SPACE SECURITY: THE NEED TO SAFEGUARD OUTER SPACE FOR THE NEXT GENERATION

Yvette Stevens

INTRODUCTION

The use of space applications, such as for remote sensing, communications and global positioning systems, has increasingly facilitated the activities aimed at the achievement of UN goals and targets, and there is great potential for their more widespread use. In fact, it can be argued that many of these goals cannot be reached in the near future without the use of space applications. As their usefulness becomes more and more appreciated, it is clear that concern in safeguarding space technology becomes paramount, not only to the scientific and military communities, but to humanitarian workers and development practitioners.

I will here review current uses of space applications of relevance to the implementation of Agenda 21,[1] the Hyogo Framework for Action[2] as well as to meeting the Millennium Development Goals,[3] three mutually dependent areas of UN work. In addition, I will examine their existing and potential uses in meeting these goals, and highlight the challenges of the next generation. Furthermore, I will describe in brief established UN programmes and initiatives set up to promulgate space applications. Finally, I will examine the risks to space technology that would hamper their applications and hence their use in addressing the universally declared problems facing the planet.

SPACE TECHNOLOGY AND ITS APPLICATIONS

Satellite remote sensing can be used to monitor land surface, oceans and the atmosphere. Most of these satellites provide global coverage hence provide the possibility of observing global phenomena. They represent a fast, repetitive, consistent, accurate and cost-effective means of observing global phenomena from outer space.

Published in *Security in Space: The Next Generation—Conference Report, 31 March–1 April 2008*, United Nations Institute for Disarmament Research (UNIDIR), 2008.

Perhaps the most widespread civilian use of space technology is in telecommunications. Communications satellites can reach people in remote places and, together with ground-based networks, provide access to the World Wide Web. They are thus potential sources of information, not only for urban dwellers, but for rural and remote areas.

Global Navigation Satellite Systems are based on a constellation of Earth-orbiting spacecraft. Suitable receiver equipment combines the signals from at least four spacecraft, yielding the time and three space coordinates, enabling it to determine its location, speed and direction. When used in conjunction with remote sensing and Global Information Systems, satellite navigation has wide potential applications in many fields. These could include location-based services and emergency calls; road, rail and air transport; maritime, inland motorway and fisheries navigation, site surveying, civil protection, emergency management and humanitarian aid; dangerous goods; livestock transport and feedstock management; agriculture, parcel measurement, geodesy and cadastral survey; energy, oil and gas and biogas production; search and rescue services; as well as a wide range of other applications, including in logistics, the environment, science and the maintenance of public order.

A combination of these Earth-observation systems is indispensable to the achievement of the Millennium Development Goals and other UN goals.

USE OF SPACE TECHNOLOGY IN THE ACHIEVEMENT OF UN GOALS

It has now become increasingly clear that unless drastic measures are taken to address current and potential problems facing the world, future generations will suffer severely. To address this and other concerns, the United Nations has developed, over the years, a number of goals, which could lead to addressing the major problems facing mankind and provide safeguards for the next generation. Many of these are interrelated and, for the purpose of this chapter, three sets of goals are included. These are:

- protecting the Earth's environment and natural resources management (Agenda 21);
- disaster risk reduction (Hyogo Framework for Action: Building the Resilience of Nations); and
- the Millennium Development Goals.

PROTECTING THE EARTH'S ENVIRONMENT AND NATURAL RESOURCES MANAGEMENT (AGENDA 21)

The environmental goals, as elaborated in Agenda 21, are:

- protection of the atmosphere;
- planning and management of land resources;
- combating deforestation;
- combating drought and desertification;
- sustainable mountain development;
- promoting sustainable agriculture and rural development;
- conservation of biological diversity;
- management of biotechnology;
- protection of oceans and seas;
- management and protection of fresh water resources; and
- management of toxic chemicals, hazardous, solid and radioactive wastes.

Satellite applications for protecting the environment and natural resources management include the monitoring of land cover and land use; monitoring environmental degradation (particularly useful in remote and difficult-to-access areas, and for areas undergoing rapid environmental change); measuring the environmental impact of disasters and wars and assessing impacts of pollution, from depletion of the ozone layer to tracing oil spills and photochemical smog.

