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**INVITED PAPERS**

# ESTABLISHING THE UNITED NATIONS PLATFORM FOR SPACE-BASED INFORMATION FOR DISASTER MANAGEMENT AND EMERGENCY RESPONSE

**Submitted by United Nations Office for Outer Space Affairs****

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# Establishing the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (SPIDER)

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## Abstract

Under the theme "Space benefits for humanity in the twenty-first century", the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) [1] was held in Vienna from 19 to 30 July 1999, bringing together more than 2,500 participants representing 100 countries and 30 international organisations. The most important result of UNISPACE III was the adoption of the Vienna Declaration on Space and Human Development [2] in which 33 specific actions were recommended that should be carried out to enable space technologies to contribute to the global challenges of the new millennium.

One of the main recommendations put forward was the need to help developing countries have access and be in a position to use space-based technologies (earth observation satellites, meteorological satellites, communication satellites and global navigation satellite systems) for risk reduction and disaster management. From this recommendation several actions were initiated. This presentation reviews the progress achieved by these actions, focusing on the recommendation that was put forward by the Committee on the Peaceful Uses of Outer Space (COPUOS), during its forty-ninth session last June, that a United Nations Platform for Space-based Information for Disaster Management and Emergency Response (SPIDER) should be established.

This presentation also discusses the role of the National Mapping Organisations in the implementation of such a Platform, and the importance of Global and National Spatial Data Infrastructures to support disaster management activities.

## Keywords

Space Technology, Disaster Management, Spatial Data Infrastructure, United Nations, Remote Sensing, COPUOS, SPIDER.

## Introduction

Each year, disasters such as storms, floods, volcanoes and earthquakes, cause thousands of deaths and tremendous damage to property around the world, displacing tens of thousands of people from their homes and destroying their livelihoods. Many of these deaths and losses could be prevented if better information were available regarding the onset and course of such disasters. Space-based technologies, such as meteorological and Earth observation satellites, communication satellites and satellite-based positioning technologies offer the potential to contribute to improved prediction and monitoring of potential hazards, which in turn would lead to sharp reductions in losses to life and property. The tsunami that swept through the Indian Ocean region in late 2004 demonstrated that space-based technologies are increasingly being made available to be used for early warning and emergency response. It also demonstrated that developing countries still do not have wide access to such solutions, not only during the disaster response phase, but also during the more important preparedness phase of the disaster cycle, which invariably results in unnecessary loss of life and property when disaster strikes.

## Use of Space Technology for Disaster Management

Earth observation satellites have demonstrated their utility in providing data for a wide range of applications in disaster management. Pre-disaster uses include risk analysis and mapping; disaster warning, such as cyclone tracking, drought monitoring, the extent of damage due to volcanic eruptions, oil spills, forest fires and the spread of desertification; and disaster assessment, including flood monitoring and assessment, estimation of crop and forestry damages and monitoring of land use/change in the aftermath of disasters. Remotely sensed data also provide a historical database from which hazard maps can be compiled, indicating which areas are potentially vulnerable. Information from satellites is often combined with other relevant data in geographical information systems (GIS) in order to carry out risk analysis and assessment. GIS analytical tools can be used to model various hazard and risk scenarios for planning the future development of an area.

Meteorological satellites can monitor weather patterns, detect and track storms and monitor frosts and floods. Derived products are produced routinely several times per day, many of them focused on particular hazard events. Tracking sequences of tropical cyclone images from geostationary satellites as well as storm intensities and atmospheric winds derived from these images provide vital information for forecasting landfall, thus contributing to saving lives. Global navigation satellite systems (GNSS) provide accurate position, velocity and time information that is readily accessible at ground level to anyone with a receiver, enabling the collection of data to support risk reduction and emergency response activities. Communication satellites are geo-stationary satellites that enable the setting up of emergency communication channels and are being used increasingly by all those responding to an emergency. Restoring communication in disaster stricken areas is usually the first priority when responding to an emergency. Additionally, there is a need to receive information from and send information to the various emergency response teams working in the field, including large data files such as maps and satellite images.

The World Conference on Disaster Reduction, held in Kobe, Japan, in January 2005, recognized the contribution of space technology to disaster reduction and emphasized the need to incorporate space-based services routinely to support risk reduction. The

Conference was the largest gathering ever of the disaster community, totalling 4,000 participants in the plenary activities and the thematic sessions and around 40,000 people in the public segment. A list of commitments is set out in the main document produced by the Conference delegates the "Hyogo Framework of Action 2005-2015: Building the Resilience of Nations and Communities to Disasters" [3], which, once implemented, will contribute to substantially reducing loss of life and damage to the social, economic and environmental assets of communities and countries. Specifically with regard to space technology its contribution to risk reduction during the last 10 years was recognised in a report prepared for the World Conference by the Conference Secretariat [4] and the delegates confirmed in the outcome document the need to promote the use, application and affordability of recent information, communication and space-based technologies and related services, as well as Earth observations, to support disaster risk reduction [3].

