UNITED NATIONS
Office for Outer Space Affairs
UN-SPIDER
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NEWSLETTER

February 2014 Vol. 1/14

In Focus

Space Technologies in the UN - Global Views for Global Challenges

Destruction and inundation in the town of Rikuzentakata, Japan, after the tsunami on 11 March 2011 - captured by NASA's Terra satellite

Disasters triggered by natural hazards such as floods, droughts, storms or fires affect millions of people every year and result in billions of dollars in economic losses. The United Nations therefore works to improve its Member States' capacities to reduce disaster risks, to foster resilience and to respond effectively to such disasters.

Space technologies play an important role in this context and contribute to sustainable development as the UN declaration paving the way to the post-2015 development framework "The future we want" explicitly points out. These technologies can cover large areas at once regardless of borders or weather conditions and allow for precise positioning or tele-communications in emergency situations. Therefore, United Nations agencies, departments and programmes all over the world labour to make these resources available to all countries.

In its role as a gateway to space-based information, UN-SPIDER compiled this newsletter to highlight some examples of how and why space technologies are used by the United Nations in the context of disasters. For example, FAO uses satellite-derived information to estimate how badly a drought will affect agricultural production. UNESCO-IOC coordinates the establishment and operation of tsunami early warning systems to warn those at risk and to assess exposed communities using satellite communications and satellite imagery.

It is especially challenging for developing countries to access and effectively use space technologies due to a lack of funding, a lack of awareness or a lack of staff with the necessary skills. Capacity building and institutional strengthening are therefore at the core of numerous United Nations efforts, such as in the cases of ECA and ESCAP.

These case studies are examples of the extremely valuable work carried out throughout the entire UN system, not only by the agencies mentioned in this publication, but also by UNOSAT/UNITAR, UNEP, WMO, WFP, WHO, UNU, and others. In order to streamline the use of geospatial information in the UN and to foster inter-agency coordination and collaboration, UN experts furthermore join forces in the United Nations Geographical Information Working Group (UNGIWG).

In this issue

ESCAP: Building Disaster Resilience in Asia and the Pacific with Space Applications

The Asia-Pacific region is the most disaster-prone region of the world. It continually faces multiple shocks, transcending geographical boundaries and endangering communities and livelihoods. Building resilience to multiple shocks is therefore one of the most pressing challenges for policymakers in the region.

The flagship publication of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) entitled "Building Resilience to Natural Disasters and Major Economic Crises" indicated that a more comprehensive and systemic approach to building resilience was needed. ESCAP then presented a regional roadmap at the 69th Commission session of ESCAP.

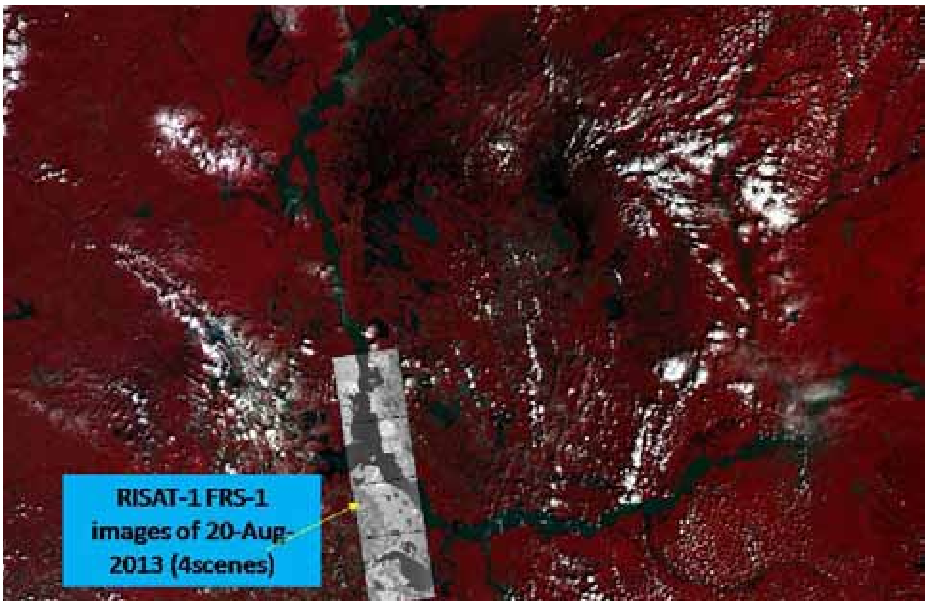
The Commission has taken many steps to address the challenges of building resilience in multi-dimensional ways. For example, ESCAP has taken the lead at the regional level to strengthen regional cooperation mechanisms and to implement the historical "Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012-2017".

