CTBTO
PREPARATORY COMMISSION

preparatory commission for the comprehensive nuclear-test-ban treaty organization

Annual Report 2013

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Throughout the document, countries are referred to by the names that were in official use in the period for which the text was compiled.

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The map on the back cover shows the approximate locations of International Monitoring System facilities based on information in Annex 1 to the Protocol to the Treaty adjusted, as appropriate, in accordance with proposed alternative locations that have been approved by the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization for reporting to the initial session of the Conference of the States Parties following entry into force of the Treaty.

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Message
from the Executive Secretary

We had a very eventful year in 2013. The year was marked with pressing challenges and promising opportunities. This Annual Report attempts to capture, though very briefly, the remarkable performance of the Preparatory Commission in all areas of its extensive field of operation throughout the period in review.

With the ratification of the Treaty by Brunei Darussalam, Chad, Guinea-Bissau and Iraq, the number of ratifying States rose to 161, surpassing the 160 ratifications milestone. This edged the Treaty closer to universalization.

The Treaty, its entry into force and the work of the Commission received strong political backing. The President of Burkina Faso, HE Blaise Compaoré, addressed the Fortieth Session of the Commission. The seventh Article XIV conference held in New York was an occasion to present a unified, resolute call for early entry into force of the Treaty.

I visited China, Ukraine, the Russian Federation, the United States of America, Angola, Japan, Jordan and France, meeting high ranking officials, including prime ministers and foreign ministers. The message of absolute support that I received during these visits is very heartening. During my visit to China an agreement was reached to ensure the flow of data from the International Monitoring System (IMS) stations located on the territory of the country.

In order to secure additional signatures and ratifications, the Commission liaised with a large number of States as well as with the United Nations and other global and regional organizations. We conducted consultations with senior officials from nearly all States that had not yet ratified or signed the Treaty, including all but one Annex 2 State. In particular, on the margins of the Article XIV conference and the sixty-eighth session of the United Nations General Assembly in New York, I met with the foreign ministers of Angola, Egypt, Japan, Kazakhstan, Lithuania, Romania and Papua New Guinea, as well as the Deputy Prime Minister of Tuvalu and the Deputy Foreign Minister of Iran.

On 26 September, we launched the Group of Eminent Persons in New York. This group comprises a former prime minister, current and former foreign and defence ministers, members of parliament, politicians and diplomats with a wealth of international expertise and experience. Their political and social reach can certainly assist us in promoting the Treaty, broadening contacts and strengthening dialogue with non-ratifying States, including the remaining Annex 2 States.

The response of the Commission to the announced nuclear test by the Democratic People's Republic of Korea on 12 February 2013 again proved the readiness of the verification regime. The system put on display yet another impressive performance. All elements of the system worked in a coherent and efficient manner. The event was registered by 94 seismic stations and 2 infrasound stations in our network. Later, our radionuclide station in Takasaki (Japan) also detected radioactive noble gases at levels which were consistent with a release from a nuclear test. Monitoring data and products were constantly shared with States Signatories, meeting the time frame specified in the Treaty.

The year was also a turning point in our strategic planning. To improve our efficiency and optimize the use of limited resources available to the Commission, we introduced our four year Midterm Strategy (2014–2017). The new strategy streamlines our strategic goals. These goals include operation and sustainment of the IMS and the International Data Centre and further development of on-site inspection operational capabilities. Capacity building activities, as an enabling factor, will also receive special attention.

Improving network coverage and data availability are vital objectives of the Commission. This requires continuous build-up, sustainment and recapitalization of the IMS network. By the end of 2013, 282 IMS stations had been installed. This figure represents 88% of the network foreseen by the Treaty. Station design in all four of the Treaty's monitoring technologies also continued to evolve, providing for higher detection capability of newly installed stations. With the certification of six noble gas systems and the upgrade of three further systems, significant progress was made in the noble gas monitoring programme. By the end of the year, 31 noble gas systems (78% of the planned total) were installed.

We made efforts to keep pace with technological advancements and innovation. In this regard we focused on technology foresight for verification technologies. The Science and Technology 2013 conference was another major undertaking by the Commission in this respect. The conference was attended by over 700 participants from about 90 countries. More than 300 oral and poster presentations were given. The event provided an opportunity to review the performance of the Treaty's verification regime. It offered a useful platform for exploring new and improved monitoring technologies and methods and their possible inclusion in the verification system. The conference also examined the wider scientific and civic applications of monitoring data and products. Finally, the gathering helped to broaden our interaction with the scientific and technological communities.

Our capacity building activities, in particular for developing countries, increased notably. We consider this a rewarding investment that assists States Signatories in better fulfilling their Treaty obligations and using the data and products of the verification system more efficiently.

Further progress was made in preparations for the next Integrated Field Exercise (IFE), to be held in Jordan in 2014. The exercise aims to enhance our operational capabilities for on-site inspections (OSIs) anywhere and at any time. In 2013 we conducted a build-up exercise, with almost 150 experts participating. In the meantime five field tests related to the OSI techniques and technologies were carried out. In addition, the implementation of our four year OSI action plan, the second training cycle for surrogate inspectors and a number of other OSI training programmes were completed. All of the remaining task forces for the IFE were activated.

The Commission's success in 2013 was made possible by the unconditional and steadfast support of States Signatories and the assiduous work of the dedicated staff of the PTS. I should therefore congratulate them for their achievements and express my appreciation for their invaluable service to the noble cause of nuclear non-proliferation and disarmament. I also sincerely acknowledge the tireless efforts of my predecessor Mr Tibor Tóth in promoting the Treaty and furthering the work of the Commission during the last eight years.

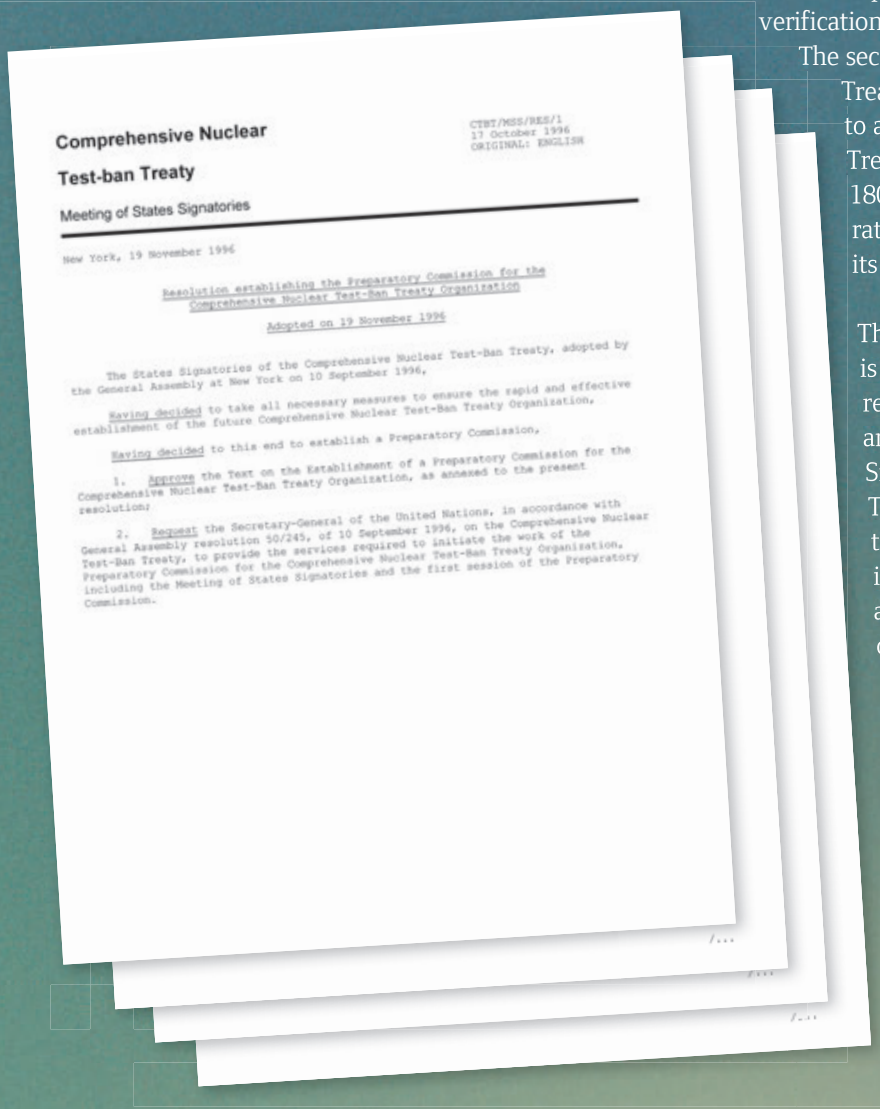
Lassina Zerbo
Executive Secretary
CTBTO Preparatory Commission
Vienna, February 2014

Treaty

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is an international treaty outlawing nuclear explosions in all environments. In providing for a total ban on nuclear testing, the Treaty seeks to constrain the development and qualitative improvement of nuclear weapons and end the development of new types of nuclear weapon. In doing so, it constitutes an effective measure of nuclear disarmament and non-proliferation in all its aspects.

The Treaty was adopted by the United Nations General Assembly and opened for signature in New York on 24 September 1996. On that day, 71 States signed the Treaty. The first State to ratify the Treaty was Fiji on 10 October 1996.

Under the terms and provisions of the Treaty, the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) is to be established in Vienna, Austria. The mandate of this international organization is to achieve the object and purpose of the Treaty, to ensure the implementation of its provisions, including those for international verification of compliance with it, and to provide a forum for cooperation and consultation among States Parties.



Comprehensive Nuclear

Test-ban Treaty

Meeting of States Signatories

CTBT/MSS/RES/1
17 October 1996
ORIGINAL: ENGLISH

New York, 19 November 1996

Resolution establishing the Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization

Adopted on 19 November 1996

The States Signatories of the Comprehensive Nuclear Test-Ban Treaty, adopted by the General Assembly at New York on 10 September 1996,

Having decided to take all necessary measures to ensure the rapid and effective establishment of the future Comprehensive Nuclear Test-Ban Treaty Organization,

Having decided to this end to establish a Preparatory Commission,

1. Approves the Text on the Establishment of a Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization, as annexed to the present resolution;

2. Requests the Secretary-General of the United Nations, in accordance with General Assembly resolution 50/245, of 10 September 1996, on the Comprehensive Nuclear Test-Ban Treaty, to provide the services required to initiate the work of the Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization, including the Meeting of States Signatories and the first session of the Preparatory Commission.

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Preparatory Commission

In advance of the entry into force of the Treaty and the establishment of the CTBTO proper, a Preparatory Commission for the organization was established by the States Signatories on 19 November 1996. The Commission was given the mandate of preparing for entry into force and is located at the Vienna International Centre.

The Commission has two main activities. The first consists of undertaking all necessary preparations to ensure the operationalization of the CTBT verification regime at entry into force. The second is the promotion of Treaty signature and ratification to achieve entry into force. The Treaty will enter into force 180 days after it has been ratified by all 44 States listed in its Annex 2.

The Preparatory Commission is made up of a plenary body responsible for directing policy and comprising all States Signatories, and a Provisional Technical Secretariat (PTS) to assist the Commission in its duties, both technically and substantively, and carry out such functions as the Commission determines. The PTS started work in Vienna on 17 March 1997 and is multinational in composition, with staff recruited from States Signatories on as wide a geographical basis as possible.

Summary

This report provides a brief description of the major accomplishments of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization in 2013.

The response of the verification system to the announced nuclear test by the Democratic People's Republic of Korea on 12 February was a vivid demonstration of its reliable operational capability and its relevance to global nuclear disarmament and non-proliferation.

Detections were made by 96 International Monitoring System (IMS) stations, 2 of which were infrasound stations. Eighty-eight stations were used in the event location estimate reported in the Reviewed Event Bulletin (REB). The location of the event was estimated within a confidence ellipse with a semi-major axis of 8.1 km. The magnitude of the event was 4.9 according to the International Data Centre (IDC) body wave magnitude scale.

The first data and results were made available to States Signatories in little more than one hour and before the announcement by the Democratic People's Republic of Korea, and the REB was issued to States Signatories well within the time frame specified in the Treaty. Atmospheric transport modelling (ATM) was used to estimate where a possible radionuclide release would be detectable. On 9 April, 55 days after the announced nuclear test, radioactive noble gases were detected by the IMS noble gas system in Japan. These detections, so long after the announced test, are illustrative of the monitoring capability of the IMS system.

In 2013, the Commission registered further progress in the installation, upgrade, certification and start-up of new IMS facilities.

Three IMS stations were installed in 2013, bringing the total number installed by the end of the year to 282 (88% of the network foreseen by the Treaty). Station design in all technologies also continued to evolve, resulting in a higher detection capability of newly installed stations.

Four IMS facilities were certified as meeting all of the stringent technical requirements of the Commission. The total number of certified IMS stations and laboratories reached 278 (82% of the network foreseen by the Treaty) at the end of 2013.

These activities helped to increase the coverage and data availability in all IMS technologies, in particular for noble gas monitoring. They also enhanced network resilience.

The major project to repair IMS hydroacoustic station HA3 and infrasound station IS14 (Chile), which were heavily damaged by a tsunami in 2010, moved forward. Preparation work to install and certify additional IMS facilities continued progressively. Notably, preparations for work on the re-establishment of HA4 (France) – the only uncertified hydroacoustic station in the IMS – advanced substantially with the aim to complete the IMS hydroacoustic monitoring network by 2016. At the end of 2013, preparations were also under way for installation and/or certification of about 20 facilities in 2014.

There was considerable evidence of political support from several countries hosting IMS facilities where the Provisional Technical Secretariat (PTS) had not been able to proceed in previous years. Of particular importance was the resolution of long standing issues with China that allowed resumption of data flow from IMS stations hosted by China. Important steps were also made to further the completion of the IMS segment in the Russian Federation. All of these advances in 2013 contributed to bringing closer the prospect of the completion of the IMS network.

With the certification of six noble gas systems and the upgrade of three further systems the noble gas monitoring programme progressed significantly. By the end of 2013, 31 noble gas systems (78% of the planned total) were installed at IMS radionuclide stations, of which 18 had been certified.

Improved performance of the Global Communications Infrastructure helped to keep overall adjusted availability consistently above 99.77%. The network also increased its data and product transmission to an aggregate of over 35 gigabytes per day.

The PTS succeeded in further consolidating infrasound and noble gas monitoring into IDC operations, incorporating data from the newly certified facilities. At the end of the year, 47 infrasound and 31 noble gas systems were in provisional operation. Moreover, efforts were continued to further enhance the ATM capabilities of the verification system.

Activities to enhance data security as well as hardware and software improvements were continued. In addition, there was further progress in the initiative funded by the European Union to improve knowledge of the global xenon background.

The 2013 Science and Technology conference, held from 17 to 21 June in Vienna, was a major undertaking, with over 750 participants from around 100 countries. The key objectives of the conference were to review the status of the verification system and to explore ways and means to improve its capabilities. The gathering also aimed to broaden the interaction of the Commission with the scientific and technological community.

The conference discussed three themes: (1) the earth as a complex system, (2) events and their characterization and (3) advances in sensors, networks and processing. Within each theme several topics were identified. It also featured panel discussions addressing synergies between on-site inspection (OSI) technologies and industry, innovations and technological drivers that will shape the future of verification, and radioxenon anthropogenic release mitigation. The number of presentations was notably very high, with over 80 oral presentations and over 250 poster presentations.

Fostering the operational capabilities of the organization in the area of OSI was a main priority in 2013. The OSI operational capabilities were improved through the implementation of the four year OSI action plan, with advancement in five main areas, namely policy planning and operations, operations support and logistics, techniques and equipment, training and procedures and documentation.

In preparation for the Integrated Field Exercise (IFE) in 2014, a host of activities were undertaken. The third build-up exercise (BUE III) was concluded. Almost 150 experts from States Signatories and the PTS participated in the exercise, which was the second largest exercise ever conducted by the organization. BUE III findings and observations indicated considerable progress since the IFE in 2008.

IFE preparations also included five field operational tests covering the OSI techniques and technologies. A scientifically credible and comprehensive scenario for the IFE was developed, encompassing all necessary information about scenario related preparations and implementation aspects, and all remaining task forces were activated. These include scenario design; logistics and operations; health, safety and security; equipment; public information and external relations; and documentation.

In addition, the second training cycle for surrogate inspectors and a number of other OSI training programmes were concluded. The completion of the four year OSI action plan was a notable achievement of the organization in 2013.

The political momentum in support of the Treaty and its early entry into force became stronger in 2013. Brunei Darussalam, Chad, Guinea-Bissau and Iraq ratified the Treaty, increasing the number of

ratifications to 161. The President of Burkina Faso, HE Blaise Compaoré, addressed the Fortieth Session of the Commission, being the first head of state to attend a session of the Commission.

The Executive Secretary visited several States Signatories, including China, Ukraine, the Russian Federation, the United States of America, Angola, Japan, Jordan and France, and met with high level officials, including prime ministers and foreign ministers. He also met with the foreign ministers of Egypt, Kazakhstan, Lithuania, Romania and Papua New Guinea, as well as the Deputy Prime Minister of Tuvalu and the Deputy Foreign Minister of Iran. The repeated messages of unwavering support for the Treaty and the work of the Commission were very encouraging.

The eighth Article XIV conference and the sixty-eighth session of the General Assembly of the United Nations in New York provided additional platforms for a worldwide call for ratification of the Treaty by the remaining Annex 2 States and appreciation of the work of the Commission.

To promote the Treaty and secure additional ratifications, the Group of Eminent Persons (GEM) was established. GEM enjoys the membership of renowned former prime, foreign and defence ministers, parliamentarians, politicians and diplomats. The group held its first meeting in September in New York.

Other outreach activities of the Commission involved liaising with many States, including Annex 2 States, international organizations and civil society.

Efforts were made to streamline and expand the capacity building and capacity development initiative (CDI) activities of the Commission. These activities included training courses and workshops for National Data Centres (NDCs), software provision, equipment donations and technical follow-up visits. They aim to ensure the smooth operation of the IMS and to build the capacity of NDCs to fulfil their obligations under the Treaty. Activities related to the CDI included education and outreach activities that aim to broaden knowledge of the Treaty and to prepare States Signatories to confront effectively the political, legal, technical and scientific challenges to the Treaty and its verification regime. More than 300 station operators and NDC staff attended capacity building programmes. The number of participants in CDI courses in 2013 stands at 675.

The Commission further intensified its efforts in promoting the Treaty and its verification regime through media outreach. Global media coverage of the Treaty and its verification regime saw an increase of more than 60%, with over 4500 articles and citations in online media alone. The public web site and social media outlets of the Commission received on average around 150 000 visits monthly. There was also a significant surge of interest in the 37 videos on the CTBTO YouTube channel.

In August 2013 the Commission introduced its new Midterm Strategy (MTS) for 2014–2017, which presents a framework for the programmes and activities of the organization over the next four years. The MTS focuses on two strategic goals: (1) operation and sustainment of the IMS and IDC and (2) further development of OSI operational capabilities. It also accords high importance to capacity building activities and improved management.

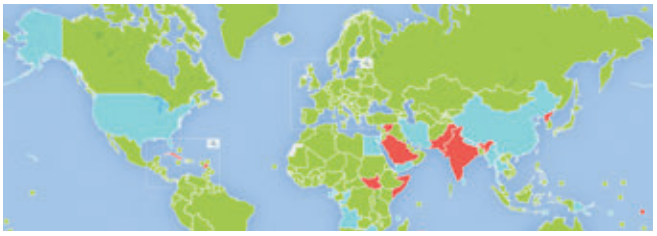
Work on the development of an IPSAS-compliant Enterprise Resource Planning system was pursued. According to plan, the system will go live in 2014. The organization sought further synergies and efficiencies by fostering results based management, accountability and oversight. This has resulted in a continuation of achieving higher delivery rates.

Contents

Management

Facilitating the Entry into Force of the Treaty

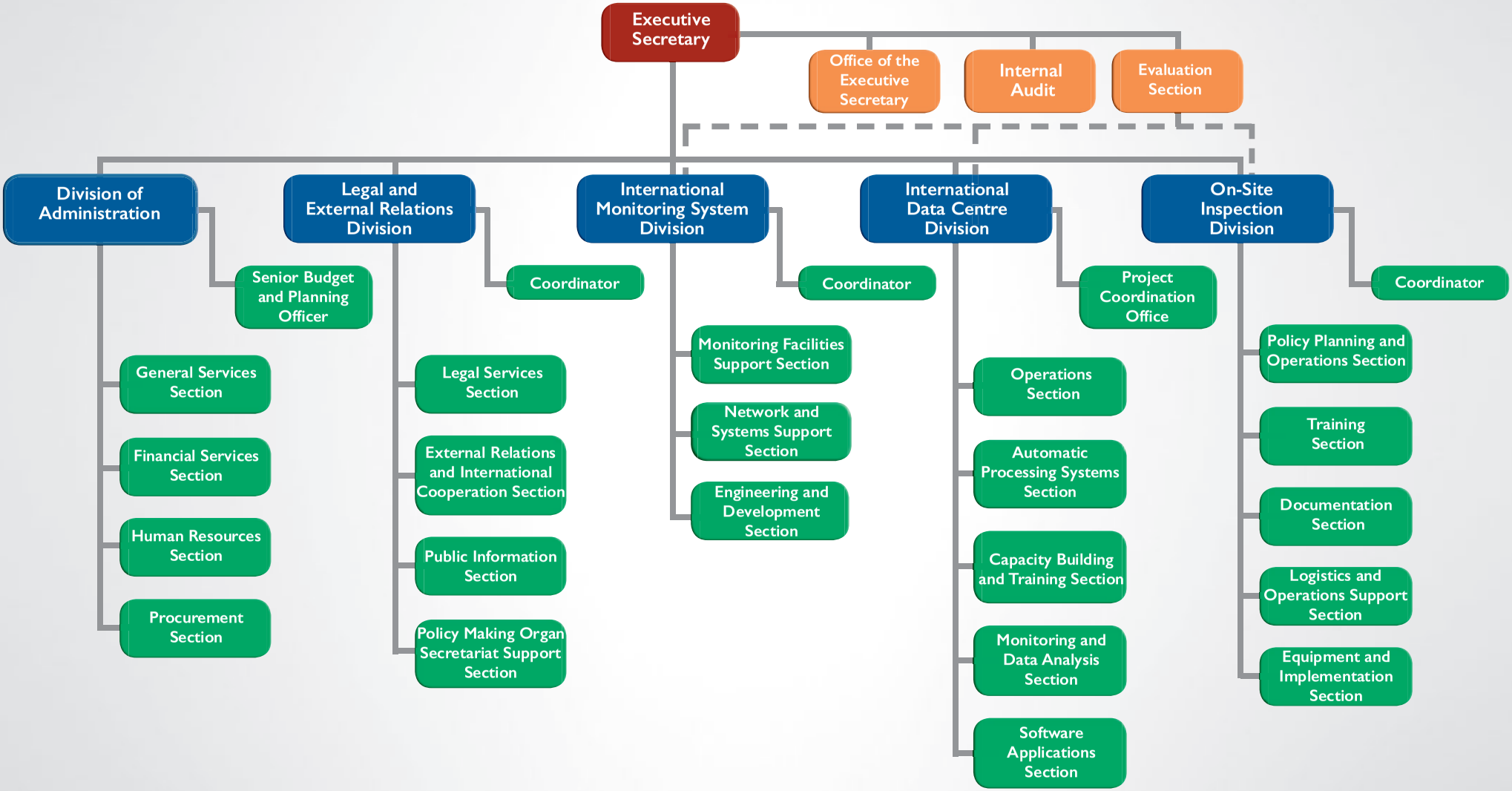
Signature and Ratification



Abbreviations

ATM	atmospheric transport modelling
BOO	base of operations
BUE	build-up exercise
CPT	continuation period techniques
ESMF	Equipment Storage and Maintenance Facility
EU	European Union
FIMS	field information management system
GEM	Group of Eminent Persons
GCI	Global Communications Infrastructure
H&S	health and safety
IAEA	International Atomic Energy Agency
IDC	International Data Centre
IFE	Integrated Field Exercise
IIMS	Integrated Information Management System
IMS	International Monitoring System
IPSAS	International Public Sector Accounting Standards
IPU	Inter-Parliamentary Union
ISP	inspected State Party
IT	inspection team
ITF	inspection team functionality
NDC	National Data Centre
O&M	operation and maintenance
OSC	Operations Support Centre
OSI	on-site inspection
PCA	post-certification activity
POE	point of entry
PTS	Provisional Technical Secretariat
QMS	Quality Management System
REB	Reviewed Event Bulletin
SAMS	Seismic Aftershock Monitoring System
SOP	standard operating procedure
WGB	Working Group B
WIN	work instruction

Organizational Structure of the Provisional Technical Secretariat
(31 December 2013)



International Monitoring System

Highlights in 2013

Enhanced coverage of noble gas monitoring

Resumption of data flow from installed IMS stations hosted by China

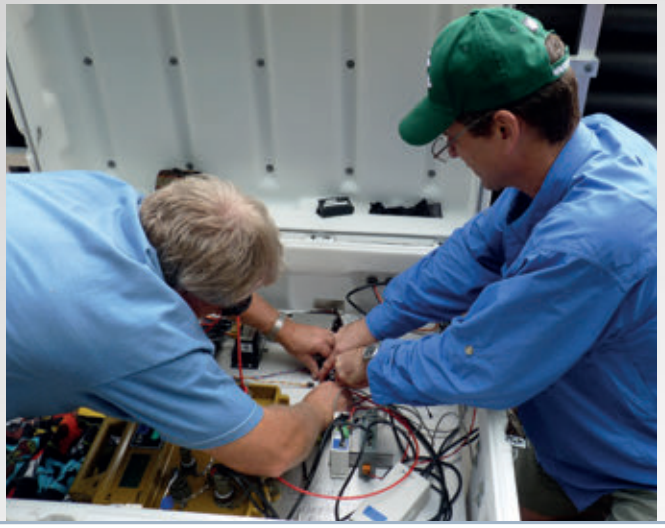
Increased efficiency in maintenance and logistics support and technology development for IMS stations

Mawson Bay, near radionuclide station RN5, Mawson, Antarctica, Australia.

The International Monitoring System (IMS) is a global network of sensors for detecting and providing evidence of possible nuclear explosions. Upon completion, the IMS will consist of 321 monitoring stations and 16 radionuclide laboratories throughout the world in locations designated by the Treaty. Many of these facilities are located in areas that are remote and difficult to access, posing major engineering and logistical challenges.

The IMS uses seismic, hydroacoustic and infrasound ('waveform') monitoring technologies to detect the energy released from an explosion or a naturally occurring event in the underground, underwater and atmospheric environments.