## UNISPACE III

Under the theme "Space benefits for humanity in the twenty-first century", UNISPACE III was held in Vienna from 19 to 30 July 1999. The most important result of this United Nations Conference was the adoption of the Vienna Declaration on Space and Human Development [2] in which 33 specific actions were recommended that should be carried out to enable space technologies to contribute to the global challenges of the new millennium. One of the recommendations put forward was the need "to implement an integrated, global system, especially through international cooperation, to manage natural disaster mitigation, relief and prevention efforts, especially of an international nature, through Earth observation, communications and other space-based services, making maximum use of existing capabilities and filling gaps in worldwide satellite coverage".

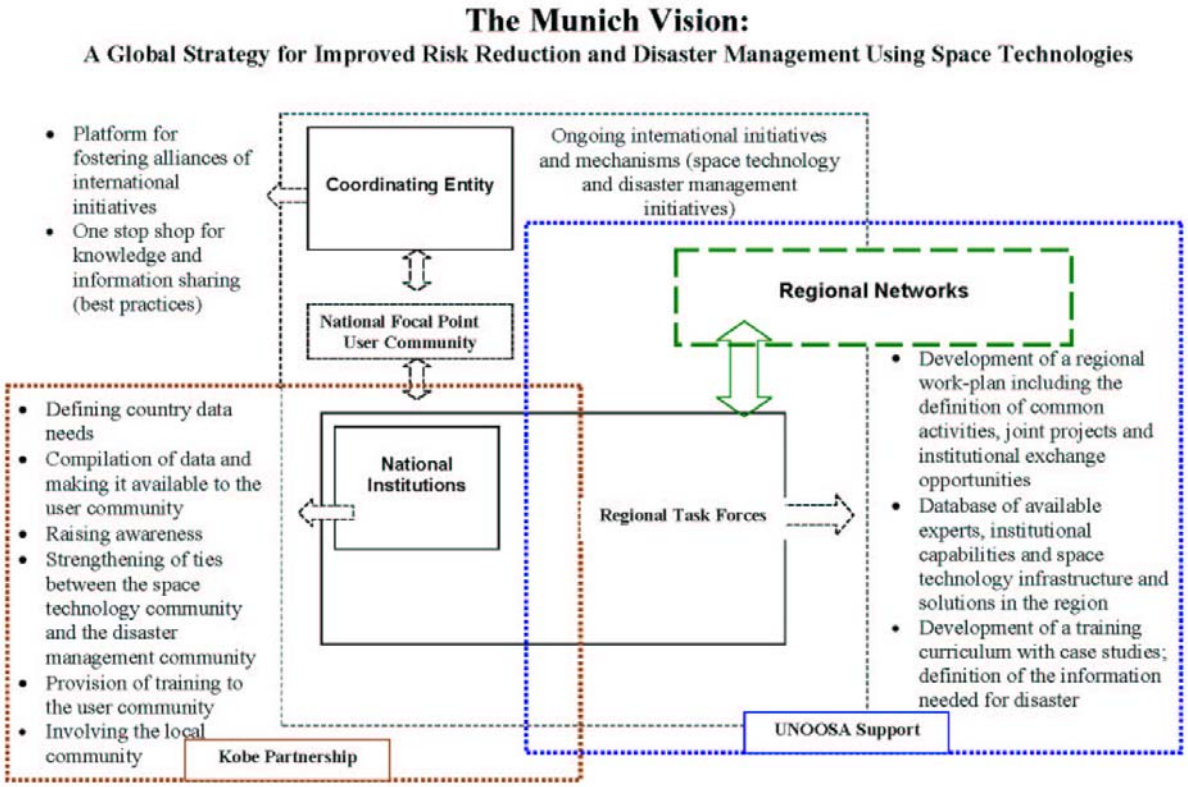
The recognition of this need has led to a number of activities that together have been successfully contributing to helping developing countries access and use space-based technology solutions for disaster management and emergency response, such as, the work carried out by the United Nations Office for Outer Space Affairs, the creation of the International Charter Space and Major Disasters, and the work carried out by COPUOS.