As a way to promote the use of space technology and GIS in disaster risk reduction, ESCAP has provided in the last two years more than 150 near real-time satellite images and damage maps to countries affected by severe disasters. These maps were provided in the framework of ESCAP's long standing Space Application Programme for Sustainable Development (RESAP).

The flagship project under RESAP is the Regional Mechanism for Drought Monitoring and Early Warning. ESCAP will facilitate the provision of space-based data, products, and services generated by the regional service nodes in China and India, and will strengthen capacities of Member States to address agricultural droughts. The Mechanism is operational in five pilot countries (Mongolia, Sri Lanka, Cambodia, Nepal, and Myanmar) and it will extend the service to Central Asia.

Moreover, ESCAP's Space Application Programme gives high priority to capacity building in developing countries. Approximately 380 policymakers and practioners from more than 30 Member States were enabled to effectively use space and GIS applications. Additionally, ESCAP has conducted research and policy analysis of emerging needs and challenges based on a regional inventory of space technology application capabilities in Asia and the Pacific region.

Technical advisory service provided to the National Remote Sensing Center of Mongolia in 2013



Floods in China in 2013 captured by the Indian Radarsat satellite

Conscious of the "One UN" spirit, ESCAP is delivering these activities in close collaboration with UNOSAT, UN-SPIDER, UNDP, and UNISDR, as well as with regional initiatives such as the Asia-Pacific Space Cooperation Organization, Sentinel Asia, the Centre for Space Science and Technology Education in Asia and the Pacific, the Applied Geoscience and Technology Division of the Secretariat of the Pacific Community, the Asian Institute of Technology and the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia.

On a final note, building resilience requires urgent attention. It is imperative that policymakers, communities and the private sector work together to weave resilience into economic, social and environmental policies. As the regional arm of the United Nations, ESCAP provides a multilateral platform to share knowledge, to engage in policy dialogue and to build consensus towards the goal of achieving inclusive, sustainable and resilient development in Asia and the Pacific.

Learn more:
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Case Study

ECA: Promoting Geospatial Data for Disaster Prevention, Preparedness and Monitoring in Africa

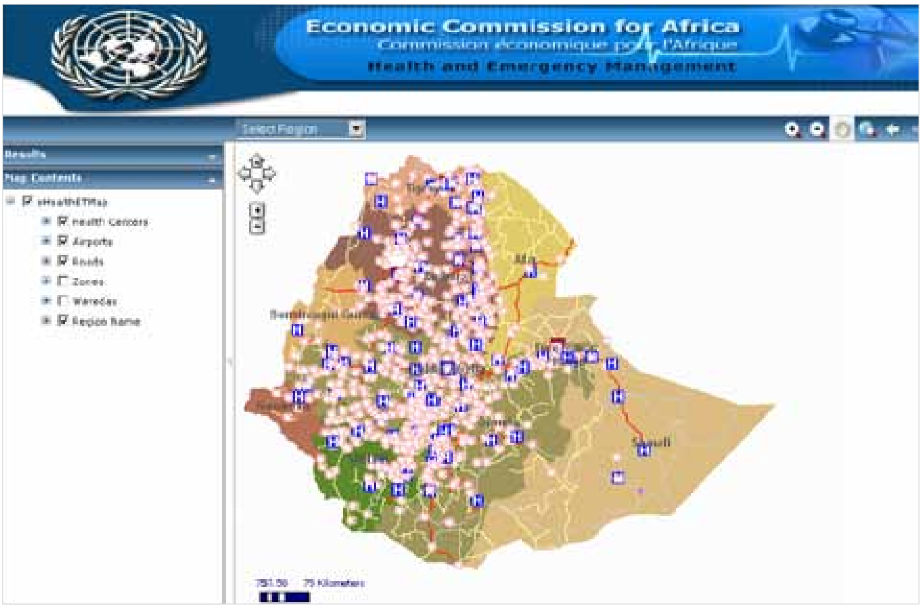
Africa is one of the regions most affected by disasters triggered by natural hazards. African countries are especially prone to events such as droughts, floods, landslides, volcanic eruptions and earthquakes impacting the economic development of nations and affecting the lives of people as well as their livelihoods. Events like droughts and floods are recurrent phenomena.