Radionuclide monitoring uses air samplers to collect particulate matter from the atmosphere. Samples are then analysed for evidence of physical products created by a nuclear explosion and carried through the atmosphere. The analysis of the radionuclide content can confirm whether an event recorded by the other monitoring technologies was actually a nuclear explosion. The monitoring capability of some stations is being enhanced by the addition of systems for detecting radioactive forms of noble gases that are produced by nuclear reactions.



Certification activities at infrasound station IS58, Midway Islands, United States of America.

Certification of the noble gas system at radionuclide station RN50, Panama City, Panama.

Establishment, Installation and Certification

Establishment of a station is a general term referring to the building of a station from its initial stages until its completion. *Installation* typically refers to all work performed until the station is ready to send data to the International Data Centre (IDC). This includes, for instance, site preparation, construction and equipment installation. A station receives *certification* when it meets all technical specifications, including requirements for data authentication and transmission through the Global Communications Infrastructure (GCI) link to the IDC in Vienna. At this point the station is considered an operational facility of the IMS.

Table 1. Status of IMS Station Installations and Certifications (31 December 2013)

IMS Station Type	Installation Complete		Under Construction	Contract Under Negotiation	Not Started
	Certified	Not Certified			
Primary seismic	42	3	1	1	3
Auxiliary seismic	105	9	3	0	3
Hydroacoustic	10	0	0	1	0
Infrasound	47	0	3	1	9
Radionuclide	63	3	5	5	4
Total	267	15	12	8	19

Table 2. Status of Noble Gas System Installations and Certifications (31 December 2013)

Total Number of Noble Gas Systems: 40	Installed: 31	Certified: 18

Table 3. Status of Radionuclide Laboratory Certifications (31 December 2013)

Total Number of Laboratories: 16	Certified: 11

Establishing the International Monitoring System

The momentum to complete the IMS network was maintained in 2013. Progress was made in all four technologies (seismic, hydroacoustic, infrasound and radionuclide) with the installation, upgrade, certification and start-up of new facilities.

Three IMS stations were installed in 2013, bringing the total number installed by the end of the year to 282 (88% of the network foreseen by the Treaty). Station design in all technologies also continued to evolve, resulting in a higher detection capability of newly installed stations.

Four IMS facilities were certified as meeting all the stringent technical requirements of the Preparatory Commission. The total number of certified IMS stations and laboratories thus reached 278 (82% of the network foreseen by the Treaty) at the end of 2013. The increase in the number of certified stations has been a source of improvement for coverage and network resilience.

Preparation work to install and certify further IMS facilities progressed. Notably, preparations for work on the re-establishment of HA4 (France) – the only uncertified hydroacoustic station in the IMS – advanced substantially, with the aim to complete the IMS hydroacoustic monitoring network

Installing a pipe array at infrasound station IS37, Bardufoss, Norway.

Performing a spike test as part of the certification of the noble gas system at radionuclide station RN27, Papeete, Tahiti, France.

by 2016. At the end of 2013, preparations were under way to install and/or certify about 20 facilities in 2014.

Political support was received from several countries hosting IMS facilities where the Provisional Technical Secretariat (PTS) had not been able to proceed in previous years. In particular, long standing issues were resolved with China, resulting in the resumption of data flow from key IMS stations hosted by China. Important steps were also made to further the completion of the IMS segment in the Russian Federation. All of these advances in 2013 contributed to bringing closer the prospect of the completion of the IMS network.

With the certification of six noble gas systems and the upgrade of three further systems, the most significant progress in 2013 was made in the noble gas monitoring programme, in accordance with the priorities set by the Commission. As demonstrated in 2006 and in 2013 when nuclear tests were announced by the Democratic People's Republic of Korea, monitoring of radionuclide noble gases plays an essential role in the Treaty's verification system. Noble gas monitoring also proved to be essential during the nuclear accident at Fukushima, Japan. Emphasis therefore continued to be placed on this technology. By the end of 2013, 31 noble gas systems (78% of the planned total) were installed at IMS radionuclide stations, of which 18 had been certified as meeting all the stringent technical requirements. The addition of these systems strengthens significantly the capacity of the IMS and continues the dynamic approach to the establishment of the verification system.

Finally, following the adoption of the noble gas laboratory certification requirements and processes by the Commission in 2012, progress was made in establishing the certification process for noble gas sample analysis of the radionuclide laboratories which support the network of IMS radionuclide stations.

These advances are not just about increases in data flow. They are about the effective application of monitoring technologies around the globe; they are about higher quality data processing and data products; they are about better and more experienced data analysts and station operators.

Agreements for Monitoring Facilities

In order to carry out the functions of efficiently and effectively establishing and sustaining the IMS facilities, the Commission needs to derive full benefit from the immunities to which it is entitled as an international organization under the Resolution establishing it, in similar terms to those stipulated in the Treaty for the CTBTO itself. Consequently, facility agreements or arrangements provide for the application (with changes where appropriate) of the Convention on the Privileges and Immunities of the United Nations to the activities of the Commission and/or explicitly provide for such privileges and immunities, including exemption from taxes or duties. In practice, this may imply that a State hosting one or more IMS facilities would adopt the necessary national measures to that effect.

Surveillance assessment of radionuclide laboratory RL7, Helsinki, Finland.

Infrasound station IS41, Villa Florida, Paraguay, which underwent maintainance and recapitalization in 2013.

The Commission has the mandate to establish procedures and a formal basis for provisional operation of the IMS, including concluding agreements or arrangements with States hosting IMS facilities to regulate activities such as site surveys, installation or upgrading work and certification, as well as post-certification activities (PCAs).

Of the 89 States hosting IMS facilities, 45 have signed a facility agreement or arrangement with the Commission, and 36 of these agreements and arrangements are in force. At the end of 2013, the Commission was in negotiation with 20 of the 44 host States which have not yet concluded a facility agreement or arrangement. States are showing increased interest in the subject and it is hoped that ongoing negotiations may be concluded in the near future and that others may be initiated soon.

In 2013, the importance of establishing such facility agreements and arrangements and of their subsequent national implementation continued to be addressed by the Commission and its subsidiary organs. The lack of such legal mechanisms causes substantial costs and major delays in sustaining certified IMS facilities, adversely affecting the data availability of the verification system.

After Certification

Following the certification of a station and its incorporation into the IMS, its operation is ultimately focused on delivery of high quality data to the IDC.

PCA contracts are fixed-cost contracts between the Commission and some station operators. These contracts cover station operations and various preventive maintenance activities. The total PCA related expenditure in 2013 was US$16 570 000. This amount covers the 2013 applicable PCA related costs for 154 facilities and noble gas systems certified up to 31 December 2013, including the 11 certified radionuclide laboratories and 12 noble gas systems.

Performance of PCAs is reported in monthly reports by station operators and is reviewed by the PTS for compliance with operation and maintenance (O&M) plans. Standardized criteria for the review and evaluation of the performance of station operators were developed.

The PTS continued to standardize the services provided under PCA contracts. Station operators of all newly certified stations and existing stations submitting new budget proposals were requested to develop O&M plans in accordance with a standard template. In 2013, O&M plans for 10 stations were submitted.

Sustaining Performance

Preparing a global monitoring system of 337 facilities supplemented by 40 noble gas systems involves much more than the building of stations. It requires taking a holistic approach to establishing and sustaining an intricate ësystem of systemsí that should be completed to meet the verification requirements of the Treaty while protecting the investment already made by the Commission. This can be achieved by testing, evaluating and sustaining what is in place, and then further improving on this.

The life cycle of the IMS station network proceeds from conceptual design and installation to operation and sustainment. Sustainment covers maintenance through necessary repairs, replacement, upgrades and continuous improvements to ensure the technological relevance of

Infrasound station IS52, BIOT/Chagos Archipelago, United Kingdom: solar panels (*left*) and maintenance and recapitalization activities (*right*).

the monitoring capabilities. This process also involves management, coordination and support for the full life cycle of each facility component, performed as efficiently and effectively as possible. In addition, with IMS facilities reaching the end of their designed life cycle, there is the need to plan, manage and optimize the recapitalization of all components of each facility in order to minimize downtime and optimize resources.

Operation and support of activities at IMS facilities continued in 2013, while work intensified in refining relevant internal processes with the aim to continue improving performance. Efforts were also made to enhance the operability of the different functional areas (logistics, maintenance, engineering and the GCI). Finally, the first initial long term IMS sustainment models were presented to the Commission. These models will continue to be refined with the aim to project the level of resources required to sustain the ever growing and ageing IMS network.

Optimizing and enhancing performance also involve the continuous improvement of data quality, reliability and resilience. Hence efforts in 2013 continued to focus on quality assurance (QA) and quality control (QC), on facility calibration activities, which are essential for the reliable interpretation of detected signals, and on improvements of IMS technologies. These activities contribute to maintaining a credible and technologically relevant monitoring system.

Logistics

The support required to ensure the highest levels of data availability from such a global network of facilities calls for an all-encompassing logistics approach, which seeks continued optimization. In 2013, the Commission therefore further exploited information technology tools for logistics support analysis (LSA). Efforts concentrated on further developing and validating LSA capabilities and associated life cycle costs and reliability variables such as mean time between failures and expected life time of equipment. The PTS, together with experienced operators and suppliers, worked to further refine these estimates of system life cycles in order to increase the accuracy of its projections of recapitalization costs. LSA is used to identify the most efficient current and future support requirements of the IMS.

Efforts also continued in 2013 to validate, review and optimize the configuration management of IMS facilities in order to strengthen overall confidence in IMS station information and configuration. The aim of configuration management is to ensure a level of service compatible with that required by the Treaty and the draft IMS Operational Manuals by maintaining the status of complex assets in a cost effective manner. Knowing and tracking the status and associated life cycle sustainment information of the IMS network of stations and its major components are thus essential for effective planning. Configuration management procedures and associated data entry processes were further reviewed and rolled out internally in the PTS. Configuration spot checks continued to be carried out during station maintenance visits, and discrepancies were reported accordingly.

Work continued in 2013 to optimize the advance location and storage of IMS equipment and consumables at regional, country specific, supplier and station based depots and at the Vienna based storage facility. The PTS continued to work with host countries and station operators to further streamline country specific shipment and timely/cost-free customs clearance procedures for IMS equipment and consumables.

Vessel used for the repair of hydroacoustic station HA3 and infrasound station IS14 in the Juan Fernández Islands (Chile).

Maintenance

Maintenance support and technical assistance continued to be provided at IMS facilities around the globe. More than 1700 maintenance tickets were addressed during 2013, 1100 of which were resolved. In particular, long term data availability problems were resolved at 10 IMS facilities in 2013. A total of 16 preventive and corrective maintenance visits were made to 20 certified facilities.

The PTS progressed with the largest IMS station repair and reconstruction so far in terms of financial investment at the joint site of hydroacoustic station HA3 (which uses hydrophones) and infrasound station IS14 in the Juan Fernández Islands (Chile), both of which were heavily damaged by a tsunami in 2010. The repair of IS14 was completed. Elements of the underwater system and the shore based equipment for HA3 were manufactured, quality controlled and integrated into a complete system in 2013 and underwent both factory acceptance and system integration tests. The repair of HA3 is a multimillion dollar project which entails substantial technical challenges and risks and is funded through an extrabudgetary mechanism.

In order to ensure more timely preventive and corrective maintenance of IMS facilities where data availability is being affected, the PTS also continued to manage equipment support contracts with manufacturers, improving several on the basis of experience. Some of these contracts were also reviewed in order to address some of the on-site inspection specific equipment support requirements. These contracts are instrumental in ensuring timely technical assistance and equipment replacement at IMS stations at optimal cost.

Emphasis also continued to be placed on developing the technical capabilities of station operators. As the entity closest to an IMS facility, the station operator is in the best position to prevent problems at stations and ensure a timely resolution when they occur. Technical training for station operators was held and station visits by PTS staff continued to include hands-on training for local station operators, with the aim of avoiding PTS staff travelling to a station twice to resolve the same problem. Furthermore, development of refined IMS station specific documentation was continued to ensure sustainability and maintainability of the station information. The PTS, in collaboration with the station operators, will continue the process of gathering, validating, verifying and managing station specific information for all certified IMS stations.

The combination of technical training and enhanced coordination within the PTS to review PCA contracts, O&M plans and station summary reports has been rewarding. The abilities of station operators continued to improve in 2013, including their compliance with best practices in preventive maintenance and configuration management, which is essential for optimizing the sustainment and performance of the IMS network, and thus increasing its overall data availability. However, this upward trend needs to continue, as there is still room for improvement in order to increase confidence in the configuration of the certified network and to support future planning.

Recapitalization

The final phase in the life cycle of equipment for IMS facilities involves its replacement (recapitalization) and disposal. The PTS continued to recapitalize IMS facility components as they reached the planned end of their operating lives. With the first certification of IMS stations in 2000 and hence an ageing IMS network, efforts continued in 2013.

Replacement nodes for the repair and reconstruction of hydroacoustic station HA3 in the Juan Fernández Islands (Chile).

In managing recapitalization, the PTS together with the station operators took into account life cycle data as well as station specific failure analysis and risk assessment. To optimize the obsolescence management of the IMS network and associated resources, priority continued to be given to the recapitalization of components with high failure rates and/or risks and where failure would cause significant downtime. At the same time, recapitalization of components that proved to be robust and reliable was delayed beyond their planned end of life, where suitable, in order to optimize available resources. Several major recapitalization projects involved substantial planning and resource investment in 2013, in particular at PS2 and IS7 (Australia), PS9 (Canada), PS28 (Norway) and IS52 (United Kingdom).

Engineering Solutions

The engineering and development programme for IMS facilities continued in 2013 by designing, validating and implementing solutions to improve overall data availability and quality, cost effectiveness and performance. Systems engineering is implemented throughout the station life cycle. It relies on open systems design through standardization of interfaces and modularity. It demands improvement of systems and equipment reliability, maintainability, logistical supportability, operability and testability. It also requires enhancing trustworthiness of the IMS through calibration and data surety measures, and finally applying end-to-end systems engineering and optimizing station design with processing by the IDC. Measures taken in 2013 focused on improving data quality and on increasing the performance and robustness of IMS facilities to enhance reliability and resilience.

Complex repairs of IMS facilities which required engineering work and infrastructure and equipment improvements were performed at certified IMS facilities. There was continuous review, evaluation and improvement of formalized engineering processes. Progress continued in the delivery of technical drawings for waveform and radionuclide stations, and the seismic station risk register matrix was completed. These activities as well as the continuous analysis of root causes and rates of station failure provided further valuable input for improving the technology of IMS facility components. The PTS hence continued to focus in 2013 on station power supply and station security solutions, on enhanced intra-site communication systems and on cooling techniques for detectors at radionuclide stations.

Several prototypes of equipment and new waveform and radionuclide monitoring equipment with enhanced performance were rolled out and tested in the field for validation. In particular, several types of new broadband seismometers were installed at IMS seismic stations for assessment and first tests of the next generation of high resolution detectors for noble gas systems were performed as well as testing and integration of a real time radiation monitor for particulate samplers as a follow-up to lessons learned from Fukushima. A temporary replacement solution for a noble gas system to reduce extended downtime was also initiated.

Owing to the critical importance of each hydroacoustic station to IMS monitoring capabilities, work continued in exploring and assessing the next generation of hydroacoustic stations and potential temporary solutions. An independent expert study supported by industry research was initiated to develop and evaluate different systems and architectures that could improve hydroacoustic stations from a deployment and

Auxiliary seismic station AS76, Keravat, Papua New Guinea, which was certified in 2013.

New liquid nitrogen generator, which was installed at radionuclide station RN26, Nadi, Fiji.

maintainability perspective. Initial results indicate that the main challenges of temporary solutions are associated with real time data transmission and high maintenance costs.

Preparation work for the infrasound technology roadmap, which is supported financially by the European Union (EU), was concluded in 2013. The main purpose of the roadmap is to provide a framework for planning and coordinating technology development in the next seven years, maintaining the relevance of the verification regime and promoting cost efficiency and investment. The infrasound roadmap remains a live document open to fine-tuning and further improvement based on technological breakthroughs. It will be presented to the international infrasound community in 2014 for final comments.

These initiatives contribute to improving the reliability and resilience of IMS facilities. In doing so, they also enhance the performance of the network and increase the robustness of the IMS stations, contributing to extending their useful life and containing data downtime risks.

Auxiliary Seismic Network

The long term operation and sustainment of auxiliary seismic stations continued to attract the attention of the Commission and its subsidiary bodies in 2013. In accordance with the Treaty, regular O&M costs of auxiliary seismic stations, including the cost of physical security, are the responsibility of the States hosting them. However, practice has shown over the years that this constitutes a significant challenge for IMS auxiliary seismic stations that are located in developing countries and do not belong to 'parent networks'.

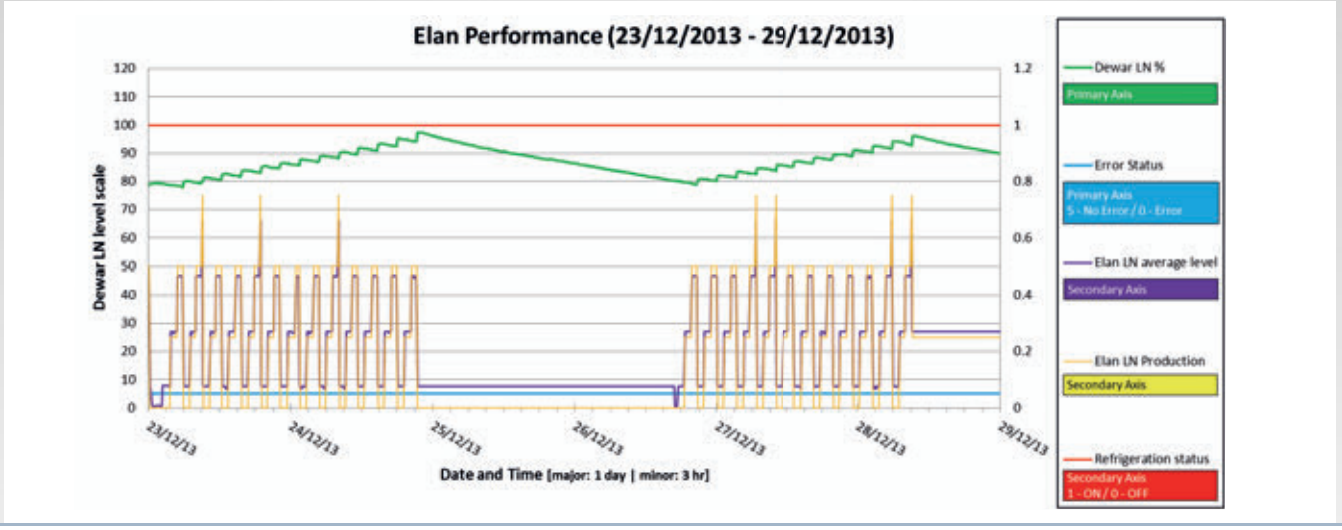
Countries hosting auxiliary seismic stations which present design deficiencies or obsolescence problems thus continued to be encouraged by the Commission to review their ability to cover the cost of upgrading and sustaining their stations. However, for several host countries, obtaining the appropriate level of technical and financial support remains challenging.

In this area, the EU continued to provide useful support for the sustainment of IMS auxiliary seismic stations that do not belong to parent networks and that are hosted by developing countries or countries in transition. This initiative includes actions to return stations to an operational state. Discussions were begun with other countries whose parent networks include several IMS auxiliary seismic stations to seek similar arrangements. In this regard, the USA provided a voluntary contribution for 2012 and 2013 to improve several auxiliary seismic stations belonging to US global parent networks and stations based in the USA. Overall, as a result of these voluntary sources of support and synergies 16 auxiliary seismic stations were supported in 2013.

The combined efforts of the host countries, the EU, the USA, the station operators and the PTS have been rewarding. As a result, the data availability of auxiliary seismic stations continued to rise steadily.

Quality Assurance

In addition to improving performance at stations, the PTS pays great attention to ensuring a reliable IMS network. Data quality therefore continued to be an important focus of attention in 2013. Calibration



Performance of the new Elan liquid nitrogen generator installed at radionuclide station RN47, Kaitaia, New Zealand, in December 2013. All features required by the IMS Engineering and Development Section were implemented, allowing full integration of the device into the certified station: (a) communication with station software and state of health data sent to the IDC, (b) automatic run mode with integrated level control, (c) remote monitoring and control of the unit and (d) compliance with station requirements, including automatic restart after power outages.

activities, in particular, continued. Calibration plays an essential role in the verification system as it determines and monitors, by measurement or comparison against a standard, parameters needed to properly interpret signals recorded by IMS facilities. As part of the infrasound data quality control project supported by the EU, the quality control on meteorological data was completed. On-site calibrations of IMS infrasound station elements were performed through a voluntary contribution provided by the USA. For the radionuclide technology, calibration procedures for noble gas sensors were improved. Full-frequency calibrations of the primary and auxiliary seismic stations in the IMS were performed in 2013, with a total of 133 seismic stations calibrated. An assessment of the 2012 calibration effort was also finalized and results were reported to the Forty-First Session of Working Group B. On the basis of the assessment, procedures, implementation methodology, reporting and analysis were updated. In December 2013 the PTS initiated the planning phase for 2014 calibration activities.

Certified IMS radionuclide laboratories provide network-wide testing capability. Samples from certified radionuclide particulate stations for QA/QC purposes are sent regularly to laboratories to test the consistency of analyses between stations and laboratories. In 2013, 206 QA/QC samples from 58 certified radionuclide particulate stations were sent to 9 laboratories for reanalysis. Additionally, 19 Level 5 samples were split and sent to laboratories to confirm the identification of anthropogenic radionuclides. The QA/QC activities for noble gas systems also continued, with the reanalysis of 38 samples from 10 stations analysed at 5 laboratories. In addition to the QA/QC programme for stations, the QA/QC programme for laboratories continued with the organization of the 2013 interlaboratory comparison exercise, using a traceable reference standard for the first time. Further assessment of the results from the 2012 interlaboratory comparison exercise, in which all IMS certified laboratories as well as 5 additional laboratories participated, was completed during the reporting period. Finally, surveillance assessments of four laboratories were successfully completed during 2013.

Continued Improvement in Data Availability

The activities referred to above contributed to increasing the overall data availability of the certified IMS stations in 2013, which has demonstrated a durable positive trend since 2009 towards the level required by the operational manuals. Over the last five years, in collaboration with the States hosting IMS facilities and local operators, data availability of certified IMS stations has steadily increased. In an ever growing but also ageing IMS network, activities undertaken in recent years have thus not only mitigated the effects of obsolescence in the network but also reversed the decreasing trend in data availability observed in the past. Sustained efforts in these areas will be essential in order to maintain this trend.

Profiles of the Monitoring Technologies

170 stations – 50 primary and 120 auxiliary – in 76 countries around the world

Seismic Station

The objective of seismic monitoring is to detect and locate underground nuclear explosions. Earthquakes and other natural events as well as anthropogenic events generate two main types of seismic wave: body waves and surface waves. The faster body waves travel through the interior of the earth while the slower surface waves travel along its surface. Both types of wave are looked at during analysis to collect specific information on a particular event.

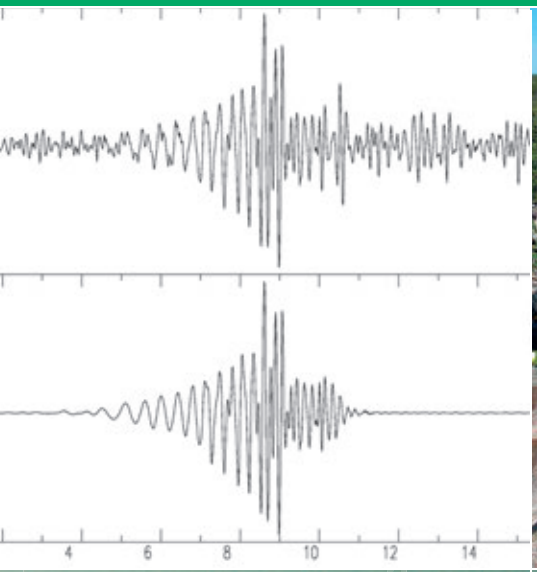
The seismic technology is very efficient at detecting a suspected nuclear explosion as seismic waves travel fast and can be registered within minutes after the event. Data from IMS seismic stations provide information on the location of a suspected underground nuclear explosion and help identify the area for an on-site inspection.

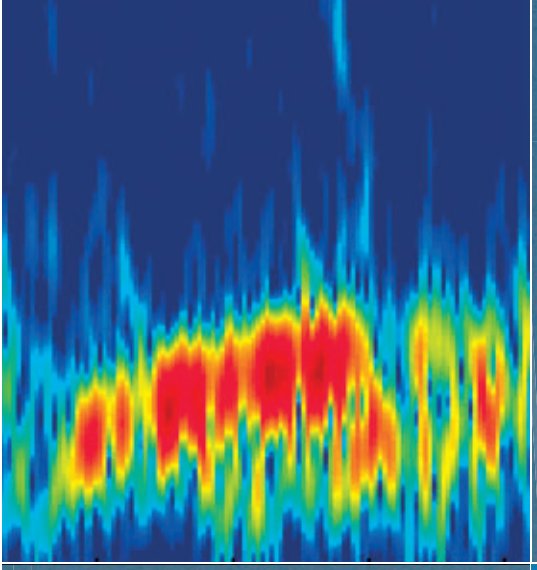
An IMS seismic station has typically three basic parts: a seismometer to measure the ground motion, a recording system which records the data digitally with an accurate time stamp, and a communication system interface.

In the primary and auxiliary seismic networks, there are two types of seismic station: three component (3-C) stations and array stations. The primary seismic network is mostly composed of arrays (30 out of 50 stations), whereas the auxiliary seismic network is mostly composed of 3-C stations (112 out of 120 stations).

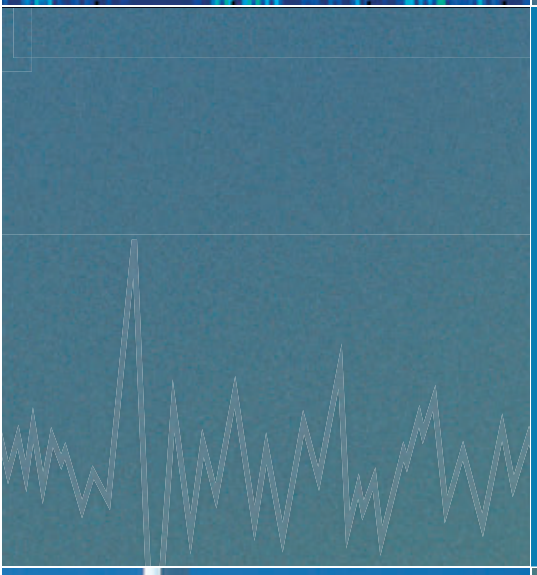
A 3-C seismic station records broadband ground motion in three orthogonal directions. An IMS seismic array station generally consists of multiple short period seismometers and 3-C broadband instruments.