## The Munich Vision

The United Nations Office for Outer Space Affairs organised a series of regional workshops on the use of space technology for disaster management between 2000 and 2004, bringing the results of the regional workshops to a final international workshop, which was held in Munich, Germany, in October 2004. At that meeting, a total of 170 participants from 51 States discussed a global strategy that would contribute to helping developing countries gain access to and be able to use space technology for disaster management, a strategy put forward as "The Munich Vision: a Global Strategy for Improved Risk Reduction and Disaster Management Using Space Technologies" [5].

Participants at the Munich workshop recognized that space-based technologies such as Earth observation satellites, communication satellites, meteorological satellites and GNSS played an important role in risk reduction and disaster management, and put forward a number of recognitions and recommendations in the areas of capacity development and knowledge-building; data access, data availability and information extraction; enhancing

awareness; and national, regional and global coordination. At the global level, participants recognized the importance of and urgent need for a coordination entity, which was envisioned by the workshop participants as a "one-stop shop" for knowledge- and information sharing (best practices) and also as a platform for fostering alliances.




COPUOS

Building upon UNISPACE III, the Committee on the Peaceful Uses of Outer Space at its forty-fourth session agreed to establish action teams composed of interested Member States in order to implement the recommendations agreed to in "The Vienna Declaration". One of the action teams established focused on disaster management. This Action Team on Disaster Management was co-chaired by Canada, China and France, with the United Nations Office for Outer Space Affairs providing substantive assistance and secretariat services. The Action Team brought together 41 Member States and 13 intergovernmental and non-governmental organizations.

In its final report to COPUOS this Action Team made a number of recommendations, including the recommendation that an international space coordination body for disaster management should be established. Its recommendations, including the recommendation to establish such a coordinating body, were included in the report of the Committee on the Peaceful Uses of Outer Space on the five-year review of the implementation of the recommendations of UNISPACE III submitted to the General Assembly at its fifty-ninth session [6].

Recognizing the need for such a coordinating mechanism, in its resolution 59/2 of 20 October 2004 [7], the General Assembly agreed that a study should be conducted on the possibility of creating an international entity to provide for coordination and the means of realistically optimizing the effectiveness of space-based services for use in disaster management and that the study should be prepared by an ad hoc expert group, with experts to be provided by interested Member States and relevant international organizations. The ad hoc expert group was established in February 2005 bringing together experts from 26 Member States and five specialized agencies of the United Nations and non-governmental organizations. This ad hoc expert group finalised its report early 2006 and presented it to COPUOS for its review during its forty-ninth session last June.

Findings and Recommendations of the Ad Hoc Expert Group

The ad hoc expert group identified a number of important space-related initiatives, either ongoing or planned, that could support different phases of disaster management (i.e. risk reduction, prevention, mitigation, early warning, relief and rehabilitation), such as the Global Earth Observation System of Systems – GEOSS, the International Charter "Space and Major Disasters", the Integrated Global Observing Strategy Partnership - IGOS-P, the Global Monitoring for Environment and Security - GMES and Sentinel Asia. A number of additional relevant initiatives such as UNOSAT of the United Nations, RESPOND of the Global Monitoring for Environment and Security, Map Action and Global Map Aid were also identified.

The ad hoc expert group concluded, however, that gaps existed in the awareness of the disaster management community of the availability of such resources, in knowledge of how to access them and in the capacity to use them, also finding that these activities are driven by different mandates, often with a focus on specific disaster phases or types of crisis. There is no single, global coordination mechanism to implement an integrated disaster monitoring system that makes maximum use of available space technologies and services for the full disaster management cycle as called for in "The Space Millennium: Vienna Declaration on Space and Human Development".

The experts concluded that because such a coordination mechanism is needed an entity should be created with the following mission statement: "Strive to ensure that all countries have access to and use all types of space-based information to support the full disaster management cycle". Furthermore, the ad hoc expert group recommended that such an entity be implemented as a programme of the United Nations Office for Outer Space Affairs. The proposed name of the new entity is: "United Nations Platform for Space-based Information for Disaster Management and Emergency Response (SPIDER)."

SPIDER, once implemented, will contribute to ensuring that all countries have access to and use all types of space-based information to support the full disaster management cycle by being a gateway to space information for disaster management support, a bridge that will connect the disaster management and space communities and a facilitator of capacity building and institutional strengthening. Such activities will be carried out by the staff that will be assigned to the United Nations Office for Outer Space Affairs office in Vienna, and to the SPIDER offices to be created in Beijing and Bonn, Germany.