While some disasters cannot be avoided or prevented, their impact can be reduced or mitigated if relevant information and planning is in place. Information and Communication Technologies (ICTs) are vital to effective management of all phases of the disaster management cycle.

ICTs can be widely used to collect data and information to manage logistics during emergencies as well as to model and forecast disaster events. They help in developing knowledge and decision support tools for early warning, mitigation and response planning. Finally, ICTs also support the dissemination of information particularly for the communities at risk and for emergency responders.

Space-based technologies such as remote sensing, navigation systems, and satellite communications are key technologies for disaster risk management. Unfortunately, Africa still lacks capacities to use these systems for prevention, preparedness and monitoring of disasters.

The Geoinformation Systems and Sectoral Statistics Section of the United Nations Economic Commission for Africa (ECA) has long been promoting the use of space-based technologies and geospatial information in Africa. A part of ECA's efforts is focused on developing individual and infrastructural capacities, strengthening enabling environments across the continent, facilitating and promoting cooperation and networking, building spatial data infrastructures, and encouraging countries to incorporate disaster risk reduction into their national policies. In doing so, ECA focuses on the areas of data, capacity building and policies.



E-health System developed by ECA using geospatial data

In the area of data, ECA has been developing authoritative geodatabases to meet different development goals. Among them are

- an e-health database to support preparedness, planning and operations for security and health-related emergencies and
- a climate change database to assess the impact of climate change, to measure the level of risk in vulnerable zones, and to map vulnerability in Africa.

With regard to capacity building, ECA has conducted different activities related to disaster risk management. For example, a seminar on "The Use of ICT for Disaster Risk Management and Climate Change Mitigation" was organized in Ethiopia in March 2013 to create awareness on disaster risk management and climate change mitigation among policymakers and to encourage countries to incorporate disaster risk reduction into their national policies. The workshop's participants resolved that governments must put in place policies on open data for accessibility and usability of disaster information.

In the policy sector, ECA has been providing assistance in the formulation and implementation of spatial data infrastructures as the appropriate mechanism for the production, management, dissemination, and use of spatial data and information products at the regional and national level for sustainable development.

Furthermore, ECA undertook and participated in various advisory missions. In particular, it has partnered with UN-SPIDER to carry out a Technical Advisory Mission to Malawi in October 2013. The aim of this mission was to assess the country's national capacity and existing policies and activities to use space-based technologies and space-based information for disaster risk reduction, disaster risk management and emergency response.

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Case Study

FAO: Watching Agricultural Drought Worldwide - from Space

In the framework of the EU/FAO Improved Global Governance for Hunger Reduction Programme, the Food and Agriculture Organization of the United Nations (FAO) is developing the Agriculture Stress Index System (ASIS) to detect agricultural areas with a high likelihood of water stress (drought) at the global level. Based on Earth Observations, ASIS will support the vegetation monitoring activities of the FAO-Global Information and Early Warning System (GIEWS).

The idea behind ASIS is to mimic the analysis that a remote sensing expert would do and simplify the results for the end-users. ASIS will provide a map every ten days in which the GIEWS officers detect "hot spots" for every region where crops may be affected by drought during the growth season. To ensure that the system will not produce false alerts due to external factors such as atmospheric perturbations, the officers then verify the "hot spots" with auxiliary information, for example by contacting the Ministry of Agriculture of the affected country or by monitoring prices of the commodities.

ASIS uses the Vegetation Health Index (VHI), which is derived from the Normalized Differenced Vegetation Index (NDVI). VHI was developed at the United States National Environmental Satellite, Data and Information Service (NESDIS) and has successfully been applied in many different environmental conditions around the globe, including in Asia, Africa, Europe, North America and South America.

The first step in ASIS is to elaborate a temporal average of the VHI assessing the intensity and duration of the dry period(s) occurred during the crop cycle at pixel level. ASIS is based on ten-day (called a "dekad") satellite data of vegetation and land surface temperature from the METOP-AVHRR sensor at 1 km resolution.

The second step is the calculation of the percentage of agricultural area affected by drought (pixels with VHI<35 – a value identified as critical in previous studies) to assess the extent of the drought. Finally, the whole administrative area is classified according to the percentage of affected area.

VHI can detect drought conditions at any time of the year. For agriculture, however, the most interesting period is the one most sensitive for crop growth (temporal integration), so the analysis is performed only between the start and end of the crop season. ASIS assesses the severity (intensity, duration and spatial extent) of the agricultural drought and indicates the final results at administrative level given the possibility to compare it with the agricultural statistics of the country.