DISASTER RISK REDUCTION (HYOGO FRAMEWORK FOR ACTION)

The priorities of the Hyogo Framework for Action are:

- ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation;
- identify, assess and monitor disaster risks and enhance early warning;
- use knowledge, innovation and education to build a culture of safety and resilience at all levels;
- reduce the underlying risk factors; and

- strengthen disaster preparedness for effective response at all levels.

As the incidence of disasters caused by natural hazards increases, the use of satellite applications in disaster risk reduction is receiving more and more attention. First and foremost, through the use of satellite communications it is now possible to spread information and launch campaigns on disaster risk reduction to the most remote areas. In addition, Disaster Early Warning Systems, which depend on Earth observation systems, are more systematically used to forecast disasters well in advance, thus allowing for better response to save life and livelihoods.

After a disaster has struck, satellite imagery is used for search and rescue operations, as well as to assess the damage caused. Planning the logistics to reach populations in the most remote locations following a disaster is often complicated and satellite imagery has been invaluable in situations such as the Himalayas following the 2005 Pakistan earthquake. Space information is also important in the recovery phase after a disaster, in identifying the requirements and in planning recovery activities.

In the case of slow-onset disasters such as droughts, satellite technology provides the environmental and agricultural indicators that are essential in mapping risks and in preparing adequately for any impending disaster.

THE MILLENNIUM DEVELOPMENT GOALS

The Millennium Development Goals (MDGs), which were adopted following the Millennium Summit in 2000, wrap up all of the development targets that were reached at various United Nations Global Conferences in the 1990s. These eight goals are:

- eradicate extreme poverty and hunger;
- achieve universal primary education;
- promote gender equality and empower women;
- reduce child mortality;
- improve maternal health;
- combat HIV/AIDS, malaria and other diseases;
- ensure environmental sustainability; and
- develop a Global Partnership for Development.

In addition to the satellite applications given above, a particular reference needs to be made to a number of crucial applications that are currently utilized, or which hold the promise of facilitating the achievements of the MDGs.

Agriculture plays a crucial role in the eradication of poverty and hunger in the world. Satellite technology has been used to monitor and forecast weather for farmers and to monitoring crop development to help predict agricultural outputs in advance. Such information is crucial in assessing vulnerability and managing food security. Satellite imagery can also assist in identifying areas at risk from natural phenomena, locusts for example, thus providing valuable information that can be used in undertaking remedial action.

In the fields of education and health, satellite communications can be used to reach the most remote areas for distance education, as well as for monitoring public health and providing tele-health services.

SOME UN PROGRAMMES AND ACTIVITIES TO PROMOTE THE USE OF SATELLITE APPLICATIONS

United Nations entities such as the Food and Agricultural Organization (FAO), the United Nations Environment Programme (UNEP) and the World Food Programme (WFP) have for some time now worked with governments and non-governmental actors to strengthen information systems to mange disasters. One example of this is the FAO/UNEP Global Land Cover Network, which provides reliable baseline land-cover data.

The World Meteorological Organization (WMO) Space Programme coordinates environmental satellite matters and activities throughout all WMO Programmes and provides guidance on the potential of remote-sensing techniques in meteorology, hydrology and related disciplines and applications.

The United Nations Institute for Training and Research (UNITAR) Operational Satellite Applications Programme (UNOSAT), created in 2001 and implemented in cooperation with the UN Office for Project Services (UNOPS) and the European Organization of High Energy Physics (CERN), is a people-centred programme that delivers integrated satellite-based

solutions for human security, peace and socio-economic development, in keeping with the mandate given to UNITAR by the UN General Assembly since 1965, and relying on the flexibility and result-oriented management capability of UNOPS. UNOSAT has in recent years played a key role in responding to major disasters, such as the Indian Ocean tsunami and the Pakistan earthquake.

Under the UN Programme on Space Applications, the United Nations Office for Space Affairs (UNOOSA) aims at providing the expertise required to ensure the full use of the potential of space technology, particularly in developing countries. It conducts international workshops, training courses and pilot projects on topics that include remote sensing, satellite navigation, satellite meteorology, tele-education and basic space sciences for the benefit of developing nations.

In 2006, the UN General Assembly agreed on the establishment of the UN Platform for Space-Based Information for Disaster Management and Emergency Response (UN-SPIDER). This programme focuses on the need to ensure access to and use of such solutions during all phases of a disaster, including the risk-reduction phase which will significantly contribute to reducing loss of lives, livelihoods and property.