Furthermore SPIDER will work closely with end-users, particularly in developing countries, through the consolidation of a network of regional support offices, building upon the commitments being provided by many countries and thus ensuring that regional and national centres have a strong role in their respective region. Initial commitments to the implementation of SPIDER have already been made by Algeria, Argentina, Austria, China, Germany, India, Italy, Morocco, Nigeria, Romania, the Russian Federation, Switzerland and Turkey. The offers of support include the necessary housing facilities, making professional experts and administrative staff available, support to capacity building activities and technical backstopping, satellite data, and also cash contributions.

COPUOS, during its forty-ninth session, agreed that the proposed Platform should be implemented as a programme of the United Nations Office for Outer Space Affairs under the Director of the Office. This proposal will now be sent to the General Assembly for its review during its sixty-first session. It is expected that once approved by the General Assembly the Platform will initiate activities, as soon as January 2007, enabling the provision of support to disaster management activities.

The Role of National Mapping Organisations

The participants of the Munich workshop summarised in "The Munich Vision" [4] the findings of the series of regional workshops with regard to the availability of data and the importance of spatial data infrastructures for disaster management. The main points the participants agreed on, in this specific area, were the following:

- There are limited mechanisms in place to make data rapidly available at all decision-making levels during disaster response and that when available data are not always in a user-friendly format.
- There is a need for consolidation of national spatial databases and specific thematic databases to support disaster management activities. The content and standards of these national datasets should be defined by a collective effort of all stakeholders, taking into account existing international data standards so as to facilitate the sharing of data.
- A web portal should be set up where users could acquire information on existing data, existing networks of excellence and opportunities for support. The portal should include links to existing initiatives such as the Global Mapping Project, Global Spatial Data Infrastructure and the United Nations Geographic Information Working Group.
- The generally high cost of remotely sensed data and the limited mechanisms in place to facilitate the sharing of data obtained from satellites limits the wider use of this space-based data. Every effort should be made to publicize and disseminate free and low-cost satellite data. Furthermore, satellite operators should make efforts to reduce the cost of imagery to be used for disaster management activities, especially in developing countries.
- There is a great need to develop standards for information extraction from remotely sensed data and disaster mapping procedures. Such standardization would foster better understanding and acceptance of space-based information by civil protection and disaster relief communities.

Several of the activities to be carried out by the SPIDER Platform will contribute to the above recommendations but ultimately the responsibility for carrying out the needed tasks at the local level will fall upon the national institutions that step forward and take charge. The Platform will be a gateway to space information for disaster management support; SPIDER will not make the actual data and information available but the information on where such data can be obtained will be readily available on a 24/7 basis.

The Platform will work closely with National Focal Points (NFPs), to be nominated by each country, in the implementation of risk reduction and emergency response activities and projects identified in conjunction with these NFPs. But ultimately the responsibility to ensure that each country takes advantage of existing space-based technology solutions falls upon the existing relevant national institutions.

These national institutions have to take a lead to ensure:

- Systematic compilation of relevant data and information or information on where such data and information can be obtained.
- Compilation of risk information at the national level by disaster theme (Country Profiles) and the development of national vulnerability assessments.
- Awareness raising and outreach activities contributing to helping end-users understand the importance of incorporating space-based technology solutions in risk reduction and disaster management.
- Consolidation of a knowledge-base – identify and bring together knowledge, practical know-how, expertise and best practices, focusing on capturing and making such knowledge available to all end-users. This includes the refinement of user requirements and definition of best practices.
- Coordination at a national level among relevant national institutions, scientific institutions, organisations implementing and/or providing space-based solutions, humanitarian, environmental and civil protection actors and the space community.

No one in this audience, and particularly this audience, could argue against the strategic importance of spatial data for disaster management and the need for a common data environment that will assist the deployment and wide-use of such data. No one either will deny that National Mapping Organisations (NMOs) are well suited to take on, at the least, the co-leading role in the implementation of the above tasks, for traditionally they already have had a continuing role centred on the establishment of data standards and integrated data provision [8].

NMOs have to be proactive though. The traditional arena is fast changing and today a convergence of factors is contributing to this upheaval. It has been many years now since NMOs were the only institution responsible for data collection, data custodian and even data retailer, and nowadays anyone with a PC and an Internet connection can become a cartographer: courtesy of Google Earth and other converging technologies.

In fact with so many changes and so many new players, including an increasing presence of the private sector, NMOs have a moral obligation to step forward and ensure the existence of not only a much needed regulatory structure, contributing to consistent and legitimate use of spatial data, but also that end users have the needed help to deal with the bigger

hidden issues of spatial data such as privacy, confidentiality, access rights, intellectual property, and community participation, among others.