Primary seismic stations send continuous data in near real time to the IDC. Auxiliary seismic stations provide data on request from the IDC.





11 stations — 6 underwater hydrophone stations and 5 T phase stations on land — in 8 countries around the world



Hydroacoustic Station

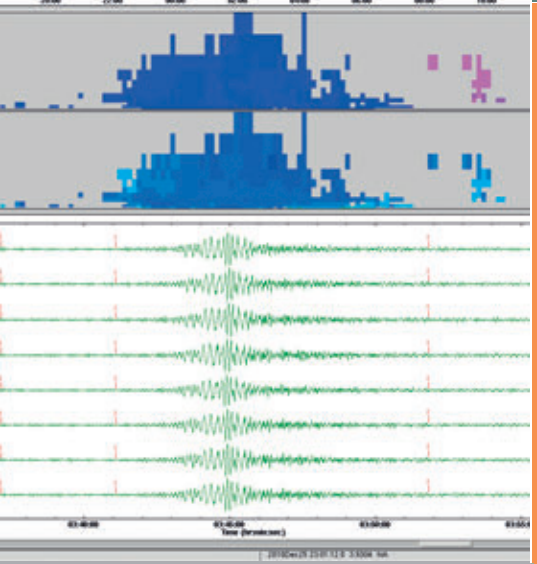
Nuclear explosions under water, in the atmosphere near the ocean surface or underground near oceanic coasts generate sound waves that can be detected by the hydroacoustic monitoring network.

Hydroacoustic monitoring involves recording signals that show changes in water pressure generated by sound waves in the water. Owing to the efficient transmission of sound through water, even comparatively small signals are readily detectable at very long distances. Thus 11 stations are sufficient to monitor most of the oceans.

There are two types of hydroacoustic station: underwater hydrophone stations and T phase stations on islands or on the coast. The hydrophone stations, involving underwater installations, are among the most challenging and most costly monitoring stations to build. The installations must be designed to function in extremely inhospitable environments, exposed to temperatures close to freezing point, huge pressures and saline corrosiveness.

The deployment of the underwater parts of a hydrophone station, i.e. placing the hydrophones and laying the cables, is a complex undertaking. It involves the hiring of ships, extensive underwater work and the use of specially designed materials and equipment.

60 stations in 34 countries around the world



Infrasound Station

Acoustic waves with very low frequencies below the frequency band audible to the human ear are called infrasound. Infrasound is produced by a variety of natural and anthropogenic sources. Atmospheric and shallow underground nuclear explosions can generate infrasound waves that may be detected by the infrasound monitoring network of the IMS.

Infrasound waves cause minute changes in the atmospheric pressure which are measured by microbarometers. Infrasound has the ability to cover long distances with little dissipation, which is why infrasound monitoring is a useful technique for detecting and locating atmospheric nuclear explosions. In addition, since underground nuclear explosions also generate infrasound, the combined use of the infrasound and seismic technologies enhances the ability of the IMS to identify possible underground tests.

Although the IMS infrasound stations exist in a wide variety of environments ranging from equatorial rainforests to remote wind-swept islands and polar ice shelves, an ideal site for deploying an infrasound station is within a dense forest, where it is protected from prevailing winds, or at a location with the lowest possible background noise in order to improve signal detection.

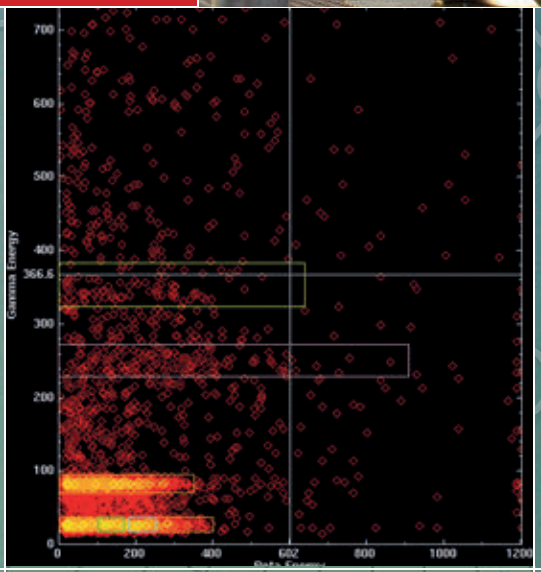
An IMS infrasound station (or array) typically employs several infrasound array elements arranged in different geometrical patterns, a meteorological station, a system for reducing wind noise, a central processing facility and a communication system for the transmission of data.

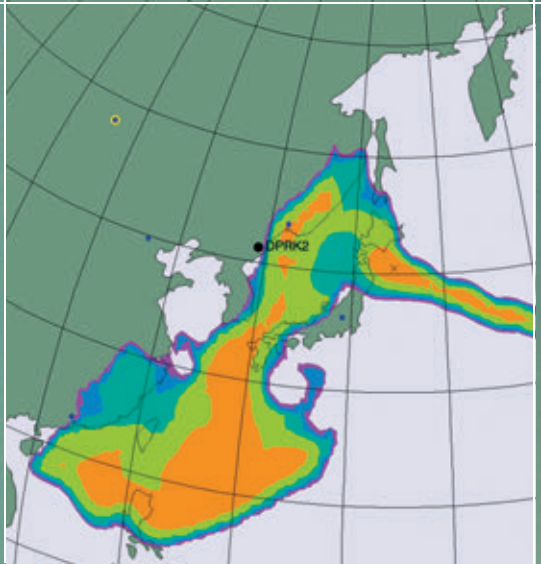
80 stations and **16** laboratories in 41 countries around the world, with additional noble gas detection capabilities at 40 of the stations

Radionuclide Particulate Station

Radionuclide monitoring technology is complementary to the three waveform technologies employed in the CTBT verification regime. This is the only technology that is able to confirm whether an explosion detected and located by the waveform methods is indicative of a nuclear test. It provides the means to identify the 'smoking gun' whose existence would be evidence of a possible violation of the Treaty.

Radionuclide stations detect radionuclide particles in the air. Each station contains an air sampler, detection equipment, computers and a communication set-up. At the air sampler, air is forced through a filter, which retains most particles that reach it. The used filters are examined and the gamma radiation spectra resulting from this examination are sent to the IDC in Vienna for analysis.



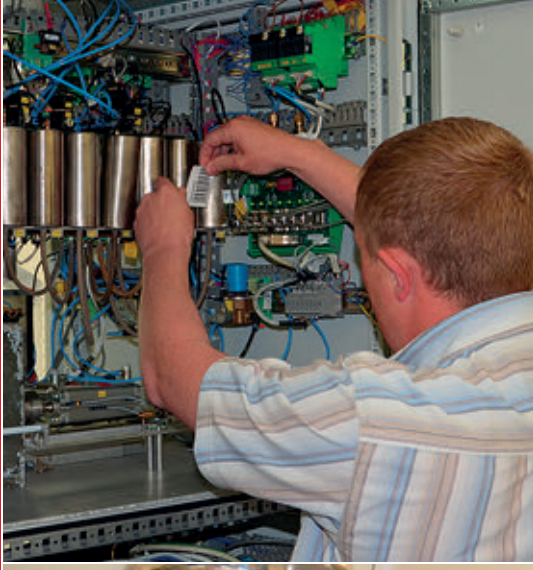


Noble Gas Detection System

By the time of entry into force of the Treaty, 40 of the 80 IMS radionuclide particulate stations are required by the Treaty to have, additionally, the capability to detect radioactive forms of noble gases such as xenon and argon. Therefore special detection systems have been developed and are being deployed and tested in the radionuclide monitoring network before they are integrated into routine operations. The addition of such systems strengthens the capacity of the IMS and continues the cutting-edge approach to the creation of the verification system.

The name 'noble gases' arises from the fact that these chemical elements are inert and rarely react with others. Like other elements, noble gases have various naturally occurring isotopes, some of which are unstable and emit radiation. There are also radioactive noble gas isotopes which do not occur naturally but can be produced only by nuclear reactions. By virtue of their nuclear properties, four isotopes of the noble gas xenon are particularly relevant to the detection of nuclear explosions. Radioactive xenon from a well contained underground nuclear explosion can seep through layers of rock, escape into the atmosphere and be detected later thousands of kilometres away. (See also *International Data Centre*: "International Noble Gas Experiment".)

All of the noble gas detection systems in the IMS work in a similar way. Air is pumped into a charcoal-containing purification device where xenon is isolated. Contaminants of different kinds, such as dust, water vapour and other chemical elements, are eliminated. The resulting air contains higher concentrations of xenon, in both its stable and unstable (i.e. radioactive) forms. The radioactivity of the isolated and concentrated xenon is measured and the resulting spectrum is sent to the IDC for further analysis.



Radionuclide Laboratory

Sixteen radionuclide laboratories, each located in a different country, support the IMS network of radionuclide monitoring stations. These laboratories have an important role in corroborating the results from an IMS station, in particular to confirm the presence of fission products and/or activation products which could be indicative of a nuclear test. In addition, they contribute to the quality control of station measurements and assessment of network performance through regular analysis of routine samples from all certified IMS stations. These world class laboratories also analyse other types of PTS sample such as samples collected during a station site survey or certification.

The radionuclide laboratories are certified under rigid requirements for analysis of gamma spectra. The certification process gives an assurance that the results provided by a laboratory are accurate and valid. These laboratories also participate in Proficiency Test Exercises organized by the PTS.

Global Communications

Highlights in 2013

Maintaining GCI availability above 99.77%

Transmitting over 35 gigabytes of data and products per day

Contributing to preparations for the IFE in 2014

Live map showing in real time the status of GCI connections to International Monitoring System facilities, the International Data Centre and independent subnetworks. Green indicates operational links, yellow indicates degraded links, and red indicates links that are out of operation.

The Global Communications Infrastructure (GCI) is designed to transport raw data from the 337 facilities of the International Monitoring System (IMS) in near real time to the International Data Centre (IDC) in Vienna for processing and analysis. The GCI is also designed to distribute to States Signatories analysed data and reports relevant to verification of compliance with the Treaty. Digital signatures and keys are used to ensure that the transmitted data are authentic and that no one has tampered with them. Increasingly, the GCI is being used as a medium of communication for the Provisional Technical Secretariat and station operators to monitor and control IMS stations remotely.

Using a combination of satellite and terrestrial communication links, this global network enables the exchange of data by IMS facilities and States in all areas of the world with the CTBTO Preparatory Commission. The GCI is required to operate with 99.5% availability for satellite communication links and 99.95% availability for terrestrial communication links, and to provide data within seconds from transmitter to receiver. The first generation GCI began provisional operation in mid-1999. In 2007, operation of the current, second generation GCI began under a new contractor.

New GCI facility for hydroacoustic station HA3 and infrasound station IS14 in the Juan Fernández Islands, Chile.

VSAT antenna at auxilary seismic station AS65, La Paz, Baja California Sur, Mexico, which underwent a maintenance visit in 2013.

GCI Technology

IMS facilities and States Signatories in all but near polar areas of the world can exchange data via their local earth stations fitted with a very small aperture terminal (VSAT) through one of six geostationary satellites. The satellites route the transmissions to hubs on the ground and the data are then sent to the IDC by terrestrial links. Complementing this network, independent subnetworks employ a variety of communications technologies to carry data from IMS facilities to a communications node connected to the GCI, from where the data are routed to the IDC.

A virtual private network (VPN) utilizes existing telecommunications networks to conduct private data transmissions. Most of the VPNs for the GCI use the basic public infrastructure of the Internet together with a variety of specialized protocols to support secure encrypted communications. In situations where VSATs are still not in use or not operational, VPNs provide an alternative means of communication. VPNs are also used at some sites to provide a backup communication link in case of failure of a VSAT or terrestrial link. For National Data Centres (NDCs) with a viable Internet infrastructure, a VPN is the recommended medium for receiving data and products from the IDC.

At the end of 2013, the GCI network included 217 VSAT stations (of which 26 have backup VPN links), 32 stand-alone VPN links, 5 independent subnetworks on terrestrial links using multiprotocol label switching (MPLS), a terrestrial MPLS link for US stations located in Antarctica, 4 satellite teleports (2 in Norway and 2 in the USA), 6 geostationary satellites and a network operations centre in Maryland, USA. All of these are managed by the GCI contractor. The satellites cover the Pacific Ocean, North Pacific (Japan), North and Central America, Atlantic Ocean, Europe and Middle East, and Indian Ocean regions. In addition, a total of 67 independent subnetwork links and 6 Antarctic communication links are operated by 10 States Signatories to carry IMS data to a GCI connection point. In all, the combined networks have close to 330 different communication links to transport data to and from the IDC.

Expanding Global Communications

Internet backup was added to five VSAT sites to improve the reliability of communications. Two IMS station sites were converted from AC to DC power to remove their dependence on unstable commercial power sources. The overall long term impacts of these measures are expansion of the network capacity to carry data as well as further improvement of the data availability parameters.

GCI Operations

The overall rolling 12 month adjusted availability, which measures the compliance of the GCI contractor against the operational target of 99.5% availability in one year, was above 99.77% in each month of the year until September. The rolling 12 month actual availability, which is a measure of the raw uptime of each GCI link over one year, was about 1.1% lower than the adjusted availability. These performance statistics are similar to those for the calendar year 2012. Over the year, the GCI transported on aggregate 28 gigabytes per day from IMS facilities to

GATR terminal, which was successfully deployed during the build-up exercises and will be used during the Integrated Field Exercise in 2014.

NDCs. In addition, about 8.7 gigabytes per day were sent to NDCs that are directly connected to the IDC.

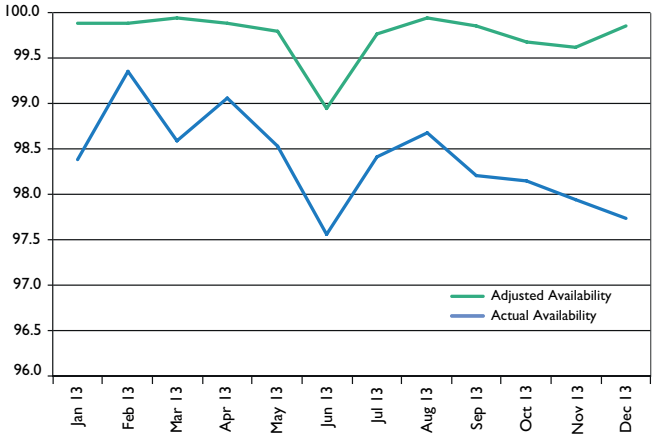
The GCI contractor obtained its ISO 9000 certification in 2013.

Further improvements in incident management involving the GCI contractor and enhancements in network monitoring were made in 2013. Training continued for existing and new network operations centre operators, and the complement and geographical distribution of field service engineers were expanded. Moreover, the staffing of the network operations centre and expert help desk of the contractor was increased.

During 2013 the process of replacing deteriorating antenna elements continued. A survey was undertaken to determine the condition of radomes at sites with such facilities. This activity was initiated as a response to the loss of randome protection at the group of stations at Tristan da Cunha (United Kingdom) in June 2013. A process was put in place to examine and, where necessary, replace radome elements that had been weakened as a result of material deterioration.

GCI II is a primary telecommunications service to be used by the On-Site Inspection Division during the upcoming Integrated Field Exercise in Jordan in 2014. The light antenna terminal (so-called GATR terminal) purchased in 2012 was successfully deployed and its services verified throughout all build-up exercises, including during field deployment in Jordan during the experts group meeting on communications in November 2013.

In 2013 independent subnetwork contracts were signed with the Special Monitoring Service of the Ministry of Defence of the Russian Federation and with the Geophysical Survey of the Russian Academy of Sciences.



GCI availability in 2013. The actual availability indicates the raw uptime of GCI links, whereas the adjusted availability is the uptime computed after excluding outage times outside the responsibility of the GCI contractor (e.g. local power outages and downtime due to station maintenance or construction work).

International Data Centre

Highlights in 2013

Response to an announced nuclear test by the Democratic People's Republic of Korea

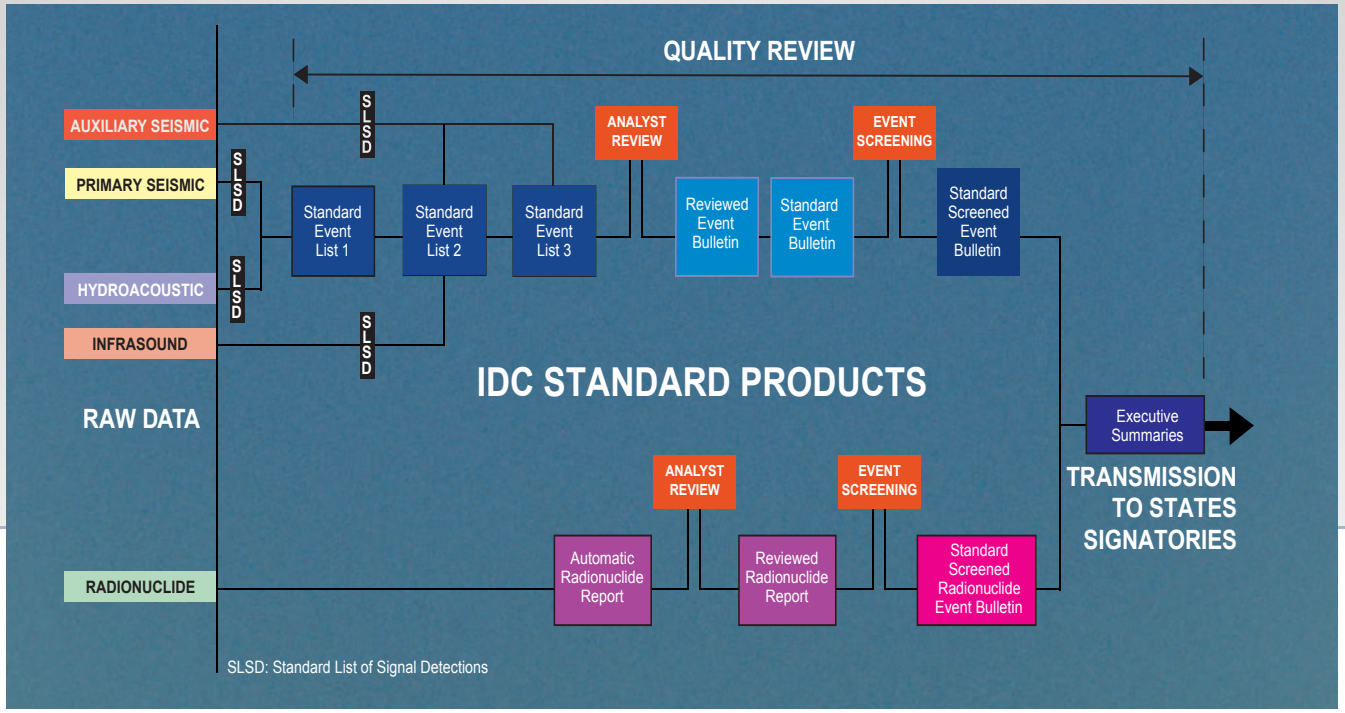
Holding of the Science and Technology 2013 conference, aimed at integrating promising technologies and methods into the verification regime

Collaboration with radiopharmaceutical producers to mitigate the effects of radioxenon emissions

Data analysts at work at the International Data Centre in Vienna.

The International Data Centre (IDC) is situated at the Headquarters of the CTBTO Preparatory Commission in the Vienna International Centre. Its function is to collect, process, analyse and report on data received from facilities of the International Monitoring System (IMS) through the Global Communications Infrastructure (GCI), including the results of analyses conducted at certified radionuclide laboratories. The data and products are then made available to States Signatories for their final assessment. In addition to handling the data and products, the IDC provides technical services and support to the States Signatories.

Full network redundancy has been created at the IDC to ensure high availability of its resources. A mass storage system provides archiving capacity for all verification data, currently covering more than 12 years. The software utilized in operating the IDC is mostly developed specifically for the CTBT verification regime.



Operations

From Raw Data to Final Products

The data collected by the IMS under provisional operations are processed immediately when they reach the IDC. The first automated waveform data product, known as Standard Event List 1 (SEL1), is completed within one hour after the data have been recorded at the station. This data product lists preliminary waveform events recorded by the primary seismic and hydroacoustic stations.

Requests are then made for data from the auxiliary seismic stations. These data, together with the data from the infrasound stations and any waveform data arriving late, are used to produce a more complete waveform event list, SEL2, four hours after recording the data. SEL2 is improved again after six hours have elapsed to incorporate any additional late-arriving waveform data, to produce the final automated waveform event list, SEL3.

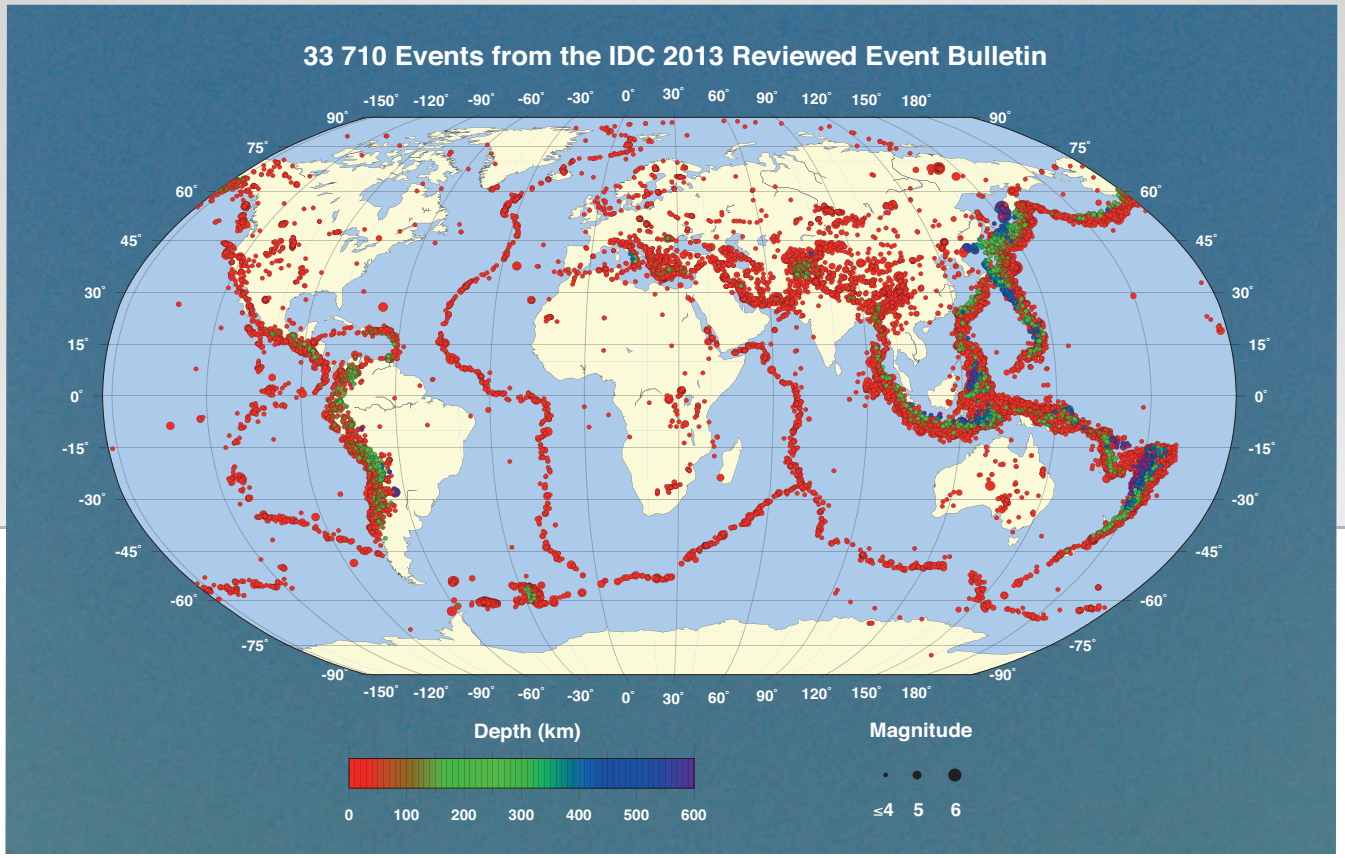
Analysts subsequently review the waveform events recorded in SEL3 and correct the automated results as appropriate to generate the Reviewed Event Bulletin (REB). The REB for a given day contains all waveform events that meet specific quality criteria. During the current provisional operating mode of the IDC, the REB is targeted to be issued within 10 days. After the Treaty enters into force, the REB will be released within two days.

Observations from events recorded by IMS radionuclide particulate and noble gas monitoring stations typically arrive several days later than the signals from the same events recorded by the seismic, hydroacoustic and infrasound stations. Radionuclide data undergo automatic processing to produce an Automatic Radionuclide Report (ARR) and then analyst review to generate a Reviewed Radionuclide Report (RRR) for each spectrum received.

Atmospheric backtracking calculations are performed daily for each of the IMS radionuclide stations with near real time meteorological data obtained from the European Centre for Medium-Range Weather Forecasts. Using software developed by the Provisional Technical Secretariat (PTS), States Signatories can combine these calculations with radionuclide detection scenarios and nuclide specific parameters to define regions in which sources of radionuclides are possibly located.

To corroborate the backtracking calculations, the Commission collaborates with the World Meteorological Organization (WMO) through a CTBTO–WMO response system. This system enables the Commission to send requests for assistance in the case of suspicious radionuclide detections to nine Regional Specialized Meteorological Centres or National Meteorological Centres of the WMO located around the world. The centres respond to these requests by submitting their computations to the Commission with a target response time of 24 hours.

After the data products are generated, they must be distributed in a timely way to the States Signatories. The IDC provides subscription- and Web-based access to a variety of products ranging from near real time data streams to event bulletins and from gamma ray spectra to atmospheric dispersion models.



New Stations in Operations

In 2013, support and build-up of the IMS continued with the testing and evaluation of data from new stations. Nine newly installed or upgraded stations (two auxiliary seismic, two infrasound, one radionuclide particulate and four radionuclide noble gas) and one radionuclide laboratory were introduced into IDC operations as part of the certification process. Other stations awaiting certification were installed in the IDC test bed.

Services

A National Data Centre (NDC) is an organization with technical expertise in the CTBT verification technologies. Its functions may include receiving data and products from the IDC, processing IMS and other data, and providing technical advice to its national authority.

The PTS continued to provide the 'NDC in a box' software package for use at NDCs, enabling them to receive, process and analyse IMS data. Efforts were also made to further improve the software. The software now has the ability to read seismic data in widely used formats and includes radionuclide processing and analysis functionality.

