Verification highlights

Extreme heat and friendly people: Experiences in establishing IMS stations in Africa

The main activity of the CTBTO Preparatory Commission is the establishment of a global verification regime, which is capable of detecting nuclear explosions underground, underwater and in the atmosphere. As defined in the Treaty, this regime consists of an International Monitoring System supported by an International Data Centre, consultation and clarification mechanisms, on-site inspections and confidence-building measures, all of which must be operational at the Treaty's entry into force.

A TYPICAL FULANI VILLAGE CLOSE TO PS26, TORODI, NIGER

Global IMS station status

The International Monitoring System (IMS) consists of 321 stations employing four different technologies (seismic, hydroacoustic, infrasound and radionuclide), located in 89 countries.

Currently, 205 of these stations are installed and are either certified as part of the IMS or substantially meet specifications. Of these 205 installed stations, approximately 170 are sending data to the International Data Centre in Vienna. An additional 70 stations are either already under construction or under contract negotiation, while another 84 stations and four radionuclide laboratories have contracts for operations and maintenance.

Even as the IMS network reaches completion, much work remains to be done. The Provisional Technical Secretariat (PTS) is moving from a development stage to a mature operational and maintenance stage. By the end of 2007, the PTS expects that over 90 per cent of the IMS network will be completed and sending data to Vienna. ■

Africa is the world's second largest continent. It has a diverse mixture of climatic zones with different ecologies stretching from the Mediterranean Sea in the North to the Cape of Good Hope in the South, from the Red Sea and the Indian Ocean in the East to the Atlantic Ocean in the West. The 38 International Monitoring System (IMS) facilities on the vast continent contribute to the global monitoring of Treaty compliance. The African region with its 53 States and an estimated population of 700 million is a major player in contributing to ensuring the entry into force and the universality of the Comprehensive Nuclear-Test-Ban Treaty.

Due to the extreme weather conditions and the remoteness of some of the IMS stations, site survey and installation works can be a challenging experience for the Provisional Technical Secretariat (PTS) staff. In April 2005, three PTS staff members and 15 contractors and sub-contractors returned from a three weeks mission in Torodi, Niger, where they completed the installation works for primary seismic station PS26, located 55 kilometres southwest from Niamey in the midst of Fulani farm land.

The Fulani are a semi-nomadic people engaging primarily in live stock breeding of cattle, sheep, goats and camels. Initially full-scale nomads, the Fulani in Niger have to rely increasingly

DRILLING OF BOREHOLES AT PS26, TORODI, NIGER, APRIL 2005

PS26 ARRAY ELEMENT ON THE LEFT WITH FULANI HUTS NEARBY

on farming for their livelihood due to the depletion of their herds by desertification. Some of them live in temporary settlements consisting of portable huts made of mud and grass, which they sometimes built as close as 50 metres to the IMS station.

A TEMPERATURE OF NEARLY 50° C WAS REACHED DURING INSTALLATION OF PS26 IN APRIL 2005

The PTS staff enjoyed the friendly interaction with the local population since their first site survey visit in 2001. The work of the PTS team was regularly accompanied by the hammering sound of the Fulani women pounding millet in wooden buckets. Children always gathered on top of the nearby hill to watch the progress of the installation work, waiting eagerly for the distribution of empty water bottles by the PTS staff at the end of the day. With more than 45° Celsius in the shade, the water consumption of the PTS team reached ten litres a day per person.

The 16-element array station at Torodi consists of three concentric rings with a diameter of six kilometres. The sensors are located in 50 metres-deep boreholes, sending their data by radio to a collecting point, from where the data are transmitted via satellite to the National Data Centre at the Institut des Radio-Isotopes in Niamey and further to the International Data Centre (IDC) in Vienna. At present, PS26 is the only seismic array station in Africa; plans for the site preparation of another array station at Luxor, Egypt, are proceeding.

Despite the extreme heat and other adverse conditions, such as collapsing bore holes due to layers of granite and mud, the installation team successfully completed the installation works for PS26 in the foreseen time frame. The station is already transmitting test data in near-real time to Vienna. Once the data is incorporated into the IDC data processing, it will result in a vast improvement of the seismic detection capability globally and in the southern hemisphere.

