior and State authorities of all disasters.

At the zonal level, resource coordination is the responsibility of a Zone Prefect, who may call upon the Interregional Civil Security Operational Co-ordination Centre (COZ), as well as the General Secretariat of the Defence Zone and the Civil Security Zone Headquarters Staff in preparing rescue measures.

Similarly, a Departmental Prefect organises local resources, and can call on the Departmental Operations Centre of the Fire and Emergency Services. Day to day emergency response is conducted by professional and volunteer firemen, financed by local authorities and chaired by the President of the General Council, but reliant upon the Prefect's authority for aid deployment.

Civil defence and security are governed by several Ordinances, Decrees, Orders, and Laws. Regarding international cooperation, France has bilateral agreements with 42 countries.

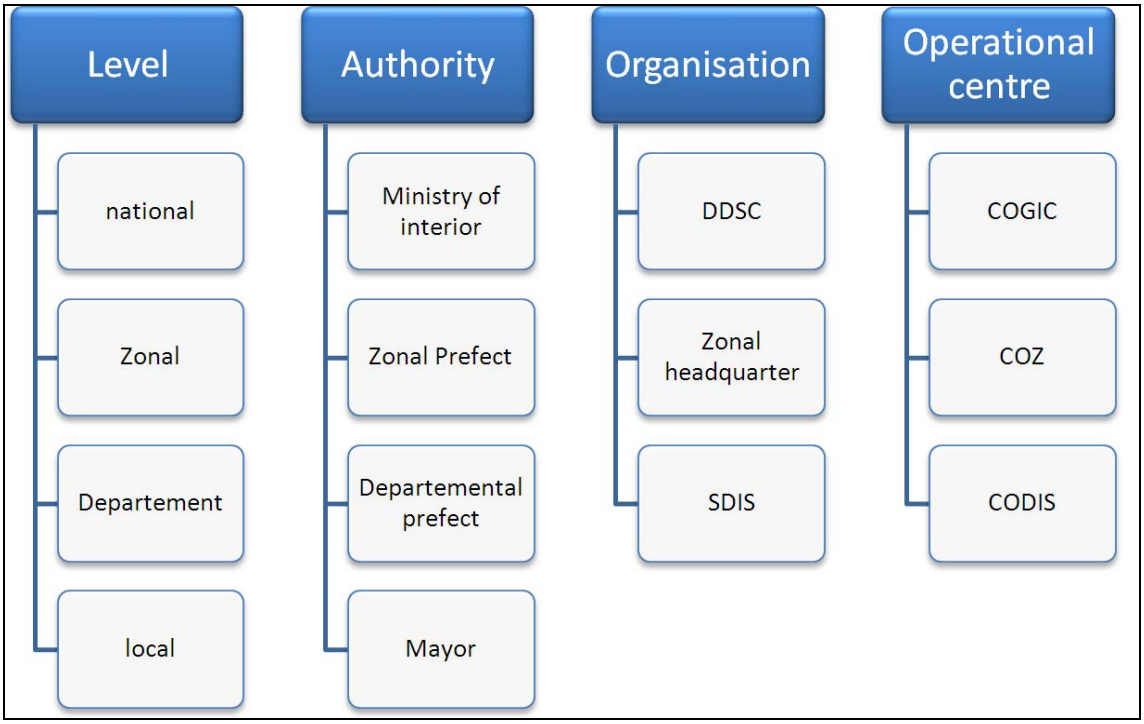


Figure A.1.2: Organisational chart of Civil Protection in France[53]

[53] "France – Disaster management structure; Organisational chart." European Commission 2 Sept. 2011 <http://ec.europa.eu/echo/civil_protection/civil/vademecum/fr/2-fr-1.html#orga>.