The UN-SPIDER programme hopes to achieve this by being a gateway to space information for disaster management support, by serving as a bridge to connect the disaster management and space communities and by being a facilitator of capacity-building and institutional strengthening, in particular for developing countries. UN-SPIDER will be implemented as an open network of providers of space-based solutions to support disaster management activities.

UNOOSA also serves as the Secretariat for the International Committee on Global Navigation Satellite Systems**,** an international forum established in 2006 (with recognition from the UN General Assembly) to discuss cooperation on Global Navigation Satellite Systems and to promote the applications of such systems to maximize their benefits to people around the world.

CHALLENGES OF THE NEXT GENERATION

Although there has been some progress in reaching the MDGs, a lot more needs to be done. Repeated conferences and reviews have noted that the goals are not going to be met within the set timeframes. For instance, the Secretary-General's Report on Africa to the 2007 General Assembly[4] notes, at the mid-point of the 2015 target, "the unfortunate reality that most African countries are off track in meeting most, if not all, of the Millennium Development Goals". It is clear that, while the reasons for this are varied, increasing the access to space applications could help in removing some obstacles.

The task is made even more difficult as a result of a number of challenges that are now apparent. Population growth in poor countries as well as the impacts of climate change (competition for increasingly scarce resources, more frequent and severe droughts and floods in some parts of the world, as well as increasing sea levels threatening small islands) are all bound to make the tasks of meeting these goals more difficult. No efforts should thus be spared in using all the tools at the disposal of the international community to the fullest to safeguard the planet for the next generation.

It is clear that space technology is vital to address the challenges of the next generation, and should be promoted to ensure its contribution to the achievements of United Nations goals.

RISKS FACING SPACE APPLICATIONS

A number of threats to the existence of space systems have been identified. First and foremost is the proliferation of space objects. The total number of space objects registered in accordance with the Registration Convention of 1974 is 12,400, of which 6,000 are still orbiting the Earth. As the number of space objects increases, there would be threats from collision unless basic "rules of the road" are instituted.

In addition, there are risks from space debris. Space debris includes the objects in orbit created by humans, that no longer serve any useful purpose. They consist of everything from entire spent rocket stages and defunct satellites to explosion fragments, paint flakes, dust, and slag from solid rocket motors, coolant released by nuclear-powered satellites as well as needles

and other small particles. There are more than 600,000 objects larger than 1cm in orbit (according to the European Space Agency Meteoroid and Space Debris Terrestrial Environment Reference, the MASTER-2005 model). Once again, there is the risk of collision with orbiting satellites and there have been a number of near misses over the years. There is a need to more comprehensively address the problem of space debris to avoid serious damage to satellites.

Furthermore, there is the question of the weaponization of outer space. This could lead to an arms race in outer space that would threaten satellites with civilian applications. Finally, deliberate attacks on satellites could also pose a threat.

For the humanitarian and development communities that are increasingly dependent on the use of space technology to achieve the MDGs, any threats to space systems that would adversely affect their use are most undesirable.

CONCLUDING REMARKS

I would like to note that "security" should be defined in a broader context to include not only military security, but human security, which would imply consideration of global goals for improving the standard of living on Earth—this should guide future activities in outer space.

I have presented the case for appreciating the current and potential uses of space applications in addressing problems on Earth. Any action which hampers the ability to exploit the vast resources provided by space technology would impede the achievements of global goals.

Notes

[1] Agenda 21, the Rio Declaration on Environment and Development, and the Statement of principles for the Sustainable Management of Forests were adopted by more than 178 governments at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil, 3–14 June 1992.

[2] The World Conference on Disaster Reduction was held on 18–22 January 2005 in Kobe, Hyogo, Japan, and adopted the present Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters. The conference provided a unique opportunity to promote a strategic and systematic approach to reducing vulnerabilities and risks to hazards. It underscored the need for, and identified ways of, building the resilience of nations and communities to disasters.

[3] The Millennium Development Goals are eight goals that 189 UN Member States have agreed to try to achieve by the year 2015. The Millennium Development Goals derive from earlier international development goals, and were officially established at the Millennium Summit in 2000, where 189 world leaders adopted the United Nations Millennium Declaration.

[4] General Assembly, *New Partnership for Africa's Development: fifth consolidated report on progress in implementation and international support, Report of the Secretary-General*, UN document A/62/203, 3 August 2007.