This mission shows that the PTS staff members sometimes have to deal with unexpected challenges when establishing IMS stations in Africa. However, the friendliness of the local population and their willingness to cooperate with the PTS installation teams have contributed significantly to the steady build-up of the IMS network on the African continent. ■

FULANI WOMAN WITH CHILDREN NEXT TO A PTS FIELD VEHICLE, TORODI, NIGER

Verification highlights

Elaborating the Draft On-Site Inspection Operational Manual

The Operational Manual for On-Site Inspections (OSI) is a Treaty-required document to guide the operation of on-site inspections, which form a component of the CTBT verification regime. Upon entry into force of the Treaty, it will require approval by the initial session of the Conference of the States Parties. Thereafter, the manual will be maintained and updated by the Technical Secretariat (TS), with any further changes to be approved by the Executive Council.

WORKING GROUP B MEETING DISCUSSING THE DRAFT OSI OPERATIONAL MANUAL, VIENNA INTERNATIONAL CENTRE, MAY 2005

The Treaty and the Protocol generically define the scope of the manual. It should cover, *inter alia*, procedures for discharging TS inspection responsibilities, specifications for the use of inspection equipment, procedures for overflights, and specifications for off-site analysis of inspection samples at designated laboratories. Of direct relevance to the manual are OSI procedures and provisions otherwise defined in Article IV, Part D of the Treaty and Part II of the Protocol.

The Preparatory Commission, supported by the Provisional Technical Secretariat (PTS), started work on the draft manual in 1997. The process encompasses three stages: Creation of the initial draft rolling text, first reading of the draft rolling text and the second round process.

The initial draft rolling text of the OSI Operational Manual

States Signatories developed at first an outline of the manual and started the drafting process of an initial draft rolling text. The drafting process of the document, which was designed to contain all potential requirements for both "peace time" and an operational phase of an inspection mission for all key players, proved to be a difficult one.

By 1999, it became clear that a better mechanism was needed to achieve faster progress. Working Group B mandated the OSI Programme Coordinator, Mr. Vitaliy Shchukin, to form a group of Friends of the Programme Coordinator, who, over a period of eighteen months, produced a 670-page document, the Initial Draft Rolling Text of the On-Site Inspection Operational Manual (IDRT). In May 2001, the document was adopted by Working Group B as the common basis for the elaboration of the draft manual by States Signatories.

First reading of the Initial Draft Rolling Text of the On-Site Inpection Operational Manual

In mid-2001, the next stage of the elaboration process of the manual started under the chairmanship of Ambassador Arend Meerburg of the Netherlands, the Working Group B Task Leader for the manual. During this process, comments, amendments and alternative proposals from national delegations were registered. Upon Ambassador Meerburg's retirement in mid-2004, Mr Malcolm Coxhead, Australia, led the Task Group to the end of the first reading of the entire document in February 2005. In May 2005, the Annotated Draft Rolling Text of the On-Site Inspection Operational Manual (ADRT) was issued.

Second round process

In light of the practical requirements of the projected large scale OSI field exercises, the second round process of the draft manual will focus on the continued elaboration of the manual using the Annotated Draft Rolling Text of the On-Site Inspection Operational Manual as its basis. It will further concentrate on the selection and refinement of manual elements for testing and evaluation during field exercises and on the preparation of subsidiary documents. ■

The System-Wide Performance Test SPT1: Where do we stand?

In 2003 the Preparatory Commission of the CTBTO decided to call for a system-wide performance test (SPT1) to measure the performance of the verification system and its component parts. It was determined that the earliest practical opportunity to begin the system-wide testing would be in mid-2004, since by that time about 40% of the stations in the International Monitoring System (IMS) would be able to provide data. By mid-2005, this percentage would exceed 50%, thus yielding a representative sample of the IMS network.