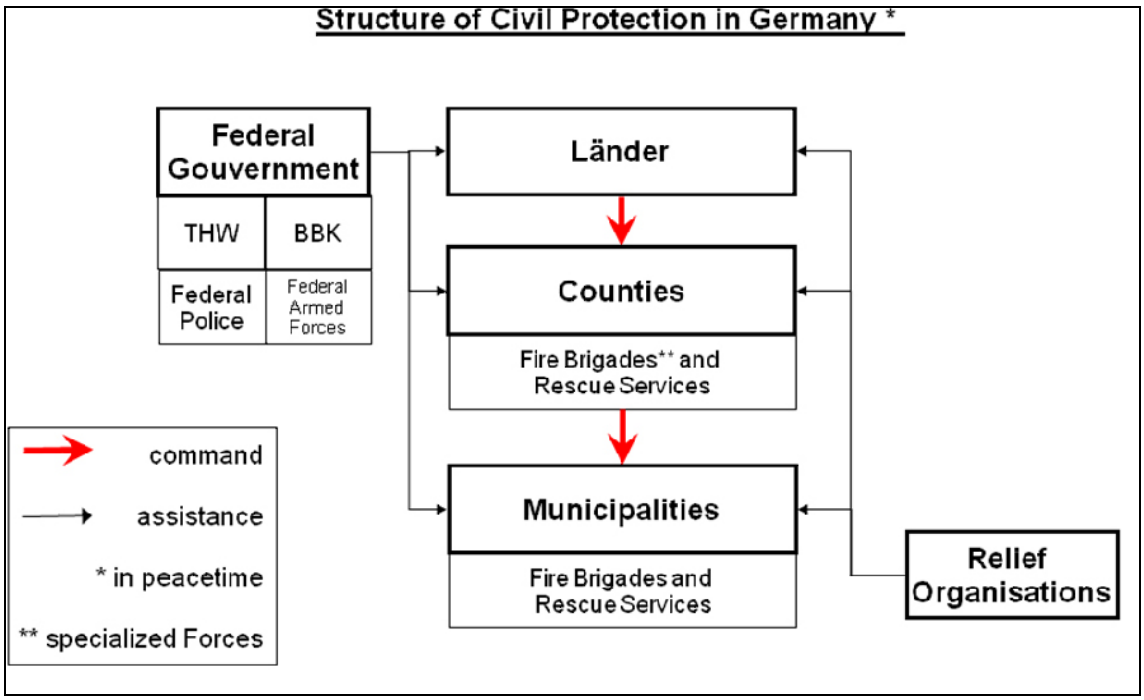


Figure A.1.3: Organisational chart of Civil Protection in Germany[54]

A.1.3 Germany

According to the laws of each of Germany's 16 states, the first authority in charge during a peacetime disaster is the respective rural district, county, or municipal authority, as led by each local administrative director and supported by his respective staff, representatives of other authorities, and other organizations involved in disaster management. An appointed director of operations coordinates the response, and should multiple districts be affected or local resources prove insufficient, then the next highest authority ensures coordination. The Federal Government will assist upon request with resources such as the Federal Agency for Technical Relief (THW), the Federal Police, and the Armed Forces, along with services provided by the Federal Office of Civil Protection and Disaster Assistance (BBK). During war, the federal government is responsible for civil defence, and thus there are two areas of Civil Protection policy: Emergency Planning in peacetime (States), and "Extended" Emergency Planning in case of war (Federal).

Operational organizations are organised by civil protection authorities, who can be supported on-site by fire-fighters, private relief organizations, and NGOs. These authorities consist of the Federal Ministry of the Interior (assisted by the Federal Office of Civil Protection and Disaster Assistance, and the Federal Agency for Technical Relief), the States' Ministries of the Interior, administrative districts, counties and county boroughs, and municipalities. All civil protection authorities contribute to disaster prevention and recovery, and when a disaster exceeds the capability or boundaries of a given State, an inter-ministerial coordination group may be established within the Federal Ministry of the Interior. In military crises, the Ministry of the Interior coordinates 13 Ministries responsible for civil emergency planning within their own areas to provide for continuity of government, civil protection, supply of goods/services, and support of the armed forces. There are no structural differences for different types of disaster.

The protection of the people via federal law is mostly confined to wartime (or a precursor), so States mostly have their own laws regulating urgent medical assistance, fire fighting, and disaster management. However the Federal Government has increased collaboration with the States via the Federal Office of Civil Protection and Disaster Assistance. The legal basis for the emergency response of States lies within State law, and may consist of combined or separate fire response laws and disaster management laws. Both Federal and State laws address local level Civil Protection responsibilities. Germany has also signed several bilateral agreements concerning mutual disaster assistance.

[54] "Germany – Disaster management structure; Organisational chart." European Commission 2 Sept. 2011 <http://ec.europa.eu/echo/civil_protection/civil/vademecum/de/2-de-1.html#orga>.

A.1.4 Hungary

The Minister of Local Government supervises disaster and Civil Protection management, as his Ministry oversees the National Directorate General for Disaster Management. Under this Directorate lies the County Disaster Management Directorates, the Civil Protection Directorate of the Capital, Civil Protection Branch Offices, and Civil Protection Offices. Parliament establishes national Civil Protection policy, and government decides funding levels, size of the organizations, and structure. After a disaster has struck, the Minister responsible for the governance of the type of disaster that has occurred establishes and operates a protection working committee in order to manage and mitigate the consequences.