Since METOP imagery is only available for 2007 or later, the Flemish Institute for Technological Research (VITO), FAO's partner in scientific and technical development, simulated METOP data into the NOAA-AVHRR time series through an "inter-calibration" study to obtain a time series from 1984 to 2013. The ASIS database thus contains 30 years of agricultural hot spots, starting with the year 1984 when the Sahel was severely affected by drought. The most affected year by drought of the time series is 1989 when most of the agricultural land suffered from water scarcity. At the end of the first ten day-period of 2014 the most significant hot spots of the main crop season 2013/2014 were detected in Argentina, Brazil, Madagascar, Mozambique, and Tanzania. For example, in Argentina, the main season of maize was severely affected by drought and high temperatures.

From the global version of ASIS, which was designed to detect agricultural hot spots on the globe, standalone versions can be developed to monitor agricultural drought at country or regional level. The standalone versions would be calibrated with local agricultural statistics and they would use specific parameters, coefficients and masks of the main crops of the country or region. ASIS will become operational and accessible on the GIEWS website in February 2014.

Learn more:
www.fao.org/climatechange/asis/en
www.fao.org/giews/english
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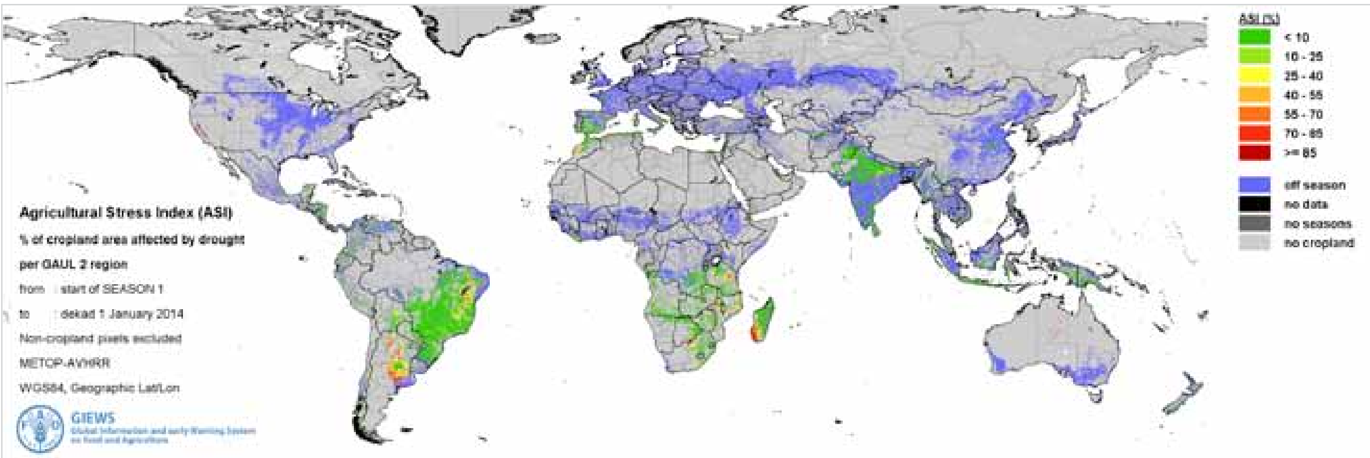

ASIS shows agricultural areas with a high likelihood of water stress (red areas) of the first ten day-period of January 2014

UNESCO-IOC: Sharing Sea Level Data for Tsunami Warnings via Satellites

It is well known: no single country can develop a basin-wide tsunami warning system. Therefore, the United Nations plays a major role in coordinating regional tsunami warning systems, and in ensuring that national capacities are strengthened to prepare for and cope with tsunamis.

Since 1965, the UNESCO Intergovernmental Oceanographic Commission (IOC) has been responsible for the coordination of the Pacific tsunami warning system.

The Indian Ocean tsunami in 2004 gave renewed impetus to establish early warning systems worldwide, and the IOC was given the mandate to pursue this objective. On 12 October 2011, the tsunami early warning system for the Indian Ocean was launched, after approximately six years of development work. Similar warning systems are currently being developed in the Caribbean, the North East Atlantic, the Mediterranean and connected seas.