Build-Up and Enhancement

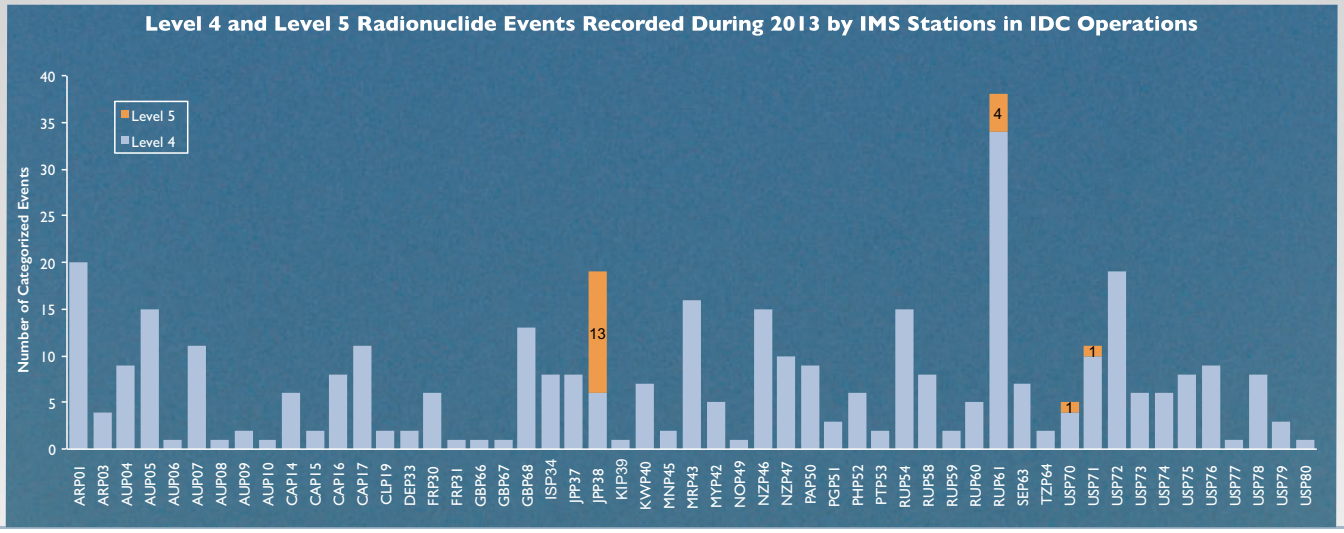
IDC Commissioning

Build-up and enhancement of the IDC further the goal of commissioning the IDC, GCI and IMS. To move from phase 5a to 5b of the IDC Progressive Commissioning Plan, the IDC must ensure that formal security measures are in place to prevent external interference or compromise of IDC operations and products and of other PTS facilities. The necessary security measures are being implemented.

Security Enhancements

Security continued to be addressed on a number of levels, from email, network and Internet to data authentication. Email and Internet security was enhanced through installation of new infrastructures to curb spam and to prevent the introduction of malware in the PTS. Additional controls for improving network security were introduced to ensure that only authorized devices connect to the PTS network.

To ensure the authenticity of IMS data and IDC products, highly secure hardware was installed in the computer centre to manage the private keys that are used by the IDC certificate authority. States Signatories may also authenticate data and products by connecting to dedicated



A Level 4 radionuclide particulate spectrum indicates that the sample contains an anomalously high concentration of a single anthropogenic radionuclide (fission product or activation product) which is on the standard list of relevant radionuclides.
A Level 5 radionuclide particulate spectrum indicates that the sample contains multiple anthropogenic radionuclides at anomalously high concentrations, out of which at least one is a fission product.

certificate repositories which store all certificates generated by the certificate authority. The associated public keys for all IMS facilities are also retrievable from the certificate stores, which in turn have a robust infrastructure.

The single sign-on infrastructure was upgraded to unify and ultimately simplify user management of several disparate systems.

Hardware Enhancements

The external database was transferred to a new server in the database grid, providing NDCs with improved access and performance. The external database is the near real time replica of the IDC verification pipeline database.

Software Enhancements

In preparation for an increase in the resolution of atmospheric transport modelling (ATM) simulations, a new ATM operational system was deployed on the high performance computer system donated by Japan. The new ATM operational pipeline provides reliable acquisition of the meteorological fields, robust ATM simulations and stable ATM computational results to authorized users.

Progress continued with the new regional seismic travel time (RSTT) software and model provided by the USA as part of a contribution in kind for 2012 and 2013. The IDC derived travel time correction files for IMS seismic stations in Eurasia, North Africa and North America using the latest RSTT model (a total of 82 stations). Relocation tests undertaken by the PTS and collaborators validated the projected improvement in location accuracy over using a single standard reference earth model. An integration test to verify operational performance in the IDC development environment was completed in 2013. An operational test will begin in 2014.

The PTS continued the development of new automatic and interactive software that uses state of the art machine learning and artificial intelligence. The NET-VISA software was enhanced to enable it to process hydroacoustic data in addition to seismic data. Testing NET-VISA at the IDC continued, focusing on determining an optimal training strategy as well as studying the effect of including alternative models of prior information in the NET-VISA model. A new interactive model visualization tool allows users to visualize the elements of the NET-VISA model and to explore the scientific and technical documentation for each model element.

International Noble Gas Experiment

Data from the 31 noble gas systems in provisional operation at IMS radionuclide stations continued to be sent to the IDC. The 18 certified systems and one non-certified station which is in the process of certification sent data to IDC operations, while data from the remaining non-certified systems were processed in the IDC testing environment. Significant efforts continued to be undertaken to ensure a high level of data availability at all systems through preventive and corrective maintenance and regular interaction with station operators and system manufacturers.

Today the xenon background is measured as part of the International Noble Gas Experiment (INGE) at 32 locations,

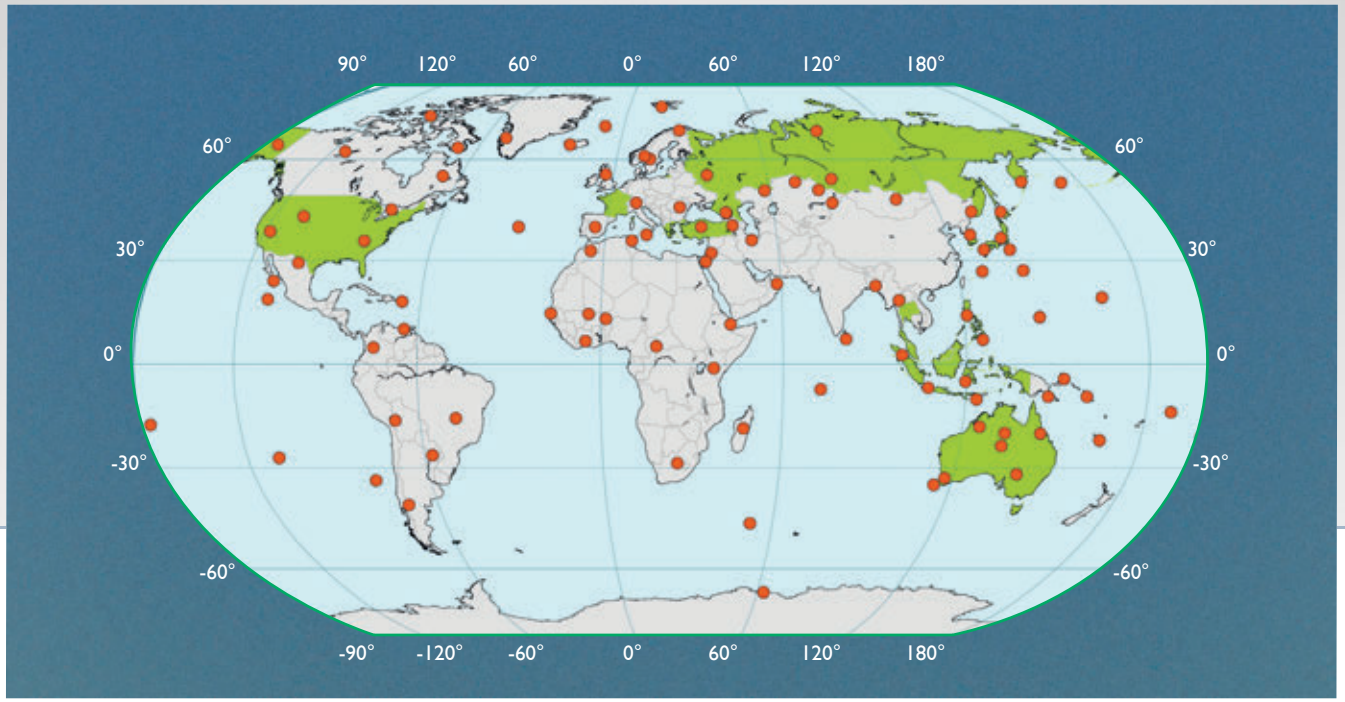
Executive Secretary Lassina Zerbo and representatives of the five producers of radiopharmaceuticals that signed a pledge for radioxenon emission control in 2013.

but is still not understood in all cases. Medical isotope production facilities are the biggest contributor to the radioxenon background. As more medical isotope production plants are expected to start operating, this will lead to an increased number of non-CTBT-relevant detections. Also, the noble gas composition of the emissions from these plants can be similar to emissions from nuclear explosions. A good understanding of the noble gas background is thus crucial for identification of signals from nuclear explosions.

The initiative funded by the European Union (EU) (Joint Action III) to improve knowledge of the global radioxenon background, which started in December 2008, continued in 2013. The objectives of this project are to supplement knowledge on the global radioxenon background over longer periods. This will allow for more representative periods at selected sites by performing measurements for at least six months, to detect local sources, if present, and to provide empirical data for validating network performance, for testing xenon equipment and logistics, for data analysis and for training local experts. Joint Action III and follow-up activities have explored how radiopharmaceutical facilities affect Treaty related noble gas analysis and will improve understanding of the global radioxenon inventory. The data and subsequent analysis will help the PTS better interpret its observations and differentiate between Treaty-relevant events and normal background events.

To continue this important work, Joint Action V supports a two year project begun in December 2012 to further measure the noble gas background and test remediation efforts. This work is also supported by a contribution in kind from the USA, through which the Pacific Northwest National Laboratory conducts background measurements, using an additional portable detection system, and supports facility monitoring and remediation tests. The portable measurement system was shipped to Burkina Faso in June for deployment in the third quarter of 2013. Following the end of Joint Action III, the PTS continued to operate the mobile noble gas monitoring systems in Indonesia and Kuwait. Locations were selected on the basis of the noble gas background information available, the influence from medical isotope production facilities and negotiations with host countries, among other things. The location in Jakarta is in the immediate vicinity of a medical isotope production facility for which emission data are available, thus providing the unique opportunity to correlate emission measurements with sampling data. Emission data were provided to the PTS on a weekly basis. The measurement system in Indonesia will also serve as a backup system for IMS stations that are under maintenance as well as continue to be used for background measurements. Through these measurements, insight into seasonal variations and general background levels can be gained in areas which are poorly covered by the current IMS stations.

Five producers of radiopharmaceuticals have pledged to help the Commission mitigate the effects of radioxenon emissions by reducing emissions, sharing stack monitoring data and continuing to collaborate with the Workshop on Signatures of Medical and Industrial Isotope Production community. These include the Belgium based Institute for Radioelements (IRE), the Korean Atomic Energy Research Institute (KAERI), the Australian Nuclear Science and Technology Organisation (ANSTO), PT Batan Teknologi Company of Indonesia and Coquí Radio Pharmaceuticals Corp. of the USA. Several other producers have expressed interest in learning more about the pledge.



The Commission provides data to tsunami warning organizations in the States indicated in green. The red dots represent tsunami warning stations.

Civic Activities

Provision of Data for Tsunami Early Warning

In November 2006, the Commission endorsed a recommendation to provide continuous IMS data in real time to recognized tsunami warning organizations. The Commission subsequently entered into agreements or arrangements with a number of tsunami warning centres approved by the United Nations Educational, Scientific and Cultural Organization (UNESCO) to provide data for tsunami warning purposes. In 2013, an agreement was finalized with the Geophysical Survey of the Russian Academy of Sciences in the Russian Federation. This brought to 12 the number of such agreements or arrangements: with Australia, France, Indonesia, Japan, Malaysia, the Philippines, the Republic of Korea, the Russian Federation, Thailand, Turkey and the USA (Alaska and Hawaii).

2013 CTBT Science and Technology Conference

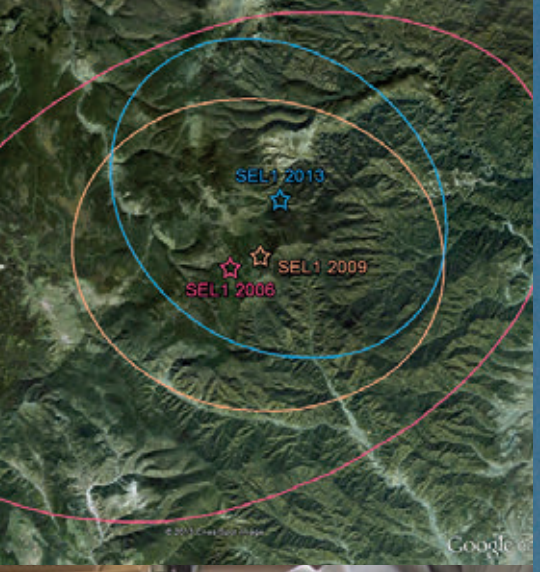
The CTBT verification regime relies on the latest advances in science and technology. It is therefore essential for the Commission to keep abreast of the latest scientific developments. To that end, the organization has continuously sought to promote its interaction with the scientific and technological community through various means, including the convening of Science and Technology conferences.

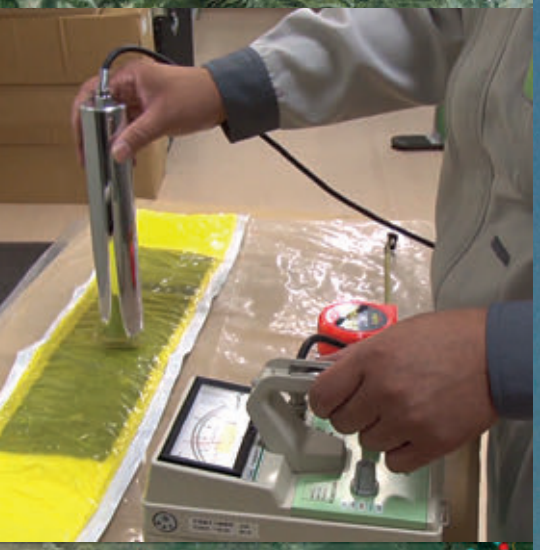
The Science and Technology 2013 conference, held at the Hofburg in Vienna from 17 to 21 June, was the fourth in a series of such conferences. Over 750 participants from approximately 100 countries converged to discuss how to advance the verification regime of the Treaty. The conference began with presentations emphasizing the importance of advancing science and technology as part of global nuclear disarmament and non-proliferation efforts, which were followed by scientific sessions.

The scientific sessions featured presentations and panel discussions. These sessions were organized around three themes: the earth as a complex system; events and their characterization and advances in sensors, networks and processing. Within each theme several topics were identified. The panel discussions addressed synergies between on-site inspection technologies and industry, innovations and technological drivers that will shape the future of verification, and radioxenon anthropogenic release mitigation. The latter subject was an important focus of the conference, with the Executive Secretary Elect and the chief executive officer of the Institute of Radioelements (a major producer of radiopharmaceuticals) signing a pledge to cooperate in mitigating the effects of radioisotope production on the detectability of Treaty-relevant noble gases.

The closing day of the conference included discussions of two recent events of direct relevance to CTBT verification: the announced nuclear test by the Democratic People's Republic of Korea on 12 February and the meteor explosion over Chelyabinsk, Russian Federation, on 15 February.

Scientists made more than 80 oral presentations and 250 poster presentations at the conference. These helped to draw useful conclusions on the overall verification capabilities of the organization as well as new directions that might be pursued by the Commission or by the wider verification community.





Third Announced Nuclear Test by the Democratic People's Republic of Korea

The announced nuclear test by the Democratic People's Republic of Korea on 12 February 2013 was the most recent opportunity to demonstrate the viability of the CTBT verification system and highlight its relevance to global nuclear disarmament and non-proliferation efforts.

Performance of the Verification System

The verification system put on display yet another remarkable performance. All elements of the system worked in a coherent and efficient manner.

The first data and results were made available to States Signatories in little more than one hour and before the announcement by the Democratic People's Republic of Korea. By around 17:00 (UTC) the following day, the REB was issued to States Signatories, well within the time frame specified in the Treaty. Detections were made by 96 IMS stations, 2 of which were infrasound stations. Eighty-eight stations were used in the event location estimate reported in the REB. The magnitude of the event was 4.9 according to the IDC body wave magnitude scalae. The location of the event was estimated within a confidence ellipse with a semi-major axis of 8.1 km.

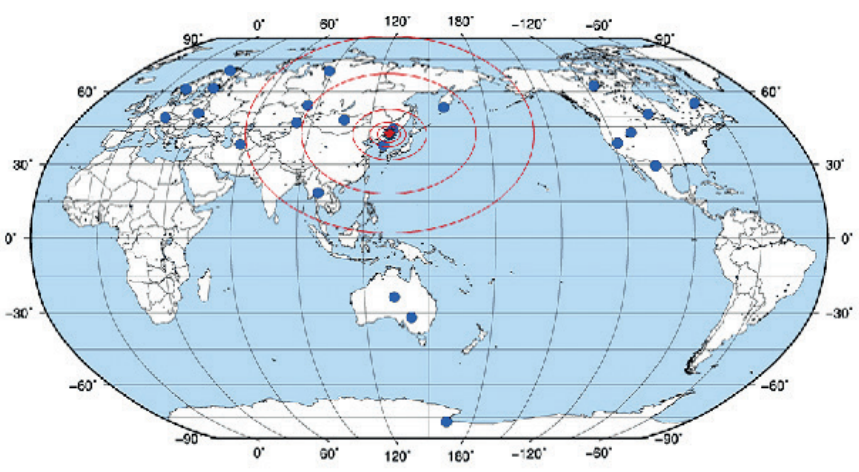
A significant increase was observed in the number of IMS stations that detected the event compared with similar events that took place in 2006 (22 stations detected the event) and in 2009 (61 stations registered the event). In addition, the ability to locate the event indicated more precision: 181 km^2 in 2013 compared with 265 km^2 in 2009 and 880 km^2 in 2006. This is not only a result of the increased size of the events; it also clearly demonstrates the success of the Commission in building the verification system and the significant progress achieved in its full operationalization.

In preparation for the possibility that radionuclides were released, ATM was used to estimate where a possible radionuclide release would be detectable.

Over subsequent weeks the radionuclide monitoring system was observed carefully. Although some stations close to the Democratic People's Republic of Korea made detections shortly after the event that were high relative to global averages, the radionuclides and activity levels were typical for the stations.

On 9 April, 55 days after the announced nuclear test, radioactive noble gases were detected by the IMS noble gas system in Japan with activity levels that were atypical. Isotope ratios and ATM confirmed that the detections were consistent with a nuclear test at the time and place of the announced test, but with a release of gases at a much later date. These detections, so long after the announced test, are illustrative of the monitoring capability of the IMS.

Information on the performance of the verification regime was immediately communicated to the public as it became available. About 2000 articles on the event and the performance of the monitoring system were published in the international media, including in most Annex 2 States.



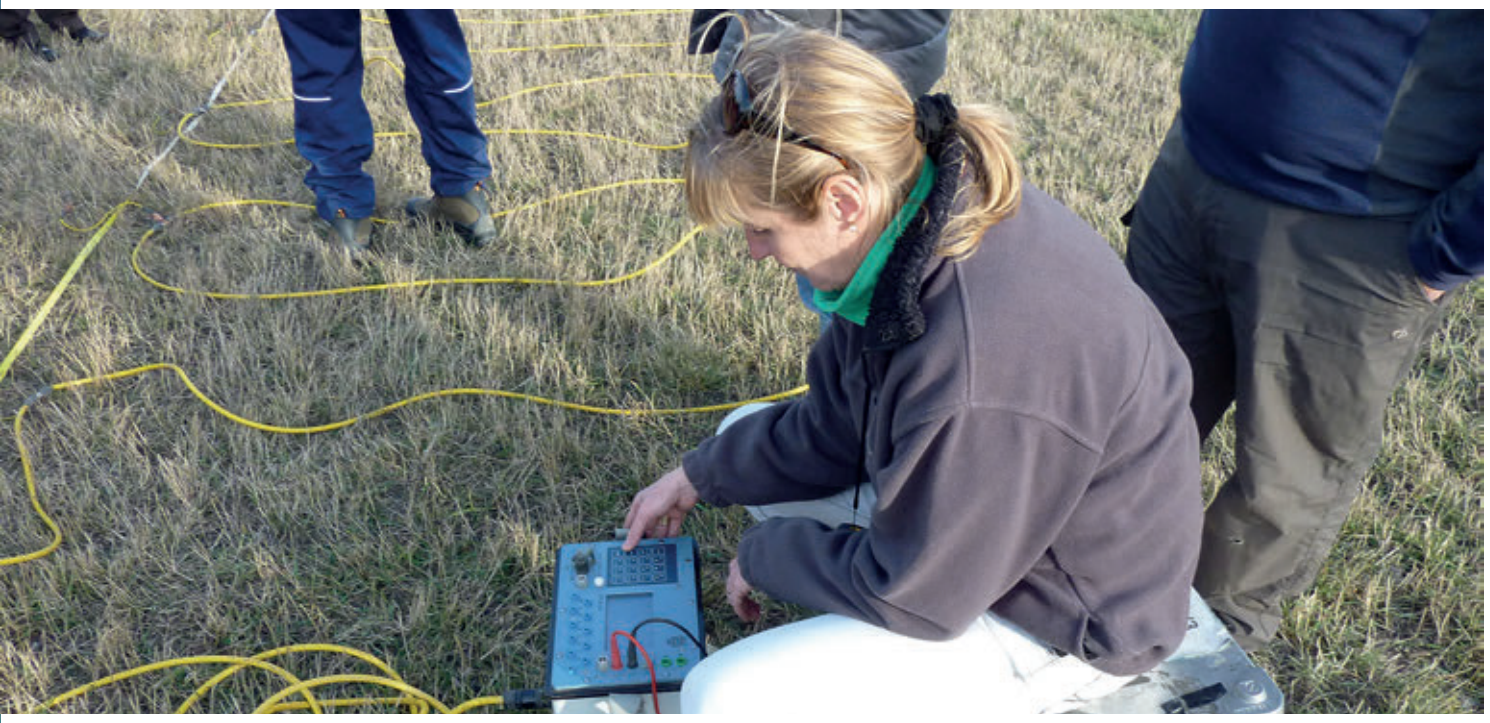
Conducting On-Site Inspections

Highlights in 2013

Conclusion of the four year OSI action plan and completion of the second training cycle for surrogate inspectors

Further progress in preparing for the IFE, including the conduct of BUE III and OSI Workshop-21

Conduct of five field operational tests related to OSI techniques and technologies



Surrogate inspector conducting a geoelectric survey during training for build-up exercise III in March 2013.

The Treaty verification system monitors the world for evidence of a nuclear explosion. If such an event were to occur, concerns about possible non-compliance with the Treaty would be addressed through a consultation and clarification process. States could also request an on-site inspection (OSI), which is the final verification measure under the Treaty and can be invoked only after the Treaty's entry into force.

The purpose of an OSI is to clarify whether a nuclear explosion has been carried out in violation of the Treaty and to gather those facts which might assist in identifying any possible violator.

Since an OSI can be invoked by any State Party at any time, the capability to conduct such an inspection requires development of policies and procedures and validation of inspection techniques. In addition, OSIs require adequately trained personnel, appropriate logistics and approved equipment to sustain a team of up to 40 inspectors in the field for a maximum of 130 days while enforcing the highest standards of health and safety and confidentiality.

The base of operations during build-up exercise III, Veszprém, Hungary.

Progress in Implementation of the Action Plan

At its Thirty-Third Session the Preparatory Commission adopted a comprehensive action plan for further development of the OSI regime. Accordingly, the Provisional Technical Secretariat (PTS) started implementing the action plan at the end of 2009 and has regularly reported to States Signatories on progress.

In addition, in February 2011 the PTS presented a concept for the preparation and conduct of an Integrated Field Exercise (IFE) in 2014.

At the same time, some adjustments to the OSI action plan were introduced in order to bring it in line with the requirements of the IFE in 2014. These adjustments were adopted by the Commission at its Thirty-Sixth Session in June 2011.

The PTS has reported annually on the status of the action plan implementation.

The OSI action plan proved to be the right strategic tool for building the OSI operational capabilities based on the Revised OSI Strategic Plan, a comprehensive assessment of the development of the OSI regime, lessons learned from the main OSI events including tests, training and exercises such as the IFE in 2008, and the evaluation report on the IFE in 2008.

To build on the success of the OSI action plan, the PTS is considering continuing the approach originally proposed in the Revised OSI Strategic Plan, as appropriate, after conduct and evaluation of the IFE in 2014.

2014 Integrated Field Exercise

Preparations for the IFE intensified in 2013 and the remaining task forces were activated. Accordingly, six task forces were established under the leadership of the project management team for planning and preparation purposes. These include scenario design; logistics and operations; health, safety and security; equipment; public information and external relations; and documentation.

Major efforts were devoted to the preparation of a scientifically credible and comprehensive scenario for the IFE. With the support of experts provided by States Signatories, a 'scenario playbook' was prepared that encompasses all information about scenario related preparations and implementation. Scenario preparations culminated in a peer review performed by six external experts from 9 to 13 September in Austria. The prime objective of the review was to assess the scientific credibility of the scenario, the triggering event information and the planned technical methods and approach to stimulate the application of OSI techniques by the inspection team (IT). Peer reviewers found no major flaws or scientific errors in the scenario. At the same time, they recommended a number of refinements, which will be acted upon by the scenario task force.

In parallel, the PTS continued to work in close coordination with the IFE host country, Jordan, which established a national steering committee for the exercise. As part of the preparation process, an implementing arrangement was agreed upon and signed in March and the IFE time frame was agreed upon. Exercise activities will commence on 3 November 2014 in Vienna and conclude with the departure of exercise participants from Jordan on 9 December 2014. Moreover, the exact location

Field team preparing to leave the base of operations for field activities during build-up exercise III.

of the inspection area and the base of operations (BOO) were identified.

Two high level meetings between the PTS project management team and the senior representatives of the host country planning team were conducted in April and October respectively to address joint planning and preparation aspects. In addition, members of the IFE task force paid a working visit to Jordan from 29 to 30 October, during which contact at the operational level was established and progress in a number of related areas was made.

The PTS has undertaken a number of public information related activities. The IFE14 web site was launched on the occasion of a visit by the Executive Secretary to Jordan in December. Additionally, the PTS prepared informational brochures in English and Arabic and a brief film about joint PTS and Jordanian activities. Furthermore, progress on the development of the media and public information strategy for the IFE was made in close cooperation with the Jordanian counterparts.