At the regional level, the chairperson of the county General Assembly (in Budapest, the Mayor) directs and organizes the enforcement of Civil Protection tasks. At the local level, the Mayor manages the implementation of Civil Protection tasks.

During the period of prevention, the Governmental Coordination Committee (GCC) coordinates tasks related to preparation for a forecasted disaster, manages the national assessment of disaster-prone areas, coordinates the activities of participating organizations, monitors and coordinates nuclear emergency or accident prevention and protection against water damage, and directs rehabilitation tasks based on the governmental decision. In case of disaster, the GCC Preliminary Protection Working Committee coordinates the implementation of professional tasks.

The legal basis for Civil Protection at the national level is largely based upon the Constitution of the Republic of Hungary, the Act on Civil Protection, and the Act on Disaster Management among several others which further govern the details of the process and structure. There is also significant legislation regarding the role of the Ministries in Civil Protection. International activities are governed by political/operational agreements under the competence of the NDGDM, and Hungary maintains bilateral agreements with many other countries.

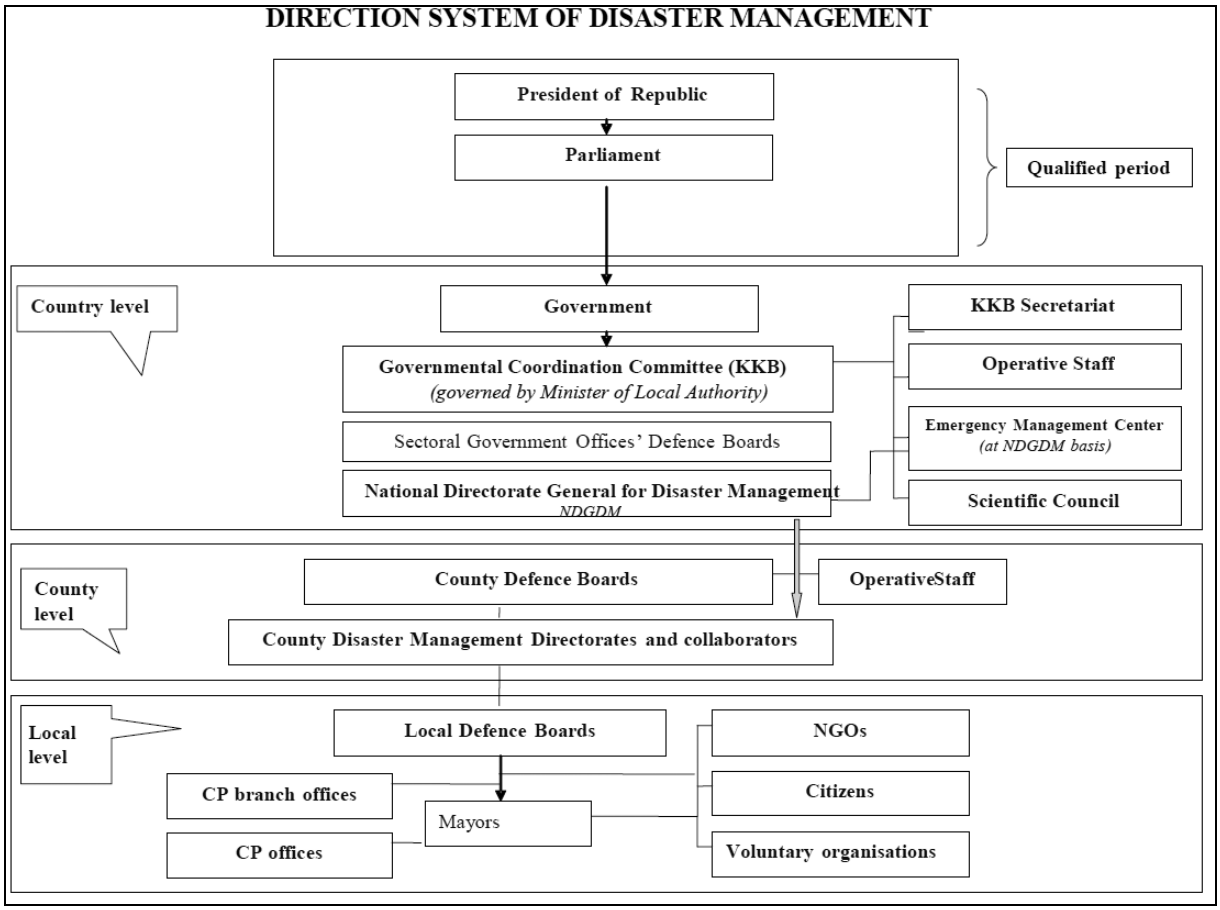


Figure A.1.4: Organisational chart of Civil Protection in Hungary[55]