These regional tsunami warning systems are complete end-to-end warning systems, involving advanced technology for data sharing as well as comprehensive learning activities to teach coastal populations about tsunami danger and appropriate response. UNESCO-IOC helps professionals and populations to better anticipate the risks, to assess possible flooding and to coordinate monitoring. Several components of these end-to-end systems involve the use of satellite technologies, for example for hazard assessment and for warning dissemination.

It is perhaps not that widely known that there are many sea level measuring stations around the world that transmit their observations every few minutes through several public geostationary satellites. From the ground receiving stations this data is flowing via the Global Tele-communication System of the World Meteorological Organization into the information systems and large screens of dozens of sea level institutions, national tsunami warning centers, regional tsunami service providers, and international tsunami alerting centers in all basins.

With its Sea Level Station Monitoring Facility, the IOC provides an additional service to make this data available. Through this Facility, hosted by the Flanders Marine Institute (Belgium), the public and operators can access all the information they need with one click in order to monitor sea level variations in real time - be it for tsunami, storm surges, operational ocean forecasting or other purposes.

Sea Level Station installed by IOC in December 2013 in Jacmel, Haiti

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Geospatial Information in the UN: The United Nations Geographical Information Working Group (UNGIWG)

The United Nations Geographical Information Working Group (UNGIWG) is a voluntary network of United Nations professionals working in the fields of cartography and geographic information science. It was formed in 2000.

The purpose of the Working Group is to address common geospatial issues that affect the work of UN Organizations and Member States, such as maps, boundaries, data exchange or standards. Furthermore, UNGIWG also drives the development of the UN Spatial Data Infrastructure (UNSDI).

UNGIWG aims to:

- Improve the efficient use of geographic information for better decision-making;
- Promote standards and norms for maps and other geospatial information;
- Develop core geospatial data to avoid duplication;
- Build mechanisms to share, to maintain and to assure the quality of geographic information;
- Provide a forum to discuss common issues and emerging technological advances.

The14th Plenary Meeting of UNGIWG will be held in New York from 14 to 16 May 2014, hosted by the Co-Chairs, the UN Department of Safety and Security (UNDSS) and the United Nations Office for Outer Space Affairs (OOSA).

Learn more: *www.ungiwg.org*

Participants of the 13th UNGIWG Plenary Meeting in 2013 in Istanbul, Turkey

Space Technologies in the post-2015 Framework

The role of space technology is acknowledged in the work of the United Nations Task Team (UNTT). The team was established in September 2011 to support United Nations system-wide preparations for the formulation of the United Nations development agenda beyond 2015. In particular, the task team elaborated a report entitled “Realizing the future we want for all: Report to the Secretary-General” and published it in June 2012.

There are many areas covered in the report, where space-based technologies and data are of crucial importance. For example, paragraph 73 acknowledges that improved scientific understanding and knowledge-sharing on climate change, natural hazards, the space environment, and natural resource limits will be necessary for effective policymaking for sustainable development. Further in the report, paragraph 79 brings to attention the importance of improved access to geographical information and geospatial data as well as the importance of building capacities to use scientific information for more accurate environmental and social impact assessments and more informed decision-making at all levels.

The report serves as a first reference for the broader consultations on the post-2015 development agenda to take place. As a supplement, participating entities of the United Nations System Task Team have prepared a number of “think pieces” on thematic issues central to this report, which are available at www.un.org/millenniumgoals/beyond2015.shtml.

The importance of space-based data, *in situ* monitoring and reliable geospatial information for sustainable development policymaking, programming and project operations was also recognized in the outcome document of the United Nations Conference on Sustainable Development, held in Rio de Janeiro, Brazil, from 20 to 22 June 2012, entitled “The future we want”.

UNITED NATIONS

The United Nations Office for Outer Space Affairs (OOSA) implements the decisions of the General Assembly and of the Committee on the Peaceful Uses of Outer Space and its two Subcommittees, the Scientific and Technical Subcommittee and the Legal Subcommittee. The Office is responsible for promoting international cooperation in the peaceful uses of outer space, and assisting developing countries in using space science and technology. In resolution 61/110 of 14 December 2006 the United Nations General Assembly agreed to establish the “United Nations Platform for Space-based Information for Disaster Management and Emergency Response - UN-SPIDER” as a new United Nations programme to be implemented by OOSA. UN-SPIDER is the first programme of its kind to focus on the need to ensure access to and use of space-based solutions during all phases of the disaster management cycle, including the risk reduction phase which will significantly contribute to the reduction in the loss of lives and property.