Regarding health and security, Jordanian medical capabilities and contingency measures were discussed and two hospitals which fully meet the required standards were visited. The security of IFE participants was addressed at a meeting with Jordanian authorities and representatives from the United Nations Department for Safety and Security in Amman. The visit resulted in further clarification of radiation protection related issues, including the transport and storage of radiation sources and material for scenario play purposes. The PTS engaged with the site modification engineer and shared preliminary information on the activities to be carried out. Site modifications are envisaged to take place in spring 2014. Further insight was obtained on logistical aspects with regard to the suitability of accommodation at the point of entry (POE) at the Amman airport and the appropriate location for the BOO was identified in the course of the visit.

Further progress was made in arranging for the long term provision of inspection equipment offered by States Signatories for the IFE. Agreements with Canada, China, the Czech Republic, Finland, Hungary, Italy, Japan, the United Kingdom and the United States of America were concluded. Moreover, detailed discussions regarding the delivery of the equipment to the PTS for training purposes in advance of the IFE were held.

As part of implementing the detailed concept for the preparation and conduct of the next IFE, the PTS successfully conducted the third build-up exercise (BUE) from 26 May to 7 June at a military training site near Veszprém, Hungary, and at the Equipment Storage and Maintenance Facility (ESMF) in Guntramsdorf, Austria. The aim of BUE III was to further develop operational capability for the IFE by exercising the inspection phase of an OSI. Participants engaged in the practical application of selected OSI techniques, replicating the planning, managing and performing of a 12 day field mission. The scope of the exercise was to test in particular the newly developed core/critical inspection technologies, including the respective concepts of operations related draft OSI Operational Manual procedures, standard operating procedures (SOPs) and other documents, as well as aspects related to the inspection team functionality (ITF) concept under field conditions and in a tactical exercise environment.

A total of 146 individuals participated in the exercise, covering all needed roles (e.g. IT, inspected State Party

Setting up a portable high purity germanium radionuclide identifier during build-up exercise III.

Surrogate inspectors at build-up exercise III training in Guntramsdorf, Austria.

(ISP) and Operations Support Centre (OSC)), including an evaluation team of 12 experts. Findings and observations from BUE III indicated considerable progress since the IFE in 2008 in areas such as health and safety (H&S); BOO layout, organization and maintenance; IT organization and structure; integration of techniques; ITF and search logic; communications between the IT and the OSC; the Integrated Information Management System (IIMS) concept; and radioactive noble gas sampling. In line with the identified findings and recommendations, the PTS also worked on the legal aspects of the IFE preparations, such as the development of internal guidelines for the provision of legal support during an OSI.

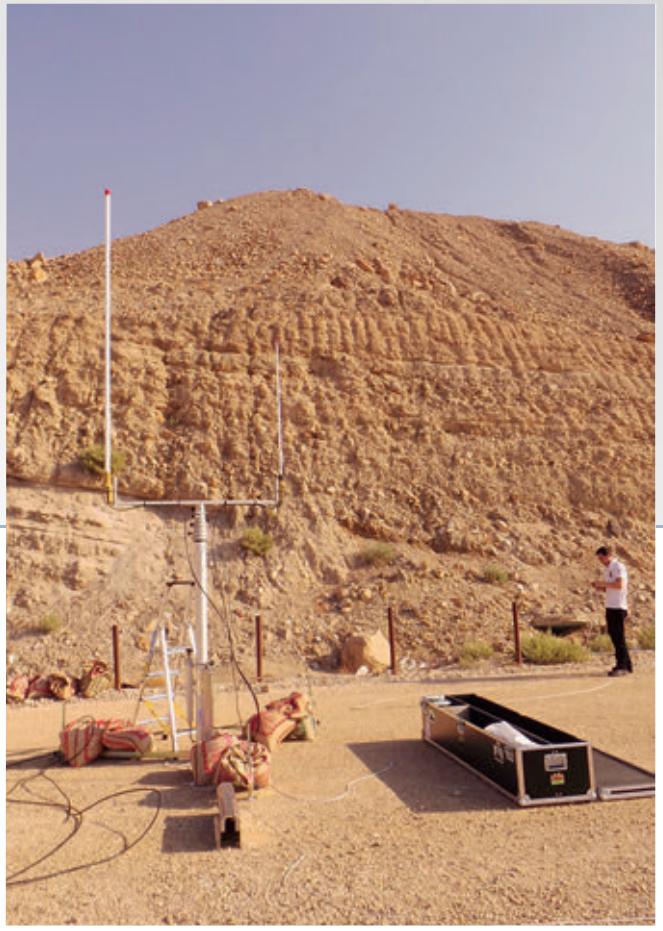
Opportunities for progress in advance of the IFE remain in a number of areas. These include greater integration of ITF, IIMS and the field information management system (FIMS); improvement of IIMS implementation and software; improvements in the planning, preparation, documentation and training required in relation to the radionuclide field laboratory; improvements in sample collection equipment use and procedures; further hands-on training on equipment operation and associated procedures; improvements in operational security at the BOO; and further improvement of existing documentation related to radionuclide and continuation period techniques (CPTs) as well as H&S.

Policy Planning and Operations

Activities during 2013 focused on preparations for the IFE and preparation and conduct of BUE III, including its follow-up. As part of these activities, the methodology and technical support needed for an IT to conduct an inspection were finalized. Taking into account the lessons identified from BUE III, the ITF concept was updated. Amendments included a revision of the time lines for implementation of the search logic methodology, guidance to the IT on how to find a balance between the collection of data within the inspection area and the analysis and reporting of results and, especially, guidance for the conduct of field missions. In this respect, BUE III identified the need to create a separate SOP for field teams covering the preparation of field teams, the activities to be performed before starting field missions

Surrogate inspectors operating the Geoprobe during build-up exercise III training.

Contamination control activities during build-up exercise III.



Setting up UHF and VHF antennas during the communications expert meeting and field test in Jordan, November 2013.

and the activities to be performed upon return to the BOO. This document is under preparation and will be ready for the IFE preparatory training in June 2014.

With respect to work on FIMS, further integration into the IIMS/ITF was implemented and a new, improved system architecture was introduced. An expert group meeting on the geographical information system (GIS) was conducted from 13 to 17 May at the ESMF. A total of 23 experts from States Signatories, United Nations based organizations and the PTS participated in the activity. The meeting focused on evaluating the new custom designed GIS solution and its technical performance after integration with the IIMS/ITF. A number of valuable recommendations were obtained and are being implemented. As a result, an improved and optimized GIS solution will be fully available for the IFE. The GIS solution was successfully used during the communications expert meeting in Jordan in November to facilitate the representation of radio coverage in the field.

Testing and development of the IIMS continued. Changes were made in the server system architecture to allow integration of the IIMS with the ITF and FIMS/GIS solution. Integration of the server architecture with the other OSI technologies, such as the Seismic Aftershock Monitoring System (SAMS) and visual observation, was also initiated. The chain of custody of OSI samples was put into effect during BUE III using the IIMS as a central information management platform. On the basis of lessons identified from BUE III, the IIMS chain of custody for samples and relevant data flow were further tested during the field test of radionuclide techniques in Slovakia in September. Additionally, software interfaces for uploading and downloading of relevant IIMS data to/from radionuclide laboratories were developed. Software licences for IIMS receiving and working areas were purchased and installed. An initial draft graphical guide on IIMS processes and procedures was also developed.

With respect to work on OSI communications, an expert meeting/field test was carried out in Jordan from 18 to 22 November. A total of 24 experts from States Signatories, the PTS and the host country participated in the event. Activities focused on testing various means of communications, including the car mounted HF/UHF/VHF equipment kit, the GATR very small aperture terminal equipment used at the BOO and handheld radios and satellite phones. The field test showed that despite the very challenging terrain the communications equipment worked satisfactorily, underlining the validity of the communications concept developed by the PTS.

In relation to the OSC the focus was on the review of the lessons identified during the three BUEs and their implementation in the quality management system (QMS) documentation, mainly in the SOP on the set-up, organization and activities of the OSC and the subsidiary work instructions (WINs). The objective was to make the whole package consistent and ready for the preparation of IFE training.

The Operations Support Centre in Guntramsdorf, Austria, during build-up exercise III.

Loading inspection equipment at the Equipment Storage and Maintenance Facility for use during build-up exercise III.

Operations Support and Logistics

The PTS focused on the implementation and integration of logistics related lessons identified during BUE I and BUE II/IV along with final operational testing of the integrated system during BUE III in Hungary. Activities included testing of the procedures and processes and their practical implementation at the ESMF, testing of equipment modules to be utilized with the Intermodal Rapid Deployment System (IMRDS), testing and implementation of the revised H&S concept, and implementation of further improvements for the BOO, including the utilization of new capabilities. The results of the implemented Integrated Inspection Support System were highly visible in BUE III. The implementation of new logistics procedures and processes along with clear roles and responsibilities within the IT provided more efficient management of assets, stocks and services during field deployment and resulted in more effective interaction between the IT, ISP and OSC. The full implementation of the Hardcat asset tracking system significantly improved the documentation to be used at the POE.

Considerable progress was made in the further integration and enhancement of OSI operational support capabilities, including enhancements in the OSC infrastructure, processes and procedures and the databank. The inspection planning module in the databank was successfully linked with the ESMF inspection equipment database, enabling its use during the inspection planning phase for selection of equipment and preparation of the inspection mandate. The Hardcat database structure was reorganized to enable better reporting and easier information sharing with multiple applications at the same time. The structure of the OSC was streamlined and enhanced by a supporting group of technical specialists; new visualization tools and daily procedures for exchange of information along the IT–OSC–PTS management line were proposed and tested. New provisional OSI confidentiality related procedures were also developed. OSC capabilities were extended by means of an improved computer infrastructure and a designated workstation for the management of classified documents.

The process to extend the leasing agreement for the ESMF for another 2.5 years was completed. During the reporting period, the ESMF underwent an external audit. A physical inventory of OSI items stored at the ESMF was performed. The inventory process was successful and with the use of the Hardcat system it was smooth and effective. The ESMF again proved its capability to function as a multipurpose facility in supporting multiple training events and exercises as well as providing a space for the storage, maintenance and calibration of all OSI equipment. Lessons identified during BUE I and BUE II/IV were implemented to further refine the ESMF infrastructure and processes and applied during BUE III. Rapid and flexible deployment capability was achieved via redesigned deployment kits and equipment modules, which were repacked and sorted into system modules. Loading schematics for each technology module and for BOO items were developed to enable faster and more effective loading and repacking of the modules in the containers.

H&S capabilities for OSI were significantly enhanced. Following the H&S regime update in the first half of 2013, the PTS created updated versions of H&S relevant subsidiary QMS documentation for the needs of OSI. Progress was made towards compilation of the final draft of the H&S chapter of the draft OSI Operational Manual. Technical capabilities associated with H&S

Surrogate inspectors at training courses in China in 2013: troubleshooting (*left*) and operating the XESPM xenon detection system.

and medical services in the field were also upgraded. Medical equipment and medical supplies for the BOO received in February were already used in the field by surrogate inspectors in May. In addition, the PTS started to address issues related to the practical application of in-field security and safety through the identification and management of possible health- and life-threatening factors and various combinations of these factors. This work took into account the individual characteristics and the nature of the work of each trainee, the specific health status and operational in-field medical, first aid and H&S advice and support provided before and during OSI training and exercise activities.

Finally, the Logistics and Operations Support Section provided all operational and logistical support to the conduct of multiple training events, expert meetings and exercises in Austria, Jordan, Slovakia and Hungary.

Techniques and Equipment

During 2013, activities were undertaken towards further implementation of action plan projects in order to ensure the operational readiness of OSI equipment and associated procedures for BUE III and the IFE in 2014. These activities covered the spectrum from equipment development to the testing of procedures and training, as well as the preparation of documents for surrogate inspectors such as SOPs and WINs.

BUE III constituted a major event involving the deployment of all PTS inspection equipment and the integration of available systems provided as contributions in kind. In advance of BUE III, all inspection equipment was tested and prepared for deployment and items to facilitate sample collection were procured. All relevant calibration and certification procedures were also performed. Similarly, inspection equipment was tested upon its return to the ESMF following the event and maintenance was performed as required.

OSI noble gas equipment development focused on noble gas processing, measurement and detection systems, where innovative solutions were sought to meet the requirements of an OSI. Through contributions in kind and European Union (EU) funding, major developments took place to secure the operational readiness of noble gas processing systems for the IFE. A factory acceptance test of the Xenon Sampling, Purification and Measurement System (XESPM) from China was successfully conducted in November. The PTS continues to support XESPM for nuclear decay measurements by means of initiating the integration of devices such as silicon PIN diode detectors. Furthermore, during the noble gas systems training in China, surrogate inspectors were trained in the operational and logistical aspects of noble gas processing and detection equipment, specifically XESPM and the Movable Argon-37 Rapid Detection System (MARDS). The latter is a unique mobile detection system for argon-37.

To test OSI noble gas equipment and procedures a field test was conducted in Sweden, during which the full noble gas chain, including sampling site selection, field sampling, processing with the new Swedish Automated Unit for Noble gas Acquisition (SAUNA) system and analysis of measurements, was successfully tested. For intercomparison purposes, subset samples were shipped to laboratories in China, the USA and Switzerland. The evaluation of results is in progress. The full SAUNA system, including the detectors in a custom made shield and the final archiving system, was verified to work according

Familiarizing trainees with a liquid nitrogen generator during build-up exercise III training.

Demonstrating the use of the subsurface noble gas sampler during build-up exercise III training.

to requirements during a factory acceptance test in autumn.

Understanding of underground noble gas processes, sampling and processing equipment as well as associated measurements was further enhanced through an expert meeting, the International Noble Gas Experiment (INGE) workshop and research on the global background of argon-37. The INGE workshop, hosted by the PTS in Vienna, included an OSI session focusing on topics relevant to the IFE in 2014. These included discussions on subsurface gas transport and identifying optimal sampling locations, subsurface gas sampling techniques and noble gas processing and measurement equipment. The findings of the workshop will inform future development by the PTS as well as the global noble gas expert community. Efforts to better understand the global background of argon-37 intensified in 2013. Scientific developments were presented during a technical seminar in Vienna at the end of the year. This work is important because it aims to identify a baseline for argon-37 in subsoil gas, which is crucial for the appropriate interpretation of argon-37 measurements during an OSI.

There were significant developments in both hardware and software in the radionuclide field laboratory. A field deployable liquid nitrogen generator was developed to cool gamma ray detectors. A solid assembly of lead bricks was also constructed so as to avoid disassembly for shipping, resulting in a significant saving of time. Work also began to characterize several gamma ray detectors for various sample counting geometries that allow accurate conversion of measured radiation into levels of activity. To deal with the potentially large number of samples collected during a series of missions, techniques were devised, based on discussions during an expert meeting, to facilitate handling (without cross-contamination) of a large number of environmental samples, counting the radiation levels in several samples simultaneously and identifying anomalous samples for further analysis. The radionuclide field laboratory was further streamlined through the purchase, installation and integration of a commercial data acquisition system, together with software provided as a contribution in kind that facilitates data acquisition, analysis and management.

To test the modifications made to radionuclide equipment and procedures, including those based on recommendations from the BUE III evaluation, a field test was conducted in Slovakia in September. The goal was to validate the radionuclide environmental sampling chain from the collection of samples through to analysis and reporting. The test allowed team members to evaluate, under field conditions, the suitability and robustness of the equipment and the relevant data flow for environmental sampling and analysis of radioactivity during the course of an OSI. In addition to testing the newly configured soil sampling kits, the full chain of custody was exercised within the IIMS, which now allows for sample tracking via barcodes.

A coordination meeting between Austrian authorities and the PTS was held in November to discuss the steps for acquiring permission to store and handle radioactive sources above exemption limits. Furthermore, Seibersdorf Laboratories was contracted to assist in the preparation of the required documents.

The radionuclide detection capability of the PTS was significantly enhanced in 2013 by the donation of an airborne gamma spectrometer by Canada. The system was tested in Italy in September on board an AS355

Field testing of the multispectral including infrared system, Veszprém, Hungary.

helicopter. The system was installed by Natural Resources Canada staff, who also conducted test flights under the supervision of the PTS. The system performed according to specifications. Surrogate inspectors as well as PTS staff were trained on the operation of the system and were also responsible for dismounting the system.

Also in the field of airborne technology, the PTS engaged in the development of an integrated multispectral system capable of acquiring data from a helicopter or fixed wing aircraft. Through EU funds and a contribution in kind from Hungary, a flexible integrated system was developed to generate high spectral and high spatial resolution imagery for OSI purposes. A test of the system was performed in Jordan in November, which involved the installation of the system on board an AS332 helicopter of the Royal Jordanian Air Force. The system performed as expected during flight testing and generated stable video and high quality imagery in the near infrared and thermal portions of the spectrum.

In addition to training during the airborne gamma spectrometer field test, support was provided to other OSI training events, including those on noble gas equipment in China, airborne skills in Italy and BUE III at the ESMF. A number of SOPs and WINs prepared for BUE III were also used during training events and subsequently updated on the basis of feedback.

In advance of IFE preparatory training in 2014, a seismic data set was acquired using SAMS equipment in the area of Ebreichsdorf in Lower Austria over six days in October. The system was set up in response to a series of small earthquakes in the area, some of which were captured in the data set. The data set will be used to provide SAMS training for surrogate inspectors to enable them to process data and, in particular, to isolate OSI-relevant signatures.

Training

In parallel with the training of surrogate inspectors nominated for the second training cycle, the PTS embarked on the training of potential participants for the upcoming IFE. This undertaking was characterized by complex field training exercises and advanced equipment training which reflects and responds to the increasing skill of the surrogate inspectors, as well as the requirements of the IFE in 2014.

Training for BUE III was delivered at the ESMF and in the surrounding areas from 4 to 15 March. This training involved a total of 84 trainees representing 38 States Signatories and the PTS. During the first half of BUE III training, technology focused units were conducted for the visual observation (VOB), CPT, radionuclide, SAMS and logistics and administration sub-teams, with separate training for OSC staff. In the second half of BUE III training, participants came together for sessions in negotiation skills related to managed access, H&S and ITF/IIMS/FIMS training. BUE III training was the last in a series of training sessions designed to prepare participants for the challenge planned in the final block of the training cycle: the BUE III field exercise and, subsequently, the IFE.

The radioactive noble gas equipment training course took place in China from 18 to 27 April and included 10 participants from 6 States Signatories and PTS staff. The purpose of the course was to train selected surrogate

Training on the MARDS II argon-37 detection system in China, April 2013.

Surrogate inspectors handling the airborne magnetometer during airborne techniques skills training in Italy, September 2013.

inspectors of the radionuclide sub-team and PTS technical experts on the concepts, components, operation and maintenance of equipment offered by China as a contribution in kind. The training covered the second-generation MARDS and XESPM detection systems. Both are designed for use in subsoil sampling of their respective noble gas targets. XESPM can additionally be used for ambient atmospheric xenon sampling.

Cross-training with the VOB, CPT and radionuclide sub-teams took place from 18 to 26 September in Sicily, Italy. The airborne techniques skills training course involved 11 surrogate inspectors from 10 States Signatories. The objective was to train a group of surrogate inspectors in the operation of airborne equipment that will be used during the IFE in 2014 and to develop the supporting skills in planning, surveying and navigation that are required to examine a region of interest both from the air and on the ground. Participants worked together to apply the skills of their respective disciplines in both airborne and ground based missions, emphasizing equipment handling, data acquisition, flight planning and field mission planning needs. A significant part of the training was devoted to familiarizing participants from the radionuclide sub-team with the installation, operation and dismantlement of the new airborne gamma equipment provided by Canada as a contribution in kind.

IFE host country training was conducted in Jordan from 1 to 6 December. This training was designed to assist National Authority personnel in their effective preparation for the IFE as members of the ISP, and as supporting partners to the exercise management. Sixty State nominated participants were trained through engagement in procedural and informal interactions (from POE and equipment check to ad hoc daily contacts) with other exercise participants. Attention was directed towards the needs of large international teams, according to the plans and programme of the IFE project management.

In 2013, training activities built upon the steady progress of previous years in improving data on surrogate inspectors. A group of active surrogate inspectors was asked to verify their records and provide additional data, including more detailed information about skills and expertise. This enhanced information will facilitate better informed and focused planning in the coming year. Consolidating data in the new, more robust and secure OSI Division databank will eliminate the duplication of effort and resources expended on maintaining information for inspector call-up and training.

The status of inspectors and inspection assistants was discussed at the Fortieth Session of Working Group B in March 2013. In particular, an amendment to the Model Agreement was agreed to. The amendment provides for a revised draft model exchange of letters between the

Demonstrating an equipment check procedure during host country training in Jordan, December 2013.

Panel discussion on preparations for the 2014 Integrated Field Exercise during OSI Workshop-21 in China, November 2013.

The visual observation expert group during OSI Workshop-21.

Comprehensive Nuclear-Test-Ban Treaty Organization and a State Party for the nomination of an inspector. The amended model defines more clearly the options and time frames for the confirmation of availability and reporting for duty of an inspector with the Technical Secretariat.

The e-training simulation system was upgraded. The radioactivity contamination simulation system was demonstrated by the manufacturer (Argon, Inc.) to interested Sections. The Training Section continued the process of gathering input on creative ways to use these systems in tandem with traditional training methods.

A development process for two new e-learning modules on inspection team information flow and OSI H&S was initiated at the end of 2013.

The year 2013 was an active and productive year in the area of OSI training, with both large scale and more focused training being conducted. BUE III served as the field training exercise of the second training cycle as well as the final training exercise of the cycle. By the end of the second training cycle, 65 surrogate inspectors had been added to the roster, bringing the total to 118 surrogate inspectors.

Procedures and Documentation

The PTS continued to provide substantive, technical and administrative assistance to Working Group B in its third round of elaboration of the draft OSI Operational Manual at its Fortieth and Forty-First Sessions. This included a further update of the Model Text, issued in July for use during the IFE in 2014, as well as an index, issued in November.

OSI Workshop-21 was held in Yangzhou, China, from 11 to 15 November. Seventy-one experts from all geographical regions participated, including 53 experts from 21 States Signatories and 18 experts from the PTS. The workshop included a debriefing on BUE III and discussions on the lessons learned and preparations for the IFE.

The workshop covered all aspects of BUE III, including ITF, techniques, equipment, H&S, command post activities, operational sustainability, communications, the OSC and interaction of the ISP with the IT, and identified valuable lessons learned for the IFE. A number of useful suggestions for the IFE were also made during the workshop.

OSI documents related to the QMS of the PTS were drafted and approved in preparation for BUE III, related training activities and for the IFE in 2014. By the end of 2013, 12 SOPs and WINs had been approved and issued. There are 44 documents with the status of draft or rough

draft, of which 11 draft documents have undergone review. A staggered, coordinated approach to the development of OSI QMS documents was introduced, with the aim of ensuring that as many documents as possible are reviewed and approved in time for the IFE and related training activities.

The final phase of the conversion of the OSI document management system to an OSI e-library was completed. The e-library moved to a production environment and was interfaced with other systems in the PTS, and its functionality was expanded to provide on- and offline functionality at headquarters and in the field. Work began on populating the e-library with documentation for the IFE in 2014.

Capacity Building

Highlights in 2013

Considerable increase in capacity building activities of the Commission

Offering a total of 20 weeks of NDC analyst training courses

Launching the first purely e-learning based NDC capacity building course

Experts from developing countries participating in a technical hands-on training course in Vienna, April 2013.

The CTBTO Preparatory Commission offers States Signatories training courses and workshops in technologies associated with the International Monitoring System (IMS), the International Data Centre (IDC) and on-site inspection (OSI), thereby assisting in the strengthening of national scientific capabilities in related areas. In some cases, equipment is provided to National Data Centres (NDCs) to increase their capacity to participate actively in the verification regime by accessing and analysing IMS data and IDC products. Such capacity building serves to enhance the technical capabilities of States Signatories throughout the globe, as well as those of the Commission. As technologies expand and improve, so too do the knowledge and experience of designated personnel. Training courses are held at the Headquarters of the Commission, as well as in numerous external locations, often with the assistance of hosting States. The capacity building programme is funded through the Regular Budget of the Commission as well as through voluntary contributions from the European Union (EU) and Monaco and a contribution in kind from the United States of America.

NDC Capacity Building and Regional Seismic Travel Time Workshop and Training in San Juan, Argentina, October 2013.

Capacity Building Phases

The capacity building programme of the Commission for States Signatories includes training courses and workshops, software provision, equipment donations and technical follow-up visits. The programme, which continues to be supported by contributions from the EU, consists of various phases:

- Development of country profiles for all States Signatories
- Organization of regional NDC development workshops
- Two week training courses for NDC technical staff
- One month NDC analyst training courses
- NDC visits by one or more technical experts
- Provision of basic NDC computer equipment and software.

The programme has been considerably enhanced with e-learning, which is being used on a routine basis and as a prerequisite for all training events for NDC technical staff, station operators and surrogate OSI inspectors. The modules are made available for authorized users, station operators, OSI inspectors and Provisional Technical Secretariat (PTS) staff.

Country Profiles

A standard country profile for all States Signatories has been developed. This profile contains the information available at the PTS regarding the number of authorized users from the State, the use of IMS data and IDC products and participation in previous training events. The profiles serve as a reference before and during events and meetings with States.

NDC Development Workshops

Four NDC development workshops were conducted in 2013: in Port Vila, Vanuatu, in Daejeon, Republic of Korea, in San Juan, Argentina, and in Ouagadougou, Burkina Faso. Their purpose was to promote understanding of the Treaty and the work of the Commission and to enhance national capabilities of States Signatories in the implementation of the Treaty. They also provided a forum to promote both the exchange of experience and expertise in the establishment, operation and management of an NDC, and the application of verification data for civil and scientific purposes.

The workshops included presentations from the Commission emphasizing the information needed to build and sustain NDCs, and from representatives of NDCs in different stages of development. They also provided

Participants in the NDC development workshop visiting the transportable xenon laboratory in Ouagadougou, Burkina Faso, October 2013.

National Data Centre staff and station managers from China at a technical training course in Vienna, August 2013.

opportunities for the PTS to collect additional information to update the country profiles. Two of these workshops were combined with training on sharing data and cooperating on the Regional Seismic Travel Time Model (RSTT) in the South East Asia, the Pacific and the Far East (SEAPFE) and the Latin America and the Caribbean (LAC) regions. The workshop in Burkina Faso included a visit to the transportable xenon laboratory and put an emphasis on radionuclide monitoring in Africa. The workshop in the Republic of Korea focused on analysis of the announced nuclear test by the Democratic People's Republic of Korea in 2013 as a common exercise among East Asian NDCs.

NDC Analyst Training

Further to the NDC development workshops, two training courses on "NDC Capacity Building: Access and Analysis of IMS Waveform Data and IDC Products" were held in Vienna for all regions. During the courses, participants were trained in accessing IMS data and IDC products, downloading and installing the 'NDC in a box' software and analysing data.