[55] "Hungary – Disaster management structure; Organisational chart." European Commission 2 Sept. 2011 <http://ec.europa.eu/echo/civil_protection/civil/vademecum/hu/2-hu-1.html#orga>.

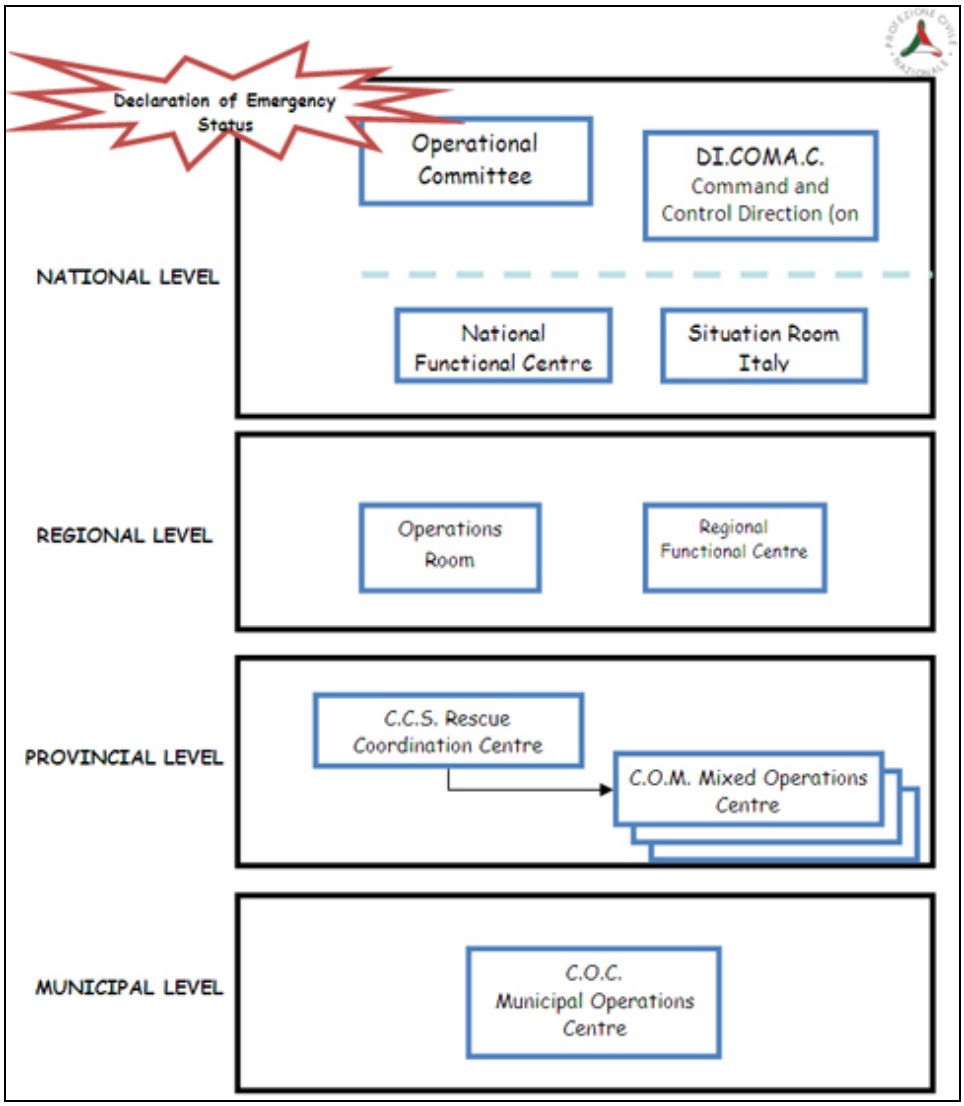


Figure A.1.5: Organisational chart of Civil Protection in Italy[56]

A.1.5 Italy

Civil Protection in Italy is an integrated system allowing coordinated use of all available State and private resources, closely mapping the administrative organization of the country. Civil Protection policy is decided by either the President of the Council of Ministers or his appointed Minister of the Interior. The Department of Civil Protection coordinates the National Service as the arm of the Council President, with eight main offices, each of which is divided into two or more services performing specific tasks. In the event of a disaster the Department of Civil Protection assesses whether local resources are sufficient, deploys extra resources as necessary, and in extreme cases will take on operational coordination itself.