Geospatial information is being made available at an increasing rate to support end users of the disaster management and emergency response community. New initiatives are being implemented that target specific hazards or steps of the disaster management cycle. In 2007 a global coordination mechanism, the SPIDER Platform, will begin working on bringing the end user closer to the space-based solutions being made available. But ultimately the day-to-day help these end users need to be able to understand such solutions and incorporate them in their disaster management activities will come from institutions that are in the best strategic position to provide such support, such as the National Mapping Organisations.

## References


[1] See Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999 (A/CONF.184/6) - http://www.unoosa.org/oosa/en/unisp-3/index.html
[2] See The Space Millennium: Vienna Declaration on Space and Human Development (Vienna Declaration) - http://www.unoosa.org/pdf/reports/unispace/viennadeclE.pdf
[3] See Report of the World Conference on Disaster Reduction (A/CONF.206/6), which contains the Hyogo Framework for Action 2005-2015:Building, the Resilience of Nations and Communities to Disasters - http://www.unisdr.org/eng/hfa/docs/Final-report-conference.pdf
[4] See Report Review of the Yokohama Strategy and Plan of Action for a Safer World (A/CONF.206/L.1), specifically paragraphs 89 and 92 - http://www.unisdr.org/wcdr/intergover/official-doc/L-docs/Yokohama-Strategy-English.pdf
[5] See Report of the United Nations International Workshop on the Use of Space Technology for Disaster Management, Munich, 18-22 October 2004 (A/AC.105/837) - http://www.unoosa.org/oosa/en/docsidx.html
[6] See Report of the Review of the Implementation of the Recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (A/59/174) - http://www.unoosa.org/oosa/en/unisp-3/index.html
[7] See Resolution A/RES/59/002 adopted on 20/10/04 Review of the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space - http://www.unoosa.org/oosa/en/SpaceLaw/gares/index.html
[8] See D. Rhind (ed) 1997. Framework for the World. Cambridge: Geoinformation International


## Abbreviations, Acronyms and Relevant Websites

CNES – French Space Agency (Centre National d'Études Spatiales) - http://www.cnes.fr/
CONAE - National Commission for Space Activities of Argentina (Comision Nacional de Actividades Espaciales) - http://www.conae.gov.ar/
COPUOS - Committee on the Peaceful Uses of Outer Space - http://www.unoosa.org/oosa/en/COPUOS/copuos.html

CSA - Canadian Space Agency - http://www.space.gc.ca/
DMC - Disaster Monitoring Constellation - http://www.dmcii.com/
ESA – European Space Agency - http://www.esa.int/
GEOSS - Global Earth Observation System of Systems - http://www.earthobservations.org/
GIS – Geographical Information System - http://www.gis.com/whatisgis/
GMES - Global Monitoring for Environment and Security - http://www.gmes.info/
GNSS – Global Navigation Satellite System
ICA – International Cartographic Association - http://www.icaci.org/
IGOS-P - Integrated Global Observing Strategy Partnership - http://www.igospartners.org/index.htm
ISCGM – International Steering Committee for Global Mapping - http://www.iscgm.org/
ISDR – United Nations International Strategy for Disaster Reduction - http://www.unisdr.org
ISRO - Indian Space Research Organization - http://www.isro.org/
JAXA - Japan Aerospace Exploration Agency - http://www.jaxa.jp/index_e.html
NOAA - National Oceanic and Atmospheric Administration - http://www.noaa.gov/
PCGIAP – Permanent Committee on GIS Infrastructure for Asia & the Pacific - http://www.gsi.go.jp/PCGIAP/
RESPOND - GMES Services Supporting Humanitarian Relief, Disaster Reduction and Reconstruction - http://www.respond-int.org/Respond/index.html
SPIDER - United Nations Platform for Space-based Information for Disaster Management and Emergency Response
UNISPACE III - Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space - http://www.unoosa.org/oosa/en/unisp-3/index.html
UNOOSA – United Nations Office for Outer Space Affairs – http://www.unoosa.org
UNRCC – AP - United Nations Regional Cartographic Conference for Asia and the Pacific
USGS - United States Geological Survey - http://www.usgs.gov/

**Biography of the Presenter**

David Stevens is a Programme Officer of UNOOSA where he is responsible for promoting the use of space technology for disaster management and complex emergencies in developing countries. His area of expertise is the use of geo-spatial information solutions to support development activities. His home country is Brazil where he first graduated in engineering (B.Sc.) and environmental planning (M.Sc.) at the University of São Paulo, before carrying out his doctoral research at the University of Maryland College Park on the impact of decision support systems on regional planning in developing countries. He joined the UN in 1999 having been assigned to his current position in 2001.

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