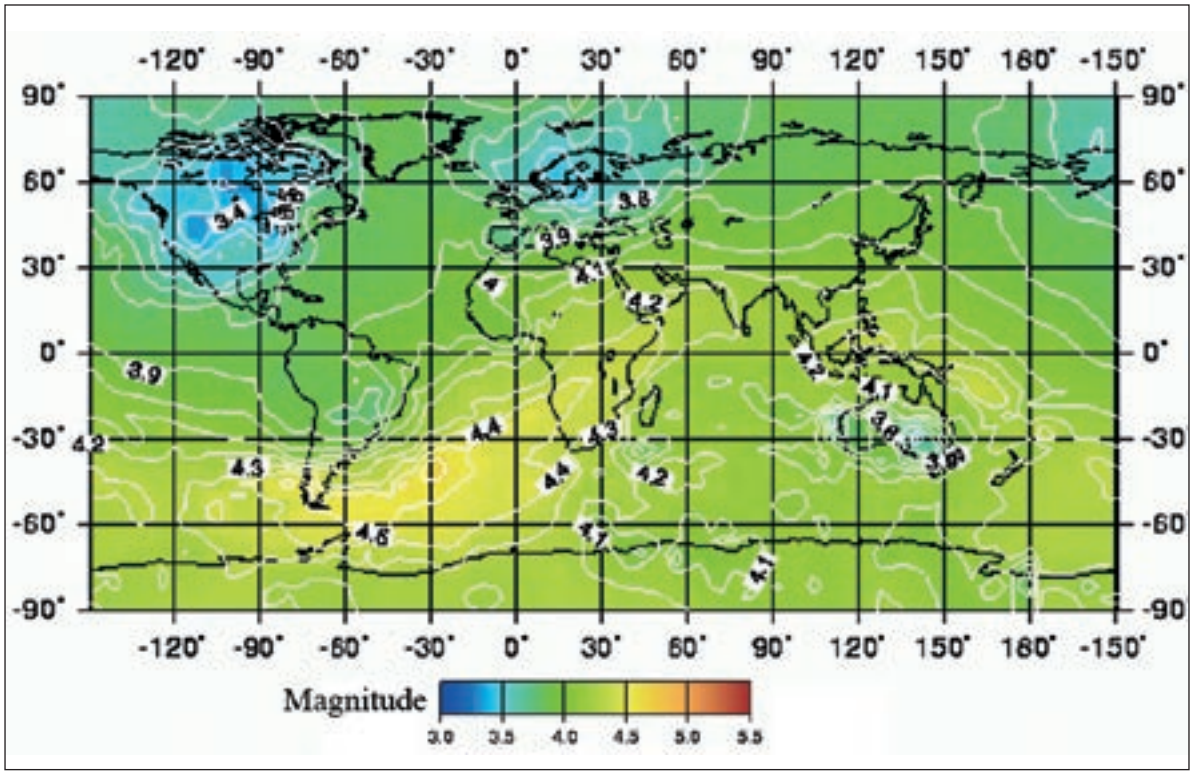
Further considerations and discussions established that SPT1 would be conducted in three progressive stages: A preparatory (developmental) phase of testing in May-June 2004, a performance testing phase in April-June 2005, and an evaluation and reporting phase in the second half of 2005.

The preparatory phase of SPT1 has been successfully completed in 2004. A total of 130 IMS stations and four certified radionuclide laboratories participated in the test. May 2004 was devoted to testing and assessing the procedures and performance metrics to be used during the 2005 performance testing phase. The Provisional Technical Secretariat (PTS) collected performance statistics and established a system-wide performance baseline under the current provisional mode of operation. In June 2004, procedures for the implementation of specific simulated 'failures' of selected system components were tested in order to examine the response of the overall system. The results were presented to Working Group B, at the Operations & Maintenance Workshop in Baden, Austria, in October 2004, and in the technical report summarizing the system baseline performance.

In April 2005, the performance testing phase of the SPT1 started with more than 150 stations in all four verification technologies and five certified radionuclide laboratories participating. During June 2005, 22 test case scenarios were implemented on a controlled basis to analyze the response of the system. This test phase provided the framework and the data for further evaluation and assessment of the verification system, while at the same time contributing to the development of the IMS and International Data Centre Operational Manuals.

The third phase of SPT1, which is scheduled for the second half of 2005, will focus on evaluation and reporting on the performance tests. National Data Centres (NDCs), IMS station operators and radionuclide laboratories are expected to play an active role in this phase, as outlined in the suggested guidelines for the NDC evaluation of SPT1. The NDC Evaluation Workshop, scheduled for the fall of 2005, in Rome, Italy, will provide an excellent platform to present initial results and to obtain feedback for further assessment during the evaluation phase.

The results and the experience gained during SPT1 will be used in technical and budgetary planning and in support of the future development of the verification system. ■



GLOBAL DETECTION CAPABILITY OF IMS PRIMARY SEISMIC NETWORK DURING PREPARATORY PHASE OF SPT1 IN MAY 2004