Civil Protection activities are performed by the National Service of Civil Protection components and national operational structures, i.e. the National Fire-Fighters Corps, the police and the armed forces, the State Forest Corps, the Italian Red Cross, the National Health Service, the National Alpine Rescue Corps, volunteer forces, state administrations, the regions, the provinces and municipalities, technical-scientific experts, and private institutions and organizations. Rescue operations are coordinated by the Operational Committee including the administrations and institutions involved at national and local levels.

[56] "Italy – Disaster management structure; Organisational chart." European Commission 2 Sept. 2011 <http://ec.europa.eu/echo/civil_protection/civil/vademecum/it/2-it-1.html#orga>.

Responsibility lies with the lowest possible administrative level. Regions are responsible for defining risk forecast and prevention programs; provinces are responsible for defining and implementing the related emergency plans; and municipalities are responsible for the draft municipal emergency plan and coordination of relief operations on their respective territories, with the primary authority within municipalities being the Mayor. Coordination and operational activities are carried out through a hierarchical organization consisting of Municipal Operational Centres (COC) at the municipal level, Mixed Operational Centres (COM) and Rescue Coordination Centres (CCS) at the provincial level, Regional Operations Centres at the regional level, and Command and Control Direction (DICOMAC) at the national level. When involved, DICOMAC takes up operations at or near the site of the disaster. The Department of Civil Protection has institutionalized the National Situation Room (SitI) at its premises, ensuring the 24 hour presence of the National Service of Civil Protection.

Italy has many national Acts and Legislative Decrees, determining the structure of Civil Protection and the roles of the groups it establishes, including the National Service of Civil Protection. Some of these laws also regulate the international role of the Department of Civil Protection, including its permission to exercise the same powers in an international role as for emergencies occurring on Italian territory. Italy also maintains international cooperation via several bilateral agreements.

A.1.6 Poland

The Council of Ministers is responsible for the public order and internal security of the State, and thus has power to declare a state of emergency. In urgent cases, crisis management is exercised by the Minister of Interior, informing the Prime Minister of his actions. The Parliament and President act only in extreme crises, as in the case of natural disaster. The Government Crisis Management Team (GCMT), chaired by the Prime Minister with the Minister of the Interior and Administration and the Minister of National Defence as deputy chairs, assists the Council of Ministers in crisis management. The main task of the GCMT is advising the Council on initiating and coordinating activities in the field of crisis management, including Civil Emergency Planning (CEP) at the national level, but the GCMT also advises on resource allocation, the national emergency response plan, and critical infrastructure protection plans. The Director of the Government Centre for Security (a new institution dealing with the coordination of efforts in the field of crisis and emergency management) is the secretary of the GCMT. All Civil Protection advice is in line with the Defence Response Plan (except in a period of martial law). Each Minister is responsible for actions in the field of CEP within their own domain, while most emergency services are subordinate to the Minister of the Interior and Administration, the responsible entity for Civil Protection.

Each administrative level has Crisis Management Teams (CMT) to support the respective lead authorities (not mandatory at the municipal level). The provinces are headed by representatives of the government, whose main tasks are the coordination and prevention of all types of hazards, the support of efforts at self-governmental levels, and to assist lower governmental levels if their resources are inadequate. Municipal authorities are responsible for all local public issues, in particular fire protection and the maintenance of public order. Additional responsibilities include threat monitoring, early warning systems, alarms, and the coordination of rescue operations and evacuations. The head of a municipality defines Civil Protection tasks for all institutions within the municipality, while the owners of critical infrastructure are responsible for developing and conducting activities and training in accordance with the Crisis Management Act.

The legal framework for Civil Protection is established by the national Constitution, and is also largely provided by Acts including the Crisis Management Act and the Act on the State of Natural Disaster. Poland participates in international Civil Protection through multilateral and bilateral agreements with many countries.