The most advanced and intense NDC analyst training course, with a duration of one month, was offered four times due to high demand after its successful launch in 2012. The objectives of the course were to further strengthen the capacity of States Signatories to participate in the verification regime and to enhance their use of PTS data and products for civil and scientific applications. This type of course enables participants to deepen their knowledge in data and products analysis through real-life, hands-on training exercises as well as interaction with analysts working at the IDC.

Sharing experience during a training course in Vienna.

For the first time, the PTS organized a training course for NDC radionuclide analysts. This was based on the new radionuclide software in the NDC in a box package and was conducted with experienced analysts on an exploratory basis to gain experience and collect feedback on the optimum design for future radionuclide analyst training courses.

NDC Support

As part of the capacity building strategy of the Commission, sets of equipment that provide an adequate technical infrastructure for NDCs were purchased by means of the Regular Budget and Joint Action IV of the EU. The equipment was delivered and installed by PTS technical experts at eight NDCs and further deliveries were planned for early 2014. The equipment, provided as part of the technical assistance given to States Signatories to establish or strengthen their NDCs, enhances the

Participants in the first Public Key Infrastructure operator training course in Vienna, November 2013.

capacity of an NDC to participate in the verification regime and to develop civil and scientific applications in accordance with national needs.

Software to process and analyse IMS data is made available to all authorized users. The tool for analysing seismic data (Geotool) was enhanced in 2013 and the tool for post-processing of atmospheric transport results (WEB-GRAPE) was improved. After incorporating feedback from beta testers, the first release of the radionuclide software was included in the NDC in a box software package. This is identical to the software used at the IDC to process and analyse all radionuclide samples, particulate as well as noble gas. A software licence agreement for SeisComP3 was signed that will allow the PTS to develop an extended NDC in a box software package using SeisComP3 for processing in combination with other tools for storing and analysis.

NDCs receive technical support upon request. This covers data access, special data handling, software issues and questions related to data analysis.

A diverse range of training events for station operators was provided in 2013. Station managers and station operators benefited from 14 courses, largely on the use and maintenance of equipment, but also covering procedures related to reporting and communication with the PTS. This included the first training for Public Key Infrastructure (PKI) operators on PKI and data surety, as well as a special programme for managers of IMS stations and the NDC in China on the procedures for data transfer, the testing and evaluation process and ways to ensure the sustainability of the IMS segment in China.

The e-learning system was expanded by 6 new modules (bringing the total to 42 modules) and 7 further modules were translated into the official United Nations languages (bringing the total to 18 modules). The first purely e-learning based NDC capacity building training course, on access and application of IMS data and IDC products, was launched.

Workshops on Monitoring Technologies

Four workshops were successfully conducted in 2013, three of which were hosted in Vienna as part of the efforts of the Commission to reduce expenses related to travel.

A workshop for radionuclide laboratories, from 20 to 23 May, in combination with a knowledge sharing session for uncertified laboratories or laboratories under revalidation, from 26 to 28 May, was held in Jerusalem and Yavne, Israel. The workshop allowed experts to discuss and address developments and issues pertaining to laboratory certified operations, intercomparison exercises of particulate and noble gas samples, as well as certification and surveillance assessment and measurements. The workshop also provided a forum to share operational experience and lessons learned and to discuss advances in gamma spectrometry and noble gas measurements. The knowledge sharing session aimed to support uncertified laboratories or laboratories undergoing revalidation in meeting IMS certification requirements.

The PTS also organized the annual Infrasound Technology Workshop in Vienna from 7 to 10 October. The objective was to create an international forum for presenting and

Participants of the fourth Workshop on Signatures of Medical and Industrial Isotope Production at the Vienna International Centre, November 2013.

discussing recent advances in infrasound research and operational capabilities of global and regional networks. The topics covered during the workshop included infrasound instrumentation, modelling, data processing, station performance and network detection capabilities, as well as analysis of infrasound sources and civil and scientific applications of infrasound. A total of 76 participants from 30 countries, together with 12 international staff of the PTS, participated in the various sessions.

The PTS also hosted the International Noble Gas Experiment (INGE) Workshop 2013 in Vienna from 4 to 8 November. More than 90 participants from 23 States Signatories as well as PTS staff attended the formal presentations and discussions. The workshop aimed at further developing the noble gas technology in order to meet the requirements for noble gas monitoring at entry into force of the Treaty. Topics covered included OSI, noble gas background and atmospheric transport modelling, analysis and calibration, science and technology, quality assurance/quality control and engineering operations. A total of 40 recommendations and observations originated from the discussions, which formed recommendations addressed to Working Group B, the INGE community and/or the PTS.

The PTS also organized jointly with the Pacific Northwest National Laboratory the fourth workshop on signatures of medical and industrial isotope production (WOSMIP IV) in Vienna from 11 to 13 November. The workshop brought together 82 experts from 25 countries from the isotope production and radionuclide monitoring communities to continue discussions on the challenges that effluents from medical isotope production present for nuclear explosion monitoring. This workshop continued to promote coordination and collaboration between these two distinct scientific communities in an effort to discover ways to mitigate the effects of isotope production on monitoring while continuing to support efficient, reliable sources of isotopes. The 2013 workshop continued to promote collaboration and specifically encouraged experts to work together towards openly available technical solutions to emission mitigation, stack monitoring and other technical matters. Participants agreed that the sharing of stack monitoring data is very important for the verification mission. They also recognized the need for continued improvements in validating models for isotope production and dispersion.

Improving Performance and Efficiency

Highlights in 2013

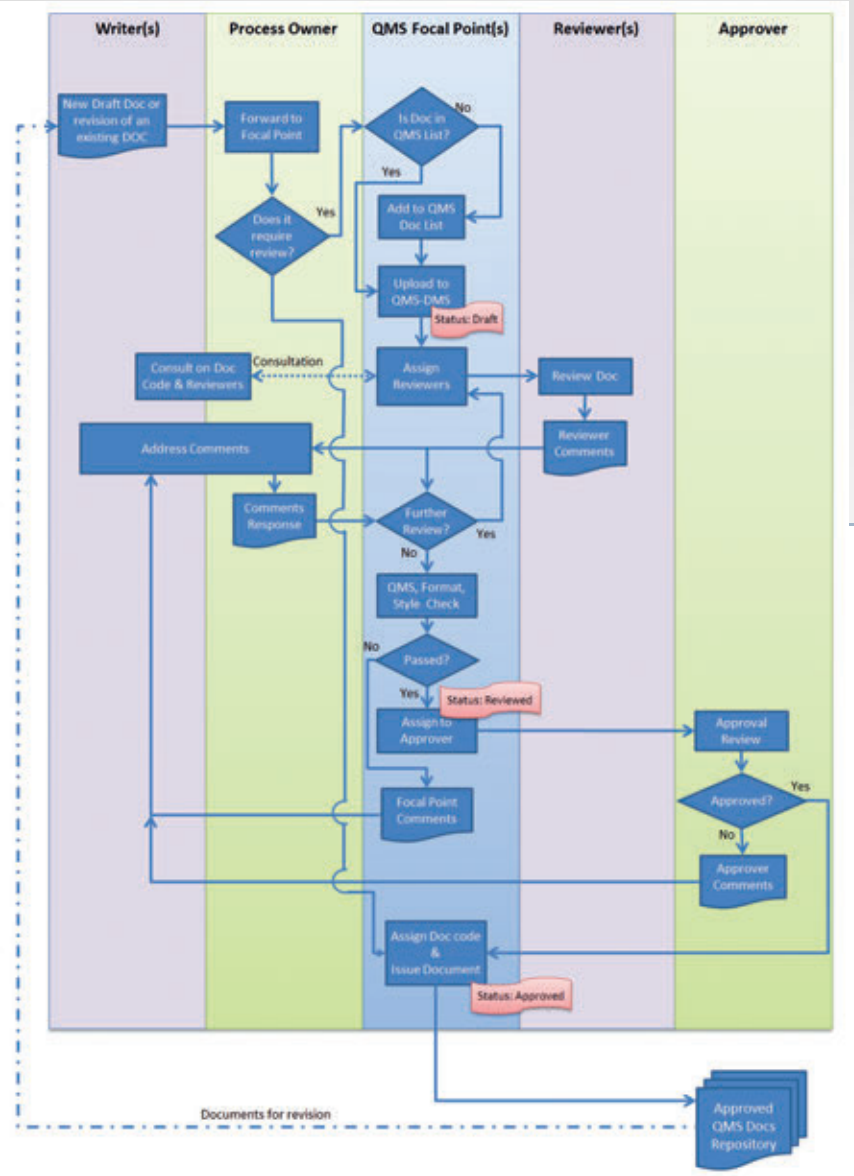
Further development and consolidation of the QMS

Enhancement of PRTool and refinement of KPIs

Evaluation of BUE III and preparations for the evaluation of the IFE in 2014

Evaluation activities in 2013 focused on preparations for the Integrated Field Exercise in 2014 and on the conduct of build-up exercise III.

Throughout the process of establishing the verification system, the Provisional Technical Secretariat (PTS) of the CTBTO Preparatory Commission aims for effectiveness, efficiency and continual improvement through the implementation of its Quality Management System (QMS). This system is focused on customers, such as States Signatories and National Data Centres, and aims at fulfilling the responsibilities of the Commission in establishing the CTBT verification regime in compliance with the requirements set forth in the Treaty, its Protocol and relevant documents of the Commission.



The workflow for document review and approval in the Quality Management System.

Quality Management System

The main purpose of the QMS is to ensure continuous provision of high quality products and services. The QMS is a 'living system' that can be adjusted, in keeping with the emphasis placed by the organization on customer needs and continual improvement.

Within the framework of continual development of the QMS system, efforts focused on completing a procedure for controlling and coding QMS documents. The procedure implements a workflow for the reviewing and approval processes in the QMS document management system and defines the main roles and responsibilities. The procedure also establishes the convention for coding documents.

Following discussions with the representatives of States Signatories, the PTS compiled a glossary of terms pertaining to the QMS. One of the benefits of having such a glossary is that it provides the organization with the capability to create, manage and share a common vocabulary as an aid to ensuring the quality of outputs, products and services. This fosters cross-functional alignment and helps all parts of the organization to better understand the context and usage of terms.

The glossary contains all terms appearing in the latest versions of the draft International Monitoring System Operational Manual, the draft International Data Centre Operational Manual and the Model Text for the draft On-Site Inspection Operational Manual as revised to reflect discussions in sessions of Working Group B. This compilation will need to be updated periodically as the QMS documentation is developed further.

Tracking the implementation of recommendations in the Quality Management System.

The performance reporting tool (PRTool) version 1.9.4 was released in November 2013.

Performance Reporting Tool

One of the functions of the QMS is to identify and put into effect key performance indicators (KPIs) for evaluating PTS processes and products, thus facilitating management review and continual improvement. KPIs are parameters used to quantify the performance of the processes of an organization. They are primarily employed to assess progress in reaching objectives and to supply quantitative information for prescribing a course of action. The aim of the QMS is to support the objective of consistently meeting verification system requirements, and it encompasses all contributing PTS processes and work products.

The PTS continued to work towards full operationalization of the performance reporting tool (PRTool). A new version of PRTool (version 1.9.4) was released in November and is accessible on the secure web portal of the PTS. Substantive progress was achieved in strengthening the common information technology platform, not only by improving its internal architecture, but also by further revising the common graphics user interface, improving system flexibility and security. The implementation of PRTool was enriched by a role based functionality, allowing tailored displays based on the role of the user.

The new elements of PRTool functionality include the first set of new data availability KPIs based on the agreed definitions. The capabilities of PRTool were strengthened in areas such as advanced grouping/filtering features. Improvements suggested by an independent review of PRTool to achieve full compatibility with the draft Operational Manuals are being progressively implemented.

PRTool continues to set ambitious standards of transparency and accountability, as it allows States Signatories to monitor programme implementation by the PTS with the possibility of going back to any given

Induction training of the evaluation team in Vienna prior to build-up exercise III.

The evaluation team after the completion of build-up exercise III in Veszprém, Hungary.

year and making a judgement on the value gained for the resources invested.

Evaluating On-Site Inspection Activities

The evaluation of on-site inspection (OSI) activities remains the key current evaluation activity. Activities in this regard continued to focus on preparations for the Integrated Field Exercise (IFE) in 2014 and specifically on the third and final part of that process and the building of OSI operational capability, i.e. build-up exercise (BUE) III, which was conducted in May/June in Hungary. BUE III was devoted to practising the actual inspection phase of an OSI. Preparations for the evaluation of the IFE in 2014 also continued, especially during the second half of the year.

The concept for the comprehensive evaluation of the next IFE as well as the three BUEs is clearly set out in a rolling draft blueprint. The blueprint was continually developed and refined on the basis of experience gained during its implementation during each BUE.

The blueprint sets out two different approaches in order to reflect the two distinct purposes of the BUEs and the subsequent IFE. Since the BUEs are viewed as 'dress rehearsals' for the IFE, through which progress can be assessed and capability built, the evaluation of the BUEs took a 'formative' approach in order to help shape and 'form' the operational capability being exercised. This was achieved by providing short-looped feedback while the OSI activities were being exercised and at the end of activities each day, as well as a comprehensive internal written report. Unlike the BUEs, the IFE is regarded as a test vehicle for assessing the current level of operational capability. Therefore the evaluation of the IFE will take a 'summative', hands-off approach in order to 'sum up' the capability demonstrated during the exercise.

Work advanced on schedule to update the draft blueprint to reflect this intended change of method. Moreover, the requirement to continually update the evaluation process, which is a central pillar of the rolling blueprint concept, extends to learning and applying the lessons learned from evaluating all three BUEs. At the practical implementation level, most of these lessons concern the need to better define what is being targeted by the evaluation and, secondly, how information about those targets is then gathered and used to make the assessment.

Work continued to improve the efficiency and effectiveness of the evaluation team and the process as a whole by developing better target definitions and new software tools that will replace the existing paper based toolsets, in order to automate the collection of observations in the field, the association of key findings and the derivation of summary conclusions, all in a consistent, evidence based approach.

Policy Making

Highlights in 2013

Participation of the President of Burkina Faso in the Fortieth Session of the Preparatory Commission

Further improvement of the method of work of WGB

Further implementation of the virtual paper approach and launch of the new ECS

President Blaise Compaoré of Burkina Faso addressing the Preparatory Commission in June 2013.

The plenary body of the CTBTO Preparatory Commission, which is composed of all States Signatories, provides political guidance and oversight to the Provisional Technical Secretariat (PTS). The plenary, as the Policy Making Organ, is assisted by two Working Groups.

Working Group A (WGA) deals with budgetary and administrative matters facing the organization, while Working Group B (WGB) considers scientific and technical issues related to the Treaty. Both Working Groups submit proposals and recommendations for consideration and adoption by the Commission.

In addition, an Advisory Group (AG) of qualified experts serves in a supporting role, advising the Commission through its Working Groups on financial, budgetary and associated administrative matters.

Participants in the Forty-First Session of the Preparatory Commission, October 2013.

Meetings in 2013

The Fortieth Session of the Commission was held on 13 June, with a Special Session on 12 September. The Forty-First Session of the Commission was held on 28 October. These sessions were chaired by Ambassador Jan Petersen, Permanent Representative of Norway.

The Forty-Third and Forty-Fourth Sessions of WGA were held on 27 May and 7 October respectively. The Forty-Third Session was chaired by Ambassador Jargalsaikhan Enkhsaikhan (Mongolia), and the Forty-Fourth Session was chaired by Ambassador Gunaajav Batjargal (Mongolia). WGB held its Fortieth Session from 18 March to 5 April and its Forty-First Session from 12 to 30 August. Pursuant to decisions of the Extended Bureau of the Commission, WGB was chaired by Mr Svein Mykkeltveit (Norway) and Mr David McCormack (Canada), the Friends of the Chair, on behalf of the Chairperson of WGB, Mr Hein Haak (Netherlands). Joint meetings of Working Groups A and B were held on 2 April and 26 August. The AG, chaired by Mr Michael Weston (United Kingdom), held the first and second parts of its Fortieth Session from 15 to 17 April and from 29 April to 3 May and its Forty-First Session from 2 to 4 September.

Expanding the Participation of Experts from Developing Countries

The PTS continued the implementation of a project, initiated in 2007, to facilitate the participation of experts from developing countries in official technical meetings of the Commission. The stated aim of this project is to

Experts from developing countries attending a technical meeting in 2013.

From left: **Genxin Li, Director of the Legal and External Relations Division; Vorian Maryssael, Director of the International Monitoring System Division; Oleg Rozhkov, Director of the On-Site Inspection Division; Randy Bell, Director of the International Data Centre Division; Frances Boyle, Director of the Division of Administration; Executive Secretary Lassina Zerbo; Ambassador Jan Petersen (Norway), Chairperson of the Preparatory Commission; and Bozorgmehr Ziaran, Secretary to the Preparatory Commission, at the Forty-First Session of the Commission.**

strengthen the universal character of the Commission and capacity building in developing countries. In October 2012 the project was extended by the Commission for a further three years (2013–2015), subject to availability of sufficient voluntary contributions. A detailed annual report on the status of implementation of the project was issued by the PTS in October.

The project continued to support the 10 experts from Algeria, Brazil, Burkina Faso, the Dominican Republic, Jordan, Kenya, Madagascar, Paraguay, South Africa and Vanuatu. The experts took part in the Fortieth and Forty-First Sessions of WGB, including formal meetings, meetings of the expert groups and meetings of their respective geographical groups. In addition, the experts benefited from technical discussions with the PTS on key verification related issues. The experts from Brazil, Kenya and Madagascar continued to carry out their functions as WGB Task Leaders for Testing and Provisional Operation, Issues Related to NDCs and Technology Refreshment respectively.

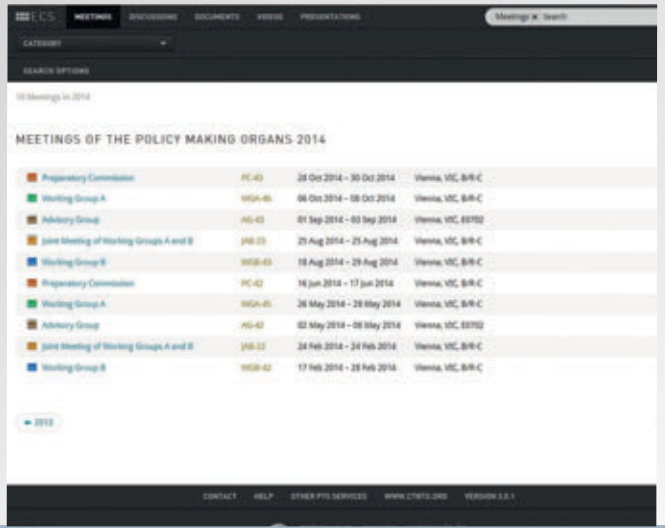
At the end of 2013 two experts supported since 2011 (from Algeria and South Africa) left the project and two new experts (from Kyrgyzstan and Niger) were selected for support in 2014. As a result of this rotation, the total number of experts supported since 2007 increased from 22 to 24, the number of currently supported experts from least developed and low income countries increased from 4 to 6 (in total since 2007: from 6 to 8) and the number of currently supported female experts increased from 1 to 3 (in total since 2007: from 4 to 6).

In 2013 the project was financed by voluntary contributions received in 2012 from Finland, the OPEC Fund for International Development (OFID), Norway and China, as well as by new voluntary contributions received in 2013 from Sri Lanka, the Netherlands, Turkey and Norway (donors are listed in the chronological order of donations). The PTS continues to seek additional voluntary contributions, as the current amount of available funds is not sufficient to ensure sustainability of the project in 2014.

Supporting the Preparatory Commission and Its Subsidiary Bodies

The PTS is the body that executes the decisions adopted by the Commission. It is multinational in composition: staff are recruited from States Signatories on as wide a geographical basis as possible. As far as the meetings of the Commission and its subsidiary bodies are concerned, the role of the PTS is to provide substantive and organizational support, including in the intersessional periods, thus facilitating the decision making process. With its tasks ranging from organizing conference facilities and arranging interpretation for the meetings and translation of papers to drafting official documents of the various sessions, planning the annual schedule of sessions and providing substantive and procedural advice to the Chairpersons, the PTS is a vital element in the work of the Commission and its subsidiary bodies.

The PTS provided substantive and organizational support to the coordinators of the Article XIV process in connection with the holding of informal consultations of States ratifiers, as well as the eighth Conference on Facilitating the Entry into Force of the CTBT ("Article XIV conference"), which was held in New York on 27 September 2013.



Screenshot of the new Experts Communication System.

Live streaming a session from the Vienna International Centre.

Information System on Progress in Fulfilling the Mandate of the Treaty

Following its launch to States Signatories in 2012, the Information System with Hyperlinks on Tasks Assigned by the Resolution Establishing the Preparatory Commission (ISHTAR) interface continued to be available to all users of the Experts Communication System (ECS), including after the roll-out of the new ECS at the end of the year. Using hyperlinks to the official documentation of the Commission as its basis, the aim of the ISHTAR project continues to be the monitoring of progress achieved in accordance with the mandate of the Treaty, the Resolution establishing the Commission and the guidance of the Commission and its subsidiary bodies. Its overall purpose is to provide up to date information to the Commission on the tasks that remain to be completed in terms of preparations for the establishment of the CTBTO at entry into force and the first session of the Conference of the States Parties.

Virtual Working Environment

The PTS provides a virtual working environment for those unable to attend regular meetings of the Commission and its subsidiary bodies. State of the art technologies are employed to transmit the proceedings of each official plenary meeting around the globe in real time. Meetings are recorded and transmitted live via the ECS before being archived for reference purposes. In addition, supporting documents related to each particular session are distributed to States Signatories through the ECS, and participants are notified of new documents by email alerts.

In December, a new, updated version of the ECS was launched, providing a more efficient and user friendly electronic platform to access and retrieve official documents, video files and other material relevant to meetings of the Commission and its subsidiary bodies. As a tool for continuous and inclusive discussion among States Signatories and experts on complex scientific and technical issues related to the verification regime, the ECS has become even more important in light of the new method of work of WGB. In 2013, States Signatories called for more intensive use of the ECS in intersessional work to further enhance the efficiency and effectiveness of work during sessions.

The PTS continued to distribute on DVDs all documents of and presentations to the Commission and its subsidiary bodies at their sessions. As part of the virtual paper approach, through which the PTS is seeking to limit its output of printed documentation, official documents of the Commission, its subsidiary bodies and the PTS were no longer distributed in hard copy to all States Signatories as of 1 January 2013. In addition, at the Forty-First Session of WGB the PTS introduced, on a trial basis, a new 'print on demand' service enabling delegates to print documents from their computers and mobile devices during the meetings.

Outreach

Highlights in 2013

Ratification of the Treaty by Brunei Darussalam, Chad, Guinea-Bissau and Iraq

Considerable expansion of outreach and education activities

Considerable surge in media coverage of the Treaty and the work of the Commission

Executive Secretary Lassina Zerbo meeting with youth communicators for a world without nuclear weapons during a visit to Hiroshima, Japan, in November 2013.

The Provisional Technical Secretariat (PTS) of the CTBTO Preparatory Commission pursues outreach activities to promote entry into force and universalization of the Treaty. It aims to enhance understanding of the Treaty and its verification regime, including the civil and scientific applications of CTBT verification technologies, and the mandate and functions of the Commission. Outreach entails interaction with the international community, including States, international organizations and civil society, such as academic institutions and the media. In practice, such interaction involves encouraging States to sign and ratify the Treaty, stimulating understanding of the objectives, principles and benefits of the Treaty by government representatives and the general public, and fostering international cooperation in verification related technologies.

Towards Entry into Force and Universality of the Treaty

The Treaty continued to gather momentum towards entry into force and universalization as a result of several developments. Most significantly, these developments occurred against the very positive backdrop of ratification by Indonesia in 2012.

The Treaty moved closer to universality in 2013 with ratifications by Brunei Darussalam, Chad, Guinea-Bissau and Iraq. As of 31 December 2013, the Treaty had been signed by 183 States and ratified by 161 States, including 36 of the 44 States listed in Annex 2 to the Treaty.

Consultations were conducted in 2013 with nearly all States that had not yet ratified or signed the Treaty, including all but one Annex 2 State. Moreover, in order to promote additional signatures and ratifications, the Commission liaised with a large number of ratifying States, the United Nations and other global and regional organizations, as well as institutions such as the Inter-Parliamentary Union (IPU), that work closely with the Commission in its efforts to move towards entry into force and universality of the CTBT.

Overall political support for the Treaty and the work of the Commission continued to be strong. As demonstrated by the support of 181 States for the Resolution on the Comprehensive Nuclear-Test-Ban Treaty (A/RES/68/68) at the United Nations General Assembly, the Treaty continued to be recognized by the international community as an effective instrument of collective security and an important pillar of the nuclear non-proliferation and disarmament regime. A growing number of governments, decision makers and representatives of civil society were spearheading the campaign for ratification of the Treaty by the States that have not yet done so, including the remaining Annex 2 States. States and international organizations also continued to support the work of the Commission with voluntary contributions, both financial and in kind. Through these efforts, the international community has reinforced the understanding that the Treaty plays a critical role in today's security environment.

Interacting with the International Community

In 2013, the PTS continued efforts to facilitate implementation of decisions of the Commission on establishing the verification regime and promoting participation in its work. The PTS also maintained a dialogue with States through bilateral visits in capitals and interaction with Permanent Missions in Berlin, Geneva, New York and Vienna. The major focus of such interactions was on States hosting International Monitoring System (IMS) facilities and States that have not yet signed or ratified the Treaty, in particular those listed in Annex 2.

The PTS took advantage of various global, regional and subregional conferences and other gatherings to enhance understanding of the Treaty and to advance its entry into force and the building of the IMS. The PTS attended meetings of the African Union, the International Atomic Energy Agency (IAEA), the IPU and the United Nations General Assembly.

In the period from January to July, the former Executive Secretary visited Belgium, Croatia, France, Switzerland, the United Kingdom and the United States of America. Since taking office in August the current Executive Secretary has visited Angola, China, France, Japan, Jordan, the Russian Federation, Ukraine, the United Kingdom and the United States of America. He participated in high level events, with a view to strengthening the engagement of these States with the Commission and emphasizing the significance of entry into force of the Treaty.

On 13 June, the President of Burkina Faso, HE Blaise Compaoré addressed the Fortieth Session of the Preparatory Commission. The President is the first head of state to attend a session of the Commission. Both the former Executive Secretary and Mr Zerbo, as Executive Secretary Elect, conducted bilateral meetings with the President.