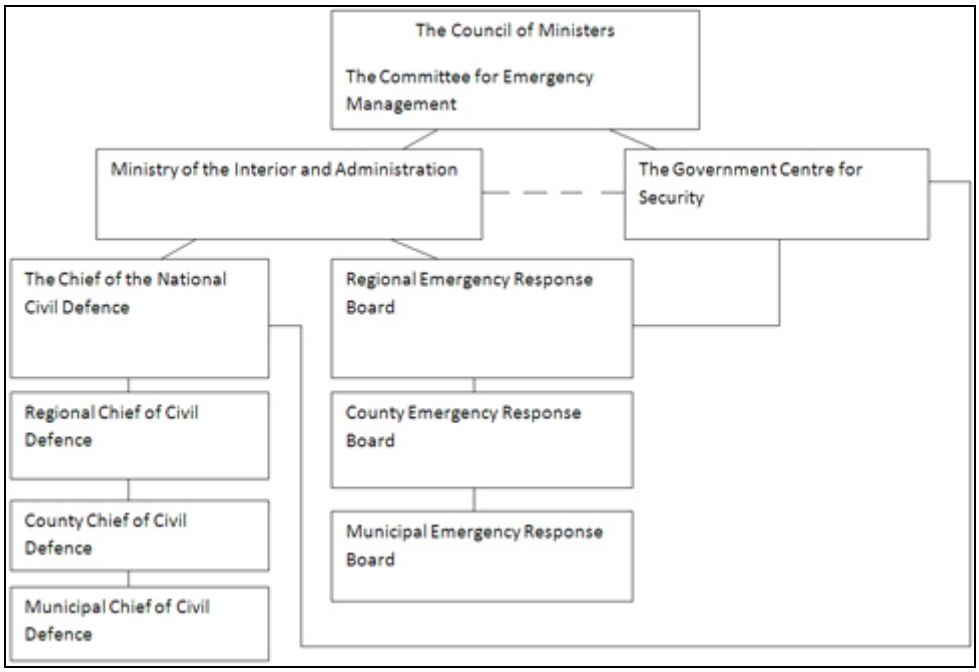


Figure A.1.6: Organisational chart of Civil Protection in Poland[57]

A.1.7 Romania

The National Committee for Emergency Situations (NCES) is composed of decision-making representatives, experts, and specialists designated by the Ministries, and it acts under the direct guidance of the Minister of Administration and the Interior, under the coordination of the Prime Minister.

At the national level, the General Inspectorate for Emergency Situations (GIES) is the authority responsible for coordinating the implementation of emergency management actions and measures within the country. The GIES is part of the National Emergency Management System, a component of the National Defence System, and is managed by a General Inspector. The GIES was established as a merger of the Civil Protection Command and the General Inspectorate of Military Fire Corps, and is responsible for coordinating all organizations involved in the management of emergencies according to international regulations.

Institutions in the field of defence, public order, and national safety must document and submit potential emergency scenarios in their respective domains to the GIES or, if necessary, to the Minister of Administration and the Interior or the Prime Minister. The GIES communicates the decisions made by the Government or by the National Committee (through its Technical Secretariat) to the central public administration authorities.

Operative Centres for Emergency Situations are organized at the Ministerial level, while other central public institutions with responsibilities in emergency management are organized at the municipal (except the Bucharest Municipality), city and commune levels. Some of these centres are permanent (for Ministries/institutions with complex functions within the National Emergency Management System), while others are temporary (active only upon request of the National Committee for Emergency Situations).

Committees for Emergency Situations exist at all levels of administration in order to coordinate across Ministries. The Ministerial/Central Public Institutions' Committees are chaired by heads of the respective Ministries (Bucharest Committee is chaired by the Prefect of Bucharest), county committees are chaired by the county prefect, and local committees are chaired by the mayor and endorsed by the prefect.

Inter-agency coordination during emergencies is managed by an “action commander”, (nominated by the National, Ministerial or County Committees; or the Bucharest Committee for Emergency Situations, depending on the nature or the extent of the event or on the number of forces involved). The action commander may receive support from operative groups under relevant legislation.

At the county level, the Professional Public Communitarian Services for Emergency Situations represent the de-concentrated

[57] “Poland – Disaster management structure; Organisational chart.“ European Commission 2 Sept. 2011 <http://ec.europa.eu/echo/civil_protection/civil/vademecum/pl/2-pl-1.html#orga>.

services and work as the Inspectorates for Emergency Situations in the 41 counties/Bucharest. The Professional Communitarian Services for Emergency Situations are subordinate to the GIES and provide - in their respective domains - guidance and control of prevention and management of emergencies.

The legal basis for Civil Protection is largely provided by the Civil Protection Act, along with many Government Decisions (such as Government Decision 21 which provides for the National Emergency Management System), Ordinances, and Orders from the MoAI. There are also Acts and MoAI Orders which regulate the role of volunteer services, as well as Government Decisions on the role of NGOs. International participation in Civil Protection is determined by specific agreements with other countries, and the GIES also takes steps to sign agreements with other States.

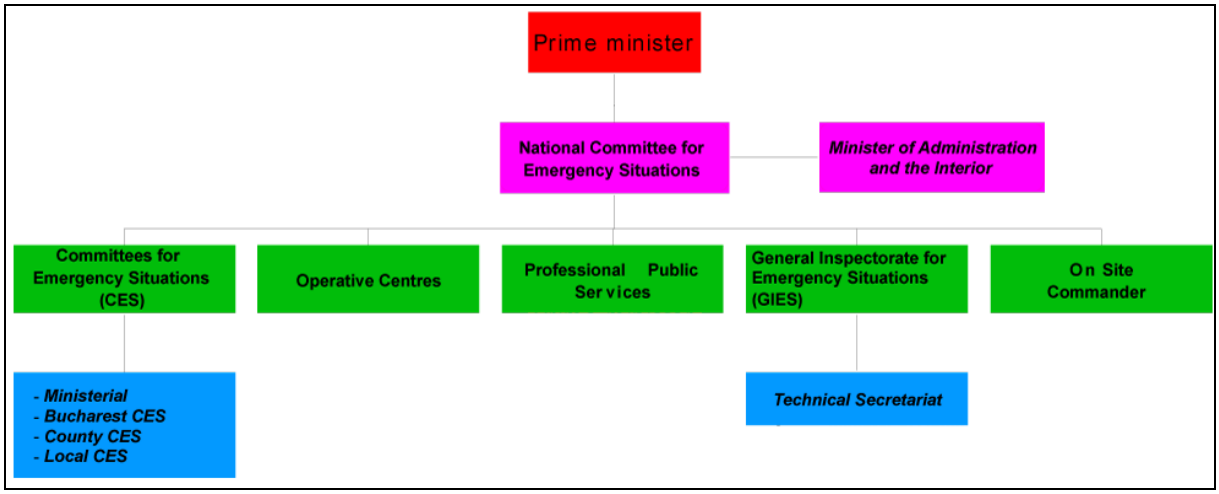


Figure A.1.7: Organisational chart of Civil Protection in Romania[58]

[58] "Romania – Disaster management structure; Organisational chart." European Commission 2 Sept. 2011 <http://ec.europa.eu/echo/civil_protection/civil/vademecum/ro/2-ro-1.html#orga>.

A.2 Workshop Programme

Telecommunications are of paramount importance for Civil Protection (CP) agencies when dealing with the steadily growing number of natural and man-made disasters. During emergencies there are often shortcomings in the quantity and quality of available satellite capacity and relevant services. The fragmented nature of demand and supply leads to a lack of standardisation and high costs. Against this background, a consolidated effort is needed to ensure that the development of new generations of services is in line with the stringent requirements of the CP communications systems.

The ESA IAP programme in cooperation with the Austrian Aeronautics and Space Agency, and the European Space Policy Institute (ESPI) is delighted to support the Austrian Federal Ministry of the Interior (BM.I) in their initiative for the civil protection community. The workshop intends to discuss possible ways to enhance existing solutions via the use of satellite-based services in the field of CP. On the first day, the workshop will reflect on preliminary activities at European level.

The second workshop day shall provide the opportunity for practitioners from the CP community in Central and Eastern European countries to share their experience and lessons learned from previous disasters. In the course of the followed roundtable session they will review their national approaches to improve the operational capabilities with regard to CP.

The workshop aims at identifying the way forward and the setting up of a roadmap for generating space-based user driven activities of direct benefit to the European CP community. Based on these results an ESPI report will be published serving as policy advice for dealing with the use of satellite-based services in the field of CP.