United Nations

During his mission to New York from 22 to 27 September, the Executive Secretary took part in the opening of the general debate of the sixty-eighth regular session of the United Nations General Assembly in New York as well as in the Article XIV conference. On the margins he met with the foreign ministers of Angola, Egypt, Japan, Kazakhstan, Lithuania, Romania and Papua New Guinea, the Deputy Foreign Minister for Legal and International Affairs of Iran, the Deputy Prime Minister and Minister of Public Utilities of Tuvalu, the Director-General of the Chinese Department of Arms Control and other high level officials. In 2013, both

A visit by the US delegation to the Provisional Technical Secretariat in July 2013. From left: Ambassador Joseph E. Macmanus, Permanent Representative to the United Nations in Vienna; Tibor Tóth, then Executive Secretary; Ernest Moniz, Secretary of Energy; Lassina Zerbo, then Executive Secretary-elect; Anne Harrington, Deputy Administrator for Defense Nuclear Nonproliferation; Thomas Countryman, Assistant Secretary for International Security and Nonproliferation.

the former and the current Executive Secretary had meetings with the United Nations Secretary-General and other high ranking United Nations officials.

Throughout the year, PTS representatives also participated in a number of conferences sponsored by the United Nations, including the high level meeting of the General Assembly on Nuclear Disarmament on 26 September and the First Committee of the General Assembly, with the aim of strengthening cooperation with the United Nations and other international organizations, as well as academics and practitioners in the field of disarmament and non-proliferation.

On 26 September, the Executive Secretary participated in the inaugural meeting of the Group of Eminent Persons (GEM). He also attended a lunch for GEM hosted by the Hungarian ambassador in New York on 27 September.

Regional Organizations

On 18 September, on behalf of the Executive Secretary, the Director of the Legal and External Relations Division addressed the IAEA General Conference, outlining aspects of cooperation between the IAEA and the organization.

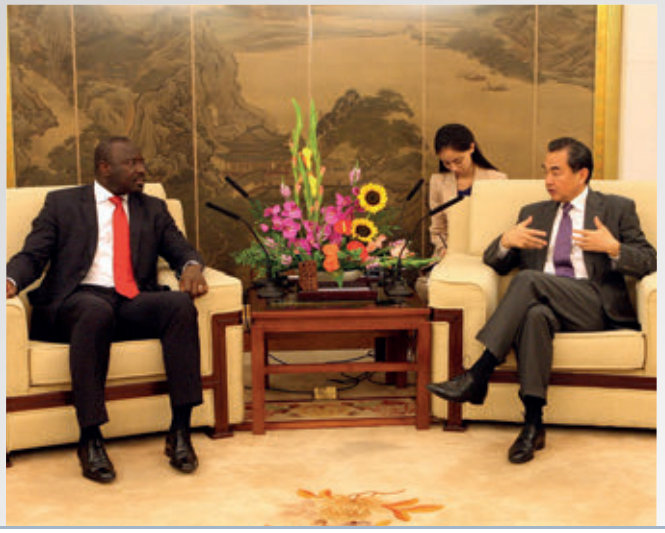
On 27 September, on the margins of the Article XIV conference, the Executive Secretary met with the Secretary General of the IPU to discuss the role of the IPU in advancing universality and entry into force of the Treaty.

On 8 October, on behalf of the Executive Secretary, the Director of the Legal and External Relations Division addressed the panel discussion entitled, "Towards a Nuclear-Weapon-Free World: The Contribution of Parliaments" (Standing Committee on Peace and International Security) within the framework of the 129th Assembly of the IPU, which was held in Geneva. He also met with the Secretary General of the IPU.

Other Conferences and Seminars

The former Executive Secretary participated in the Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons in Geneva from 22 to 23 May, where he also delivered a statement. He further attended the following conferences and meetings: the conference on "Actions to Enhance Global Security" in Zagreb from 3 to 4 May; the World Summit on the Information Society Forum in Geneva from 13 to 17 May; the Global Platform for Disaster Risk Reduction in Geneva from 21 to 23 May; Chatham House in London from 23 to 24 May; and a World Economic Forum Advisory Meeting on Global Risks in Geneva on 12 June.

The Executive Secretary was invited to address the board meeting of the European Leadership Network on



Executive Secretary Lassina Zerbo meeting with the Foreign Minister of China Wang Yi in Beijing, August 2013.

The Executive Secretary meeting with the Prime Minister of Jordan Abdalla Ensour in Jordan, December 2013.

16 September in London and to discuss the way forward with regard to the promotion and entry into force of the Treaty.

As part of outreach efforts in the European Union (EU), the Executive Secretary delivered the keynote opening address at the Second EU Non-Proliferation and Disarmament Conference in Brussels on 30 September. The conference, organized by the EU Non-Proliferation Consortium, was attended by some 300 governmental and non-governmental participants from both EU member States and other countries engaged in countering the proliferation of weapons of mass destruction.

On December 9, the Executive Secretary participated in the Fall Meeting of the American Geophysical Union in San Francisco as a keynote panellist on "Global Nuclear Security: The Alliance of International Policy and Science". While in San Francisco, the Executive Secretary met with former United States Secretary of State Condoleezza Rice at the Hoover Institution at Stanford University. He was also the guest of honour at a dinner hosted by the Preventive Defense Project at the Center for International Security and Cooperation at Stanford University, where he met with technology leaders from Silicon Valley to brief them on the Treaty and its verification system and to discuss opportunities for future collaboration.

Bilateral Visits

During his mission to China from 4 to 10 August, the Executive Secretary met with the Foreign Minister, Mr Wang Yi, as well as Mr Zhang Yulin, Deputy Minister and Head of the General Armament Directorate in the Ministry of Defence, and Mr Pang Sen, Director-General of the Department of Arms Control and Disarmament of the Ministry of Foreign Affairs. He also participated in a workshop on arms control and strategic stability held in Beijing from 8 to 9 August, which was jointly hosted by the China Arms Control and Disarmament Association and the Chinese People's Association for Peace and Disarmament. On 8 August, the Executive Secretary attended a ceremony marking the installation of an IMS infrasound station (IS16) at Kunming in south-west China.

From 8 to 10 September, the Executive Secretary visited Kiev, Ukraine, at the official invitation of the Foreign Ministry of Ukraine. During his visit, the Executive Secretary met with Vice Prime Minister Mr Konstantin Grishchenko, the Deputy Minister for Foreign Affairs, the Deputy Head of the State Space Agency of Ukraine, and the Rector of the Diplomatic Academy of Ukraine. Mr Zerbo also gave a lecture at the Diplomatic Academy, participated in a press conference for Ukrainian media and visited the National Data Centre (NDC) in Makarov.

On 19 September, the Executive Secretary briefed the International Security Advisory Board (ISAB) of the United States Secretary of State in Washington, DC, on recent developments related to the Treaty and advancements made in the establishment of its verification regime. The ISAB provides the United States Department of State with independent insight and advice on all aspects of arms control, disarmament, international security and related aspects of public diplomacy.

From 1 to 4 October, the Executive Secretary undertook a mission to Moscow, Russian Federation, where he met with Foreign Minister Mr Sergey Lavrov, the Deputy Foreign Minister, the Deputy Defence Minister, the

Meeting with representatives of the Middle East Scientific Institute for Security in Jordan, December 2013.

Deputy Head of Rosatom and representatives of the Geophysical Survey of the Russian Academy of Sciences. He also participated in a seminar organized by the Center for Energy and Security Studies and made a presentation at the Moscow State Institute of International Relations.

From 17 to 23 November, the Executive Secretary visited Tokyo, Hiroshima and Nagasaki at the invitation of the Government of Japan. He held a number of bilateral meetings with high level officials, including the Minister for Foreign Affairs, Mr Fumio Kishida, the Senior Vice Minister for Foreign Affairs, as well as the mayors and governors of Hiroshima and Nagasaki. He also interacted with young advocates against nuclear weapons and 'hibakusha' (survivors of atomic bombs) in both cities. The Executive Secretary gave lectures at Hitotsubashi University in Tokyo and at Nagasaki University and participated in a seminar organized by the Center for the Promotion of Disarmament and Non-Proliferation.

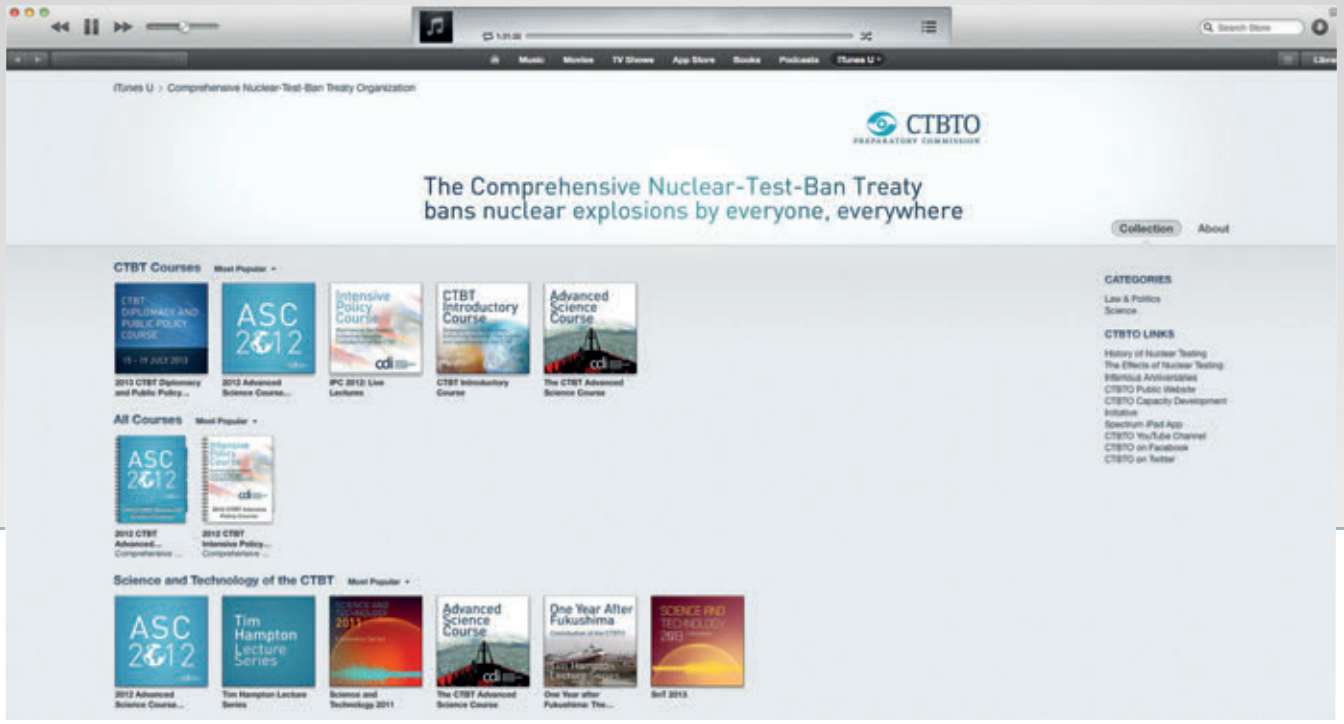
The Executive Secretary made an official visit to Jordan from 1 to 3 December to launch the 2014 Integrated Field Exercise (IFE). Jordan will host the IFE, which will be conducted in November and December 2014. While in Jordan the Executive Secretary was received by the Prime Minister, Mr Abdullah Ensour, the Minister of State for Media Affairs and Communications and the Minister of Energy and Mineral Resources. The Executive Secretary expressed appreciation for the cooperation of Jordan in ensuring the success of the IFE. The Executive Secretary also held discussions with Princess Sumaya bint El Hassan and officials from the Jordan Atomic Energy Commission and the National Resources Authority, as well as representatives of the scientific community.

The Executive Secretary paid a bilateral visit to France on 19 December. In Paris, the Executive Secretary met with the Minister of Foreign Affairs, Mr Laurent Fabius. He also attended a meeting chaired by the Director of Strategic Affairs, Security and Disarmament of the Ministry of Foreign Affairs, with representatives from the Ministry of Foreign Affairs, the Ministry of Defence, the General Secretariat for Defence and National Security and the Alternative Energies and Atomic Energy Commission (CEA). He met with the Director of Strategic Affairs of the Ministry of Defence and with the CEA Deputy Director for Military Applications. The Executive Secretary also had the opportunity to meet with non-proliferation and disarmament experts after his address at the Foundation for Strategic Research.

Information Visits

The PTS organized two information visits to its offices in Vienna for representatives from selected States Signatories. The main objectives of these visits were to enhance understanding of the Treaty and to raise awareness of the activities of the PTS. Delegations were briefed on the political aspects of the CTBT, including its entry into force and universalization; the work of the Commission; the verification regime, including operation of the IMS and International Data Centre (IDC); technical support to States Signatories and the preparatory work for on-site inspections (OSIs). Other presentation topics included membership benefits, capacity building and capacity development opportunities and technical and legal support programmes offered by the PTS.

Representatives from Angola, China, the Congo, Iraq, Nepal, Swaziland, Sri Lanka and Zimbabwe attended an



Online courses made available by the Preparatory Commission.

information visit from 15 to 19 July. The participants also had the opportunity to attend the CTBT Diplomacy and Public Policy Course and hold meetings with the Executive Secretary and PTS staff.

From 26 to 28 November, the PTS hosted a high level delegation from Yemen. The delegation, led by the Acting Secretary General of the National Atomic Energy Commission, consisted of representatives from the Ministries of Foreign Affairs, Defence, the Interior, Legal Affairs, and National Security, who together are part of a national committee established to study the ratification process of the CTBT as well as the benefits to and obligations of Yemen. The visit was a timely opportunity to exchange views and promote understanding of the Treaty, the work of the Commission and the verification regime, as well as national implementation and capacity building. It also served to encourage the participation of Yemeni experts in training courses and workshops, with a view to better understanding the use of data and data products.

Regional and National Seminars

The PTS traditionally holds regional and subregional workshops with the overall aim of encouraging political and technical cooperation in areas related to the Treaty, reviewing Treaty related achievements in support of the nuclear non-proliferation regime and promoting the entry into force and universality of the Treaty.

A Scientist-to-Scientist Workshop, sponsored by the Government of Norway, was held at the University of Illinois at Urbana-Champaign (UIUC) from 15 to 17 April. The objective of the workshop was to engage Indian and Pakistani scientists — as well as scientists from other key countries — who are involved in scientific or technical areas related to the verification technologies used in nuclear test monitoring. The workshop was attended by over 25 leading scientists from India, Israel, Norway, Pakistan and the USA, as well as senior PTS technical staff. The meeting also provided an opportunity for the former Executive Secretary to hold bilateral meetings with senior staff and faculty at UIUC on potential areas of collaboration.

From 30 to 31 October, the Executive Secretary and a PTS delegation attended a national seminar on the CTBT in Luanda, Angola, that was organized by the Government of Angola in partnership with the EU. The Executive Secretary delivered the keynote speech following the opening of the seminar by the Minister of Foreign Affairs of Angola and senior EU representatives. The Executive Secretary also met with the Foreign Minister, the President of the National Assembly of Angola, the chairperson of the Foreign Affairs Commission of the National Assembly and the chairperson of the EU Working Party on Non-Proliferation. Designed to raise awareness about the CTBT and its verification regime, the seminar was attended by key lawmakers and a wide range of senior government officials involved in the Treaty ratification

Participants in a simulated Executive Council meeting during the CTBT Diplomacy and Public Policy Course, Vienna, July 2013.

Ambassador Jaap Ramaker of the Netherlands (*left*) and Ambassador Sha Zukang of China (*right*) participating in a panel discussion on Treaty negotiations during the CTBT Diplomacy and Public Policy Course.

process in Angola. The draft resolution approving ratification of the Treaty by Angola was adopted by the National Assembly on 28 November.

The Commission held discussions with the Government of Indonesia on the organization of a high level regional conference on the CTBT for States in the South East Asia, the Pacific and the Far East (SEAPFE) region in 2014. The conference will build on the momentum of the ratification of the Treaty by Indonesia, with a view to discussing national capacities to facilitate signature and/or ratification of the CTBT and to encouraging the remaining States from the SEAPFE region to ratify the Treaty.

Educational Outreach

The Commission continued to expand its education and outreach activities in 2013 which aim to broaden knowledge of the Treaty and to develop capacities in States Signatories to confront effectively the political, legal, technical and scientific challenges facing the Treaty and its verification regime.

As a follow-up to the 2012 seminar on CTBT Education in the 21st Century, the CTBT Academic Forum was held from 18 to 20 March. The main objective of the forum was to further explore innovative methods of teaching about Treaty related issues. The Director-General of the Organisation for the Prohibition of Chemical Weapons (OPCW), Mr Ahmet Üzümcü, addressed the high level opening session, which also included addresses by the Permanent Representatives of Ireland and Norway. The forum was attended by over 40 academics from 30 institutions in 20 different countries. It covered a wide range of topics, including knowledge transfer, international organizations and global education, as well as the role of e-learning, massive open online courses, collaborative scientific research opportunities and the educational resources and services of the Commission. Discussions also addressed curricula development and the value of using simulations.

The CTBT Diplomacy and Public Policy Course, entitled "Proven Treaty, Political Challenge: The CTBT and Multistakeholder Security", was held from 15 to 19 July in Vienna. In advance of the course, participants completed online modules to provide them with basic

Lecturers and participants of the CTBT Diplomacy and Public Policy Course.

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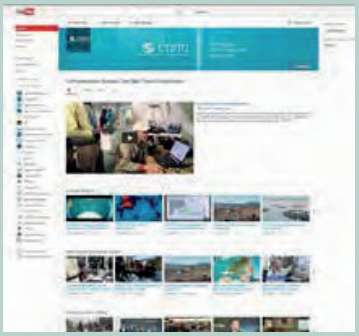
PUBLIC WEBSITE

CTBTO'S YOUTUBE CHANNEL



FIELD BLOG

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FACEBOOK

knowledge about the Treaty and its verification regime. Approximately 100 participants attended the course, while over 500 more registered to follow the course online through the live stream and video archives. Course participants included diplomats, government officials, station operators, NDC staff, academics and scientists, including from a number of Annex 2 States. The course comprised newly developed e-learning modules, presentations by CTBT experts and panel discussions focusing on practical understanding of the political, legal and diplomatic aspects of the Treaty.

As of December 2013, nearly 2500 participants had registered for the educational and outreach courses of the Commission, and more than 900 certificates of successful completion had been issued. In addition, between 2012 and 2013, the CTBT Education Portal was utilized by more than 22 000 visitors from over 150 different countries, including from all but one of the non-ratifying Annex 2 States.

The Commission also promoted online CTBT education and training material through its iTunes U page, which currently has 14 different collections, including five seminar courses. Since the Commission established a presence on iTunes U in April 2012, over 415 files have been freely shared and the page has amassed over 1600 subscribers, 13 000 visitors and 14 000 downloads of content.

From 16 to 18 September, the PTS hosted a group of 25 United Nations Disarmament Fellows. Among them were five participants from non-ratifying States. The Executive Secretary addressed the group. The course provided an overview of the CTBT and its verification system and included tours of the rooftop radionuclide station at the Vienna International Centre (VIC) and the Operations Centre of the IDC. The programme concluded with an exercise simulating a future CTBTO Executive Council deliberation on an OSI request.

Public Information

During 2013, the public web site and social media outlets of the Commission received on average around 150 000 visits per month. The web site was updated with 39 "Highlights" articles and 18 press releases. Twelve electronic newsletters were issued. The Commission expanded its presence considerably on YouTube, Facebook, Twitter and Flickr.

The 37 videos on the CTBTO YouTube channel attracted around 300 000 views, a threefold increase over 2012.

An animation of the infrasound detection of the meteor explosion over the Russian Federation in February accounted for around 165 000 views alone.

The two issues of *CTBTO Spectrum* in 2013 included contributions from the President of Burkina Faso, the foreign ministers of Hungary, Iceland, Indonesia and Iraq, as well as articles by leading scientists and non-proliferation experts. Over 4000 copies of each issue were distributed worldwide to States Signatories, non-governmental organizations, research institutions, universities and the media.

Around 50 000 visitors to the VIC toured the permanent CTBTO exhibition, with over one thousand visitors receiving individual presentations. The permanent displays on the CTBTO at the United Nations in New York and Geneva attracted even more visitors.

Global Media Coverage

Global media coverage of the Treaty and its verification regime saw an increase of over 60%, with over 4500 articles and citations in online media alone. Around 1900 of these news items were published in connection with the announced nuclear test by the Democratic People's Republic of Korea.

Media coverage related to the Treaty remained high in the USA, with special interest amongst the scientific media on the infrasound data from the meteor explosion over the Russian Federation in February. There was a notable increase in interest in the Middle East following the announcement of the IFE in 2014.

Feature stories about IMS stations PS9 and IS18 and two news packages produced by the Commission were distributed via United Nations TV and broadcast in several languages by stations around the world.

National Implementation Measures

In 2013, the PTS continued to promote the exchange of information between States Signatories on the subject of national implementation measures. A legislation workshop on national implementation measures for the CTBT verification regime was held within the framework of the CTBT Diplomacy and Public Policy Course, with the participation of representatives from 12 States Signatories. The workshop focused on the steps necessary to ensure proper operation of the IMS and preparedness to undertake an OSI in accordance with the provisions of the Treaty. Panellists included experts from France, Iraq, the IAEA, the OPCW and the Verification Research, Training and Information Centre.

Following a format similar to that of the 2011 pilot workshop, a legislation workshop was held during the Intensive Policy Course, providing an opportunity for participants to exchange their experiences in the adoption of national implementation measures. To facilitate this exchange and the identification of elements for inclusion in implementing legislation, participants completed a legislation questionnaire in advance of the meeting.

Bilateral meetings with States Signatories were also held in 2013 to discuss draft legislation submitted to the PTS with a request for legal assistance. Presentations on implementing CTBT legislation were routinely delivered during the year at workshops, seminars and other events.

Management

Highlights in 2013

Increase in collection rates of the assessed contributions

Further increase in numbers of female staff in the Professional category

Further progress in implementation of an IPSAS-compliant ERP system

The Vienna International Centre.

Effective and efficient management of the activities of the Provisional Technical Secretariat (PTS) of the CTBTO Preparatory Commission, including support of the Commission and its subsidiary bodies, is ensured mainly through the provision of administrative, financial and legal services.

A wide variety of general services are also provided, from arrangements concerning shipments, customs formalities, visas, identity cards, laissez-passer and low value purchases to insurance, tax, travel and telecommunication services, as well as standard office and information technology support and asset management. Services provided by external entities are continuously monitored to ensure that these are being provided in the most efficient, effective and economical way.

Management also involves coordinating with the other international organizations located in the Vienna International Centre over planning of office and storage space, maintenance of the premises and common services, and enhancement of security efforts.

Oversight

Internal Audit is an independent and objective internal oversight mechanism. It is designed to add value and to improve the operations of the organization in achieving its goals and objectives through the provision of internal audit and related advisory services and investigative services.

In order to promote the independence and objectivity of the function, Internal Audit reports directly to the Executive Secretary and has direct access to the Chairpersons of the Advisory Group and Working Group A. The Chief of Internal Audit independently also submits an annual activity report for consideration by the Commission and its subsidiary bodies. In addition to the approved work plan, the Chief of Internal Audit may institute special audits or investigations warranted by particular circumstances.

In 2013, five audits were undertaken. These resulted in identification of areas for improving efficiency, effectiveness and internal controls, and of compliance with rules and procedures. In line with the International Standards for the Professional Practice of Internal Auditing, Internal Audit also performs management support activities.

Internal Audit conducted a review of its charter, which sets out the purpose, authority and responsibilities of the internal audit function. The charter, which was issued on 7 October 2010, must be reviewed at least once every three years.

Networking with internal audit services of United Nations organizations was conducted regularly to exchange good practices and lessons learned.

Finance

2013 Programme and Budget

The 2013 Programme and Budget was prepared at a level corresponding to slightly less than zero real growth and maintained the split currency system (US dollar and euro) for assessing the contributions due from States Signatories. This system was introduced in 2005 to lessen the exposure of the Commission to the effects of fluctuations in the value of the US dollar against the euro.

The Budget for 2013 amounted to $44 472 300 and €61 617 900. At the budget exchange rate of 0.796 euro to 1 US dollar, the total US dollar equivalent of the 2013 Budget was $121 874 700, representing a nominal growth of 1.9% but almost constant in real terms (a decrease of $62 000 or 0.1%).

On the basis of the actual average exchange rate in 2013 of 0.7545 euro to 1 US dollar, the final total US dollar equivalent of the 2013 Budget was $124 089 322 (Table 4). Of the total Budget, 79.1% originally was allocated to verification related activities, including an allocation of $15 529 334 to the Capital Investment Fund (CIF), established for the build-up of the International Monitoring System (IMS).

Table 4. Distribution of 2013 Budget

Area of Activity	U$$ (millions)[a]
International Monitoring System	36.8
International Data Centre	49.0
On-Site Inspection	10.1
Evaluation and Audit	2.3
Policy Making Organ Support	5.0
Administration, Coordination and Support	16.5
Legal and External Relations	4.4
Total	**124.1**

[a] An average exchange rate of 0.7545 euro to 1 US dollar was used to convert the euro component of the 2013 Budget.

Assessed Contributions

As of 31 December 2013, the collection rates of the assessed contributions for 2013 amounted to 96.4% of the US dollar portion and 96.3% of the euro portion. In comparison, the 2012 collection rates as of 31 December 2012 were 92.7% and 93.3% respectively. The combined collection rate for the US dollar and euro portions in 2013 was 96.2%, compared with 93.0% in 2012.

The number of States that had paid their 2013 assessed contributions in full as of 31 December 2013 was 99, compared with 100 in 2012. Regarding 2012 assessed contributions, the collection rate as of 31 December 2013 amounted to 98.8%.

Expenditure

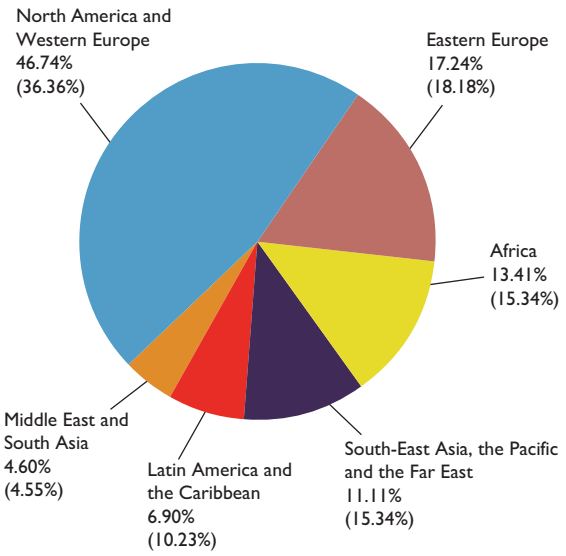
The expenditure for the Programme and Budget in 2013 amounted to $112 106 346, of which $11 407 837 was from the CIF. For the General Fund, the unused budget amounted to $7 861 480. For the CIF, approximately 26.9% of the allotment was executed by the end of 2013.

Procurement

The PTS obligated approximately $57 860 789 million through 910 procurement actions for high value purchases and $1 438 562 through 878 contractual instruments for small value purchases. At the end of the year, there were 79 open requisitions for future obligation in the procurement pipeline with a total value of approximately $10 159 882 million: $2 304 414 million for the CIF and $7 855 468 million for the General Fund.

As of 31 December 2013, 137 IMS stations, 11 radionuclide laboratories and the testing of 28 noble gas systems were under contract for testing and evaluation or for post-certification activities.

Staff Members in the Professional Category by Geographical Region as of 31 December 2013
(Percentages as of 31 December 2012 are shown in brackets.)



Human Resources

The PTS secured the human resources for its operations by recruiting and maintaining highly competent and diligent staff for all programmes. Recruitment was based on securing the highest standards of professional expertise, experience, efficiency, competence and integrity. Due regard was paid to the principle of equal employment opportunity, to the importance of recruiting staff on as wide a geographical basis as possible, and to other criteria stipulated in the relevant provisions of the Treaty as well as the Staff Regulations.

As of 31 December 2013, the PTS had 261 staff members from 79 countries, compared with 264 staff members from 79 countries at the end of 2012. The following chart provides information on the distribution of staff members in the Professional category by geographical region. Table 5 shows the distribution of regular staff members by field of work. More detailed information on human resources issues will be provided in the 2013 Human Resources Management Report.

The PTS continued its efforts to increase the representation of women in the Professional category. At the end of 2013, there were 58 women in Professional positions, corresponding to 33.34% of the Professional staff. In comparison with 2012, there were increases of 9.09% and 5.56% in the numbers of female staff members at the P2 and P3 levels respectively. Female representation at the D1, P5 and P4 level remained at the same level.

Staff were provided with opportunities to increase their skills in areas relevant to achieving the objectives of the organization. A variety of programmes were delivered in 2013 which were tailored for the benefit of the PTS in carrying out its work programmes and to enhance job performance and career development.

In general, throughout 2013 the PTS continued to focus on smart planning to streamline its activities and to increase synergies and efficiencies. It also accorded priority to results based management.

Table 5. Regular Staff Members by Field of Work (31 December 2013)

Field of Work	Professional	General Service	Total
Evaluation Section	4	1	5
International Monitoring System Division	35	21	56
International Data Centre Division	67	14	81
On-Site Inspection Division	19	7	26
Total, verification related	**125 (72.67%)**	**43 (48.31%)**	**168 (64.37%)**
Office of the Executive Secretary	3	2	5
Internal Audit	2	0	2
Division of Administration	24	28	52
Legal and External Relations Division	18	16	34
Total, non-verification-related	**47 (27.33%)**	**46 (51.69%)**	**93 (35.63%)**
Total	**172**	**89**	**261**

Midterm Strategy for 2014–2017

As part of its strategic planning, the PTS presented a new Midterm Strategy (MTS) in 2013 that will guide its activities through a period of four years.

The MTS for 2014–2017 defines new strategic priorities that will help define the work programme and activities in consideration of guidance provided by the Commission and its subsidiary bodies. The PTS acknowledges the global economic situation and the climate of financial austerity as its operating environment, which imposes resource limitations on the work necessary to carry out the mandate of the Commission. Furthermore, substantive achievements made by the PTS since its establishment have resulted in an increasing need to focus on protection of the investment of the Commission in establishing a reliable verification regime. In other words, the underlying theme for 2014–2017 is the sustainability of a cost effective and financially viable verification regime.

The approach and structure of strategic planning were revised to improve its relevance and effectiveness as well as its organizational focus. The planning period was reduced to four years from the previous five to coincide with the length of the term of appointment of an Executive Secretary. In response to the current economic climate of fiscal austerity, the MTS attempts to introduce new prioritization and reprioritization. In this respect, the strategic goals were reduced to two, compared with seven in the Medium Term Plan for 2009-2013. A reduction in the number of strategic goals will allow the PTS to focus its efforts and resources on essential key priorities while aggressively pursuing synergies and efficiencies through improved alignment and convergence of organizational activities.

The new strategic goals are (1) operation and sustainment of the verification system and (2) development of on-site inspection operational capabilities. These reflect the core mandate of the Commission and complementary functional goals of promoting universality and fostering efficiency and integrity in fulfilling its mandate.

In support of these goals, two key strategic enablers were identified as priorities: (1) integrated capacity building and (2) improved management and coordination. Strategic enablers are the tools and activities which bear direct applicability to the achievement of the strategic goals and the overarching mission of the organization.

Together, these strategic goals and strategic enablers will guide the PTS in defining its deliverables and activities for the annual Programme and Budget proposals during this MTS period. However, they will be subject to reprioritization on an annual basis in response to dynamically changing circumstances and operational context. Results based management elements such as outputs and key performance indicators will be specified in the annual Programme and Budget accordingly to ensure that the qualitative aspects of delivery will be measured and evaluated.

The political and financial context within which the PTS can expect to operate during the upcoming years will ultimately determine the actual pace of progress in implementing this MTS and the projects contained in it.

Implementation of an IPSAS-Compliant Enterprise Resource Planning System

Since the last reporting period, implementation of an Enterprise Resource Planning (ERP) system that is compliant with International Public Sector Accounting Standards (IPSAS) has progressed rapidly. The project has successfully moved from the blueprint to the realization phase.

Key activities undertaken in 2013 include data cleansing, conversion and migration. Furthermore, necessary functional specifications were identified and approved for each process area, to ensure that the final ERP system covers the requirements of the Commission.

Regular meetings were held between Capgemini, the ERP team and business process owners to ensure that the requirements of all stakeholders are properly reflected in the final solution. Furthermore, Steering Committee meetings were held on a monthly basis to monitor progress.

Material for end user training and general training for dedicated staff was prepared in 2013. Basic navigation training activities commenced during the second half of the year in order to allow user acceptance testing during the first quarter of 2014.

IPSAS-compliant financial statements were prepared for the first three quarters of 2013 using manual procedures. Moreover, the regulatory framework of the Commission continues to be reviewed to ensure that any required changes are identified and approved in a timely manner.

The project is nearing its final preparation stage. During this phase, extensive testing of the system will be carried out to ensure that it is fully functional.

Facilitating the Entry Into Force of the Treaty

The eighth Article XIV conference, held at United Nations Headquarters in New York, September 2013.

Article XIV of the CTBT concerns the Treaty's entry into force. The article foresees a mechanism of regular conferences to facilitate entry into force (commonly referred to as 'Article XIV conferences') if this has not taken place three years after the Treaty is opened for signature. The first Article XIV conference took place in Vienna in 1999. Subsequent conferences were held in New York in 2001, 2005, 2009, 2011 and 2013 and in Vienna in 2003 and 2007.

The Secretary-General of the United Nations convenes the Article XIV conferences at the request of a majority of States that have ratified the Treaty.

Both ratifying and signatory States participate in these conferences. Decisions are taken by consensus of the ratifying States, taking into account views expressed at the conference by signatory States. Non-signatory States, international organizations and non-governmental organizations are invited to attend as observers.

Article XIV conferences discuss and decide on what measures, consistent with international law, may be undertaken to accelerate the ratification process in order to facilitate entry into force of the Treaty.

United Nations Secretary General Ban Ki-moon opening the Article XIV conference in New York.

The Ministers of Foreign Affairs of Hungary (*front row, second from left*) and Indonesia (*front row, third from left*) presiding over the Article XIV conference.

Conditions for Entry into Force

The entry into force of the CTBT is conditioned on its ratification by all 44 States listed in its Annex 2. These so-called Annex 2 States are States that formally participated in the final stage of the negotiation of the Treaty in the Conference of Disarmament in 1996 and possessed nuclear power reactors or nuclear research reactors at that time. As of 31 December 2013, 36 of these 44 States had ratified the Treaty. Of the Annex 2 States that had still to ratify the Treaty, three had not yet signed it.

New York, 2013

Convened on 27 September 2013 at the United Nations Headquarters in New York, the eighth Conference on Facilitating the Entry into Force of the CTBT served to demonstrate the continued political determination of the international community to achieve the Treaty's entry into force and its universality. At that conference, around 85 States Signatories gathered to take stock of progress, discuss strategies and coordinate efforts to generate further support for the Treaty and its universality. A significant number of foreign ministers and high level officials from ratifying, signatory and non-signatory States participated in the conference, including representatives from five States whose pending ratification is required for entry into force: China, Egypt, Iran (Islamic Republic of), Israel and the USA.

In addition to foreign ministers and high level representatives, the conference was attended by officials from international organizations, specialized agencies and non-governmental organizations.

Shared Presidency

The presidency of the conference was shared by the Minister of Foreign Affairs of Hungary, Mr János Martonyi, and the Minister of Foreign Affairs of Indonesia, Mr Marty M. Natalegawa. This reflected the global nature of the Treaty. In his opening remarks, Mr Martonyi appealed "to all States to make their utmost effort to achieve the entry into force of the CTBT at the earliest possible date." Mr Natalegawa in his opening remarks stressed the need to ″take concrete measures to accelerate the entry into force of the Treaty."

Expressions of Strong Support

The conference was characterized by numerous expressions of strong support for the Treaty and its entry into force, including by the Secretary-General of the United Nations, Mr Ban Ki-moon, who opened the conference. He called on all members of the international community "to break the stagnation in the disarmament process" and "secure the CTBT's entry into force, enforce a complete ban on nuclear testing and take further concrete steps towards creating a world without nuclear weapons".

The Executive Secretary, Mr Lassina Zerbo, called the Treaty "a uniting force in the multilateral system" and noted that the "prospects for the entry into force of the Treaty appear much more positive than they did for many years." The increase of one signature and six ratifications of the Treaty since the Article XIV conference in 2011 was "an outstanding achievement." Mr Zerbo said that "the best way forward is to make the

The Group of Eminent Persons and Executive Secretary Lassina Zerbo at the United Nations Headquarters in New York, September 2013.

de facto norm banning nuclear tests a legally binding commitment."

The conference unanimously adopted a Final Declaration that offers 11 practical measures to accelerate the ratification process and bring the Treaty into force. These measures include support for bilateral, regional and multilateral outreach initiatives, capacity building and training activities, and cooperation with civil society, international organizations and non-governmental organizations.

The Final Declaration calls upon the remaining countries to sign and ratify the Treaty without delay and expresses the commitment of participating States to spare no efforts and use all avenues open to them to encourage further signature and ratification of the Treaty. The Final Declaration also recognizes the achievements made in the universalization of the Treaty and in advancing the operational readiness of its verification regime. It emphasizes the significance of the Treaty, stating that "entry into force of the CTBT is of vital importance as a core element of the international nuclear disarmament and non-proliferation regime."

Moreover, the Final Declaration recognizes that the establishment of the Group of Eminent Persons (GEM) will assist in promoting the objectives of the Treaty and facilitating its early entry into force.

The civil and scientific benefits of the monitoring technologies, including for tsunami warning, received expressions of appreciation. There was also recognition of the effectiveness of the CTBT verification regime demonstrated in response to the announced nuclear test by the Democratic People's Republic of Korea on 12 February 2013.

Group of Eminent Persons

To ensure an innovative and focused approach to advance the ratification of the CTBT by the remaining Annex 2 States, a group comprising eminent personalities and internationally recognized experts was launched on 26 September 2013 at the United Nations Headquarters in New York. Through their expertise, experience and political standing, GEM will support and complement efforts to promote entry into force of the Treaty as well as reinvigorate international endeavours to achieve this goal. The group will utilize regional understanding and expertise to facilitate dialogue among leaders in various regions and spread the message of the CTBT at international conferences and other events. The presidents of the Article XIV conference, the Minister of Foreign Affairs of Hungary and the Minister of Foreign Affairs of Indonesia, are ex-officio members of GEM. In addition to broad support in the Final Declaration of the Article XIV conference, GEM was also endorsed by the United Nations General Assembly in resolution A/RES/68/68.

Worldwide Media Coverage

The conference was promoted through proactive media outreach. In the run-up, a number of op-ed articles by prominent personalities and media advisories were published, including an article by the co-presidents of the conference in the US newspaper *The Hill*. Press conferences were held before (including on the occasion of the International Day against Nuclear Testing) and on the margins of the conference. A live stream, video–audio recordings, photographic material and statements were provided on a dedicated web page. Over two million online recipients were reached through Twitter. The conference, the ratifications by Guinea-Bissau and Iraq and the establishment of GEM were covered by print and broadcast media, including in several Annex 2 States.

A dedicated issue of *CTBTO Spectrum* was issued, featuring a special brochure on GEM. A video was also produced to introduce its members.

Signature and Ratification

STATES WHOSE RATIFICATION IS REQUIRED FOR THE TREATY TO ENTER INTO FORCE (31 DECEMBER 2013)

State	Date of Signature	Date of Ratification
Algeria	15 Oct. 1996	11 Jul. 2003
Argentina	24 Sep. 1996	4 Dec. 1998
Australia	24 Sep. 1996	9 Jul. 1998
Austria	24 Sep. 1996	13 Mar. 1998
Bangladesh	24 Oct. 1996	8 Mar. 2000
Belgium	24 Sep. 1996	29 Jun. 1999
Brazil	24 Sep. 1996	24 Jul. 1998
Bulgaria	24 Sep. 1996	29 Sep. 1999
Canada	24 Sep. 1996	18 Dec. 1998
Chile	24 Sep. 1996	12 Jul. 2000
China	24 Sep. 1996	
Colombia	24 Sep. 1996	29 Jan. 2008
Democratic People's Republic of Korea		
Democratic Republic of the Congo	4 Oct. 1996	28 Sep. 2004
Egypt	14 Oct. 1996	
Finland	24 Sep. 1996	15 Jan. 1999
France	24 Sep. 1996	6 Apr. 1998
Germany	24 Sep. 1996	20 Aug. 1998
Hungary	25 Sep. 1996	13 Jul. 1999
India		
Indonesia	24 Sep. 1996	6 Feb. 2012
Iran (Islamic Republic of)	24 Sep. 1996	

State	Date of Signature	Date of Ratification
Israel	25 Sep. 1996	
Italy	24 Sep. 1996	1 Feb. 1999
Japan	24 Sep. 1996	8 Jul. 1997
Mexico	24 Sep. 1996	5 Oct. 1999
Netherlands	24 Sep. 1996	23 Mar. 1999
Norway	24 Sep. 1996	15 Jul. 1999
Pakistan		
Peru	25 Sep. 1996	12 Nov. 1997
Poland	24 Sep. 1996	25 May 1999
Republic of Korea	24 Sep. 1996	24 Sep. 1999
Romania	24 Sep. 1996	5 Oct. 1999
Russian Federation	24 Sep. 1996	30 Jun. 2000
Slovakia	30 Sep. 1996	3 Mar. 1998
South Africa	24 Sep. 1996	30 Mar. 1999
Spain	24 Sep. 1996	31 Jul. 1998
Sweden	24 Sep. 1996	2 Dec. 1998
Switzerland	24 Sep. 1996	1 Oct. 1999
Turkey	24 Sep. 1996	16 Feb. 2000
Ukraine	27 Sep. 1996	23 Feb. 2001
United Kingdom	24 Sep. 1996	6 Apr. 1998
United States of America	24 Sep. 1996	
Viet Nam	24 Sep. 1996	10 Mar. 2006

36 Ratified **41** Signed **3** Not signed **8** Not ratified

STATUS OF SIGNATURE AND RATIFICATION OF THE TREATY (31 DECEMBER 2013)

State	Date of Signature	Date of Ratification
Afghanistan	24 Sep. 2003	24 Sep. 2003
Albania	27 Sep. 1996	23 Apr. 2003
Algeria	15 Oct. 1996	11 Jul. 2003
Andorra	24 Sep. 1996	12 Jul. 2006
Angola	27 Sep. 1996	
Antigua and Barbuda	16 Apr. 1997	11 Jan. 2006
Argentina	24 Sep. 1996	4 Dec. 1998
Armenia	1 Oct. 1996	12 Jul. 2006
Australia	24 Sep. 1996	9 Jul. 1998
Austria	24 Sep. 1996	13 Mar. 1998
Azerbaijan	28 Jul. 1997	2 Feb. 1999
Bahamas	4 Feb. 2005	30 Nov. 2007
Bahrain	24 Sep. 1996	12 Apr. 2004
Bangladesh	24 Oct. 1996	8 Mar. 2000
Barbados	14 Jan. 2008	14 Jan. 2008
Belarus	24 Sep. 1996	13 Sep. 2000
Belgium	24 Sep. 1996	29 Jun. 1999
Belize	14 Nov. 2001	26 Mar. 2004
Benin	27 Sep. 1996	6 Mar. 2001
Bhutan		
Bolivia (Plurinational State of)	24 Sep. 1996	4 Oct. 1999
Bosnia and Herzegovina	24 Sep. 1996	26 Oct. 2006
Botswana	16 Sep. 2002	28 Oct. 2002
Brazil	24 Sep. 1996	24 Jul. 1998
Brunei Darussalam	22 Jan. 1997	10 Jan. 2013
Bulgaria	24 Sep. 1996	29 Sep. 1999
Burkina Faso	27 Sep. 1996	17 Apr. 2002
Burundi	24 Sep. 1996	24 Sep. 2008
Cambodia	26 Sep. 1996	10 Nov. 2000
Cameroon	16 Nov. 2001	6 Feb. 2006
Canada	24 Sep. 1996	18 Dec. 1998
Cape Verde	1 Oct. 1996	1 Mar. 2006
Central African Republic	19 Dec. 2001	26 May 2010
Chad	8 Oct. 1996	8 Feb. 2013
Chile	24 Sep. 1996	12 Jul. 2000
China	24 Sep. 1996	
Colombia	24 Sep. 1996	29 Jan. 2008
Comoros	12 Dec. 1996	
Congo	11 Feb. 1997	
Cook Islands	5 Dec. 1997	6 Sep. 2005
Costa Rica	24 Sep. 1996	25 Sep. 2001
Côte d'Ivoire	25 Sep. 1996	11 Mar. 2003
Croatia	24 Sep. 1996	2 Mar. 2001

State	Date of Signature	Date of Ratification
Cuba		
Cyprus	24 Sep. 1996	18 Jul. 2003
Czech Republic	12 Nov. 1996	11 Sep. 1997
Democratic People's Republic of Korea		
Democratic Republic of the Congo	4 Oct. 1996	28 Sep. 2004
Denmark	24 Sep. 1996	21 Dec. 1998
Djibouti	21 Oct. 1996	15 Jul. 2005
Dominica		
Dominican Republic	3 Oct. 1996	4 Sep. 2007
Ecuador	24 Sep. 1996	12 Nov. 2001
Egypt	14 Oct. 1996	
El Salvador	24 Sep. 1996	11 Sep. 1998
Equatorial Guinea	9 Oct. 1996	
Eritrea	11 Nov. 2003	11 Nov. 2003
Estonia	20 Nov. 1996	13 Aug. 1999
Ethiopia	25 Sep. 1996	8 Aug. 2006
Fiji	24 Sep. 1996	10 Oct. 1996
Finland	24 Sep. 1996	15 Jan. 1999
France	24 Sep. 1996	6 Apr. 1998
Gabon	7 Oct. 1996	20 Sep. 2000
Gambia	9 Apr. 2003	
Georgia	24 Sep. 1996	27 Sep. 2002
Germany	24 Sep. 1996	20 Aug. 1998
Ghana	3 Oct. 1996	14 Jun. 2011
Greece	24 Sep. 1996	21 Apr. 1999
Grenada	10 Oct. 1996	19 Aug. 1998
Guatemala	20 Sep. 1999	12 Jan. 2012
Guinea	3 Oct. 1996	20 Sep. 2011
Guinea-Bissau	11 Apr. 1997	24 Sep. 2013
Guyana	7 Sep. 2000	7 Mar. 2001
Haiti	24 Sep. 1996	1 Dec. 2005
Holy See	24 Sep. 1996	18 Jul. 2001
Honduras	25 Sep. 1996	30 Oct. 2003
Hungary	25 Sep. 1996	13 Jul. 1999
Iceland	24 Sep. 1996	26 Jun. 2000
India		
Indonesia	24 Sep. 1996	6 Feb. 2012
Iran (Islamic Republic of)	24 Sep. 1996	
Iraq	19 Aug. 2008	26 Sep. 2013
Ireland	24 Sep. 1996	15 Jul. 1999
Israel	25 Sep. 1996	

161 Ratified **183** Signed **13** Not signed **35** Not ratified

State	Date of Signature	Date of Ratification
Italy	24 Sep. 1996	1 Feb. 1999
Jamaica	11 Nov. 1996	13 Nov. 2001
Japan	24 Sep. 1996	8 Jul. 1997
Jordan	26 Sep. 1996	25 Aug. 1998
Kazakhstan	30 Sep. 1996	14 May 2002
Kenya	14 Nov. 1996	30 Nov. 2000
Kiribati	7 Sep. 2000	7 Sep. 2000
Kuwait	24 Sep. 1996	6 May 2003
Kyrgyzstan	8 Oct. 1996	2 Oct. 2003
Lao People's Democratic Republic	30 Jul. 1997	5 Oct. 2000
Latvia	24 Sep. 1996	20 Nov. 2001
Lebanon	16 Sep. 2005	21 Nov. 2008
Lesotho	30 Sep. 1996	14 Sep. 1999
Liberia	1 Oct. 1996	17 Aug. 2009
Libya	13 Nov. 2001	6 Jan. 2004
Liechtenstein	27 Sep. 1996	21 Sep. 2004
Lithuania	7 Oct. 1996	7 Feb. 2000
Luxembourg	24 Sep. 1996	26 May 1999
Madagascar	9 Oct. 1996	15 Sep. 2005
Malawi	9 Oct. 1996	21 Nov. 2008
Malaysia	23 Jul. 1998	17 Jan. 2008
Maldives	1 Oct. 1997	7 Sep. 2000
Mali	18 Feb. 1997	4 Aug. 1999
Malta	24 Sep. 1996	23 Jul. 2001
Marshall Islands	24 Sep. 1996	28 Oct. 2009
Mauritania	24 Sep. 1996	30 Apr. 2003
Mauritius		
Mexico	24 Sep. 1996	5 Oct. 1999
Micronesia (Federated States of)	24 Sep. 1996	25 Jul. 1997
Monaco	1 Oct. 1996	18 Dec. 1998
Mongolia	1 Oct. 1996	8 Aug. 1997
Montenegro	23 Oct. 2006	23 Oct. 2006
Morocco	24 Sep. 1996	17 Apr. 2000
Mozambique	26 Sep. 1996	4 Nov. 2008
Myanmar	25 Nov. 1996	
Namibia	24 Sep. 1996	29 Jun. 2001
Nauru	8 Sep. 2000	12 Nov. 2001
Nepal	8 Oct. 1996	
Netherlands	24 Sep. 1996	23 Mar. 1999
New Zealand	27 Sep. 1996	19 Mar. 1999
Nicaragua	24 Sep. 1996	5 Dec. 2000
Niger	3 Oct. 1996	9 Sep. 2002

State	Date of Signature	Date of Ratification
Nigeria	8 Sep. 2000	27 Sep. 2001
Niue	9 Apr. 2012	
Norway	24 Sep. 1996	15 Jul. 1999
Oman	23 Sep. 1999	13 Jun. 2003
Pakistan		
Palau	12 Aug. 2003	1 Aug. 2007
Panama	24 Sep. 1996	23 Mar. 1999
Papua New Guinea	25 Sep. 1996	
Paraguay	25 Sep. 1996	4 Oct. 2001
Peru	25 Sep. 1996	12 Nov. 1997
Philippines	24 Sep. 1996	23 Feb. 2001
Poland	24 Sep. 1996	25 May 1999
Portugal	24 Sep. 1996	26 Jun. 2000
Qatar	24 Sep. 1996	3 Mar. 1997
Republic of Korea	24 Sep. 1996	24 Sep. 1999
Republic of Moldova	24 Sep. 1997	16 Jan. 2007
Romania	24 Sep. 1996	5 Oct. 1999
Russian Federation	24 Sep. 1996	30 Jun. 2000
Rwanda	30 Nov. 2004	30 Nov. 2004
Saint Kitts and Nevis	23 Mar. 2004	27 Apr. 2005
Saint Lucia	4 Oct. 1996	5 Apr. 2001
Saint Vincent and the Grenadines	2 Jul. 2009	23 Sep. 2009
Samoa	9 Oct. 1996	27 Sep. 2002
San Marino	7 Oct. 1996	12 Mar. 2002
Sao Tome and Principe	26 Sep. 1996	
Saudi Arabia		
Senegal	26 Sep. 1996	9 Jun. 1999
Serbia	8 Jun. 2001	19 May 2004
Seychelles	24 Sep. 1996	13 Apr. 2004
Sierra Leone	8 Sep. 2000	17 Sep. 2001
Singapore	14 Jan. 1999	10 Nov. 2001
Slovakia	30 Sep. 1996	3 Mar. 1998
Slovenia	24 Sep. 1996	31 Aug. 1999
Solomon Islands	3 Oct. 1996	
Somalia		
South Africa	24 Sep. 1996	30 Mar. 1999
South Sudan[a]		
Spain	24 Sep. 1996	31 Jul. 1998
Sri Lanka	24 Oct. 1996	
Sudan	10 Jun. 2004	10 Jun. 2004
Suriname	14 Jan. 1997	7 Feb. 2006
Swaziland	24 Sep. 1996	

State	Date of Signature	Date of Ratification
Sweden	24 Sep. 1996	2 Dec. 1998
Switzerland	24 Sep. 1996	1 Oct. 1999
Syrian Arab Republic		
Tajikistan	7 Oct. 1996	10 Jun. 1998
Thailand	12 Nov. 1996	
The former Yugoslav Republic of Macedonia	29 Oct. 1998	14 Mar. 2000
Timor-Leste	26 Sep. 2008	
Togo	2 Oct. 1996	2 Jul. 2004
Tonga		
Trinidad and Tobago	8 Oct. 2009	26 May 2010
Tunisia	16 Oct. 1996	23 Sep. 2004
Turkey	24 Sep. 1996	16 Feb. 2000
Turkmenistan	24 Sep. 1996	20 Feb. 1998
Tuvalu		
Uganda	7 Nov. 1996	14 Mar. 2001
Ukraine	27 Sep. 1996	23 Feb. 2001
United Arab Emirates	25 Sep. 1996	18 Sep. 2000
United Kingdom	24 Sep. 1996	6 Apr. 1998
United Republic of Tanzania	30 Sep. 2004	30 Sep. 2004
United States of America	24 Sep. 1996	
Uruguay	24 Sep. 1996	21 Sep. 2001
Uzbekistan	3 Oct. 1996	29 May 1997
Vanuatu	24 Sep. 1996	16 Sep. 2005
Venezuela (Bolivarian Republic of)	3 Oct. 1996	13 May 2002
Viet Nam	24 Sep. 1996	10 Mar. 2006
Yemen	30 Sep. 1996	
Zambia	3 Dec. 1996	23