Venue:

European Space Policy Institute (ESPI)
Palais Fanto
Schwarzenbergplatz 6
(Entrance: Zaunergasse 1-3)
A-1030 Vienna, Austria
Tel +43 1 718 1118 -0 / Fax -99
www.espi.or.at

Participation upon invitation only

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ESA
European Commission Humanitarian Aid & Civil Protection

April 2011

Workshop

Space for Civil Protection

Programme

ESPI, 5-6 May 2011
Vienna, Austria

Thursday, 5 May 2011

13:30-14:00 Registration

14:00-14:15 Welcome and Introduction

Kai-Uwe Schrogl
Director
European Space Policy Institute (ESPI)

Harald Posch
Head of Aeronautics and Space Agency
Austrian Research Promotion Agency (FFG)

14:15-16:30 Keynotes

Integrated Applications Promotion (IAP)
Amnon Ginati
Head of the Integrated and Telecommunications related Applications Department
European Space Agency (ESA)

Siegfried Jachs
Head of Unit National Crisis and Disaster Management
Austrian Federal Ministry of the Interior

Raed Arafat
Undersecretary of State
Ministry of Health, Romania

Tomasz Kolodziejczyk
Director of the International Cooperation Dept.
National HQ of the State Fire Service, Poland

Tiphaine Schmitt
Directorate of Civil Security
Ministry of the Interior, France

Marzia Santini
Italian Civil Protection Officer
National Department of Civil Protection

16:30-17:00 Coffee Break

17:00-18:00 European Perspective

Space for Civil Protection: the European context
Geraldine Naja
Head of the EU Relations Office
European Space Agency (ESA)

ESA Short Term Plan for Civil Protection
Pierluigi Mancini
Head of the Awareness and Feasibility Studies Division
Integrated and Telecommunications related Applications Department
European Space Agency (ESA)

18:00-19:00 Roundtable Discussion

19:00 21:00 Reception

Friday, 6 May 2011

09:00-12:00 National perspective & lessons learned

Cosmin Balcu
Head of Sibiu County Inspectorate for Emergency Situations, Romania

Martin Keitsch
ICT specialist and coordination expert
German Federal Agency for Technical Relief

Michael Pregesbauer
Civil Protection Department
Government of Lower Austria

Kinga Perge
Senior Desk Officer
National Directorate General for Disaster Management
Hungary

Jakub Ryzenko
National expert on use of satellite applications for CP
Poland

Juan Carlos Villagran De Leon
Programme Officer UN-SPIDER
Office for Outer Space Affairs (OOSA)

12:00-14:00 Lunch

14:00-15:00 Roundtable discussion

Participation of the morning session speakers

15:00-16:00 Way forward & concluding remarks

All Participants

Moderated by:
Kai-Uwe Schrogl and
Amnon Ginati

Speakers at the workshop (from left): Martin Keitsch (Federal Agency for Technical Relief, Germany), Cosmin Balcu (Sibiu County Inspectorate for Emergency Situations, Romania), Michael Pregesbauer (Government of Lower Austria), Raed Arafat (Ministry of Health, Romania), Marzia Santini (Department for Civil Protection, Italy), Amnon Ginati (ESA), Kinga Perge (National Directorate General for Disaster Management, Hungary), Siegfried Jachs (Austrian Federal Ministry of the Interior) Charlotte Mathieu (ESA), Tomasz Kolodziejczyk (National HQ of the State Fire Service, Poland), Jakub Ryzenko (Space Research Centre, Poland) Pierluigi Mancini (ESA), Mildred Trögeler (ESPI), Tiphaine Schmitt (French Ministry of the Interior), Erich Klock (ESPI), Kai-Uwe Schrogl (ESPI)

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About the Authors

Erich Klock

Erich Klock joined the European Space Policy Institute in Vienna as a project manager in 2010 and is responsible for the ESA Integrated Applications Promotion (IAP) Ambassador Platform for the Central and Eastern European region. This platform was established to support the ESA IAP programme by raising awareness and stimulating projects in the region of Central and Eastern Europe. Prior to that, Erich Klock worked three years as a scientific staff member for an Austrian research institution and two years as a process engineer for a printed circuit board producer.

Erich Klock holds a Master degree in Business Administration in General Management (MBA) as well as a Master degree in Space Sciences (MSc), with a specialisation in satellite communication and navigation. Furthermore, he holds a degree in electronic engineering (DI(FH)).

Mildred Trögeler

Mildred Trögeler has been a Resident Fellow at the European Space Policy Institute (ESPI) seconded by the German Aerospace Center (DLR) since 2011. Prior to joining ESPI, she served as a Research Associate for the DLR in the field of Strategy and International Relations. Besides a degree in law from the University of Bonn (Germany) with a specialisation in economics and competition law, she holds an Advanced LL.M. in Air & Space Law from the University of Leiden (the Netherlands). She has also published a number of papers in this field. In 2010 she was awarded the European Air Law Association (EALA) prize and was a member of the winning team of the first International Air Law Moot Court Competition, held in Delhi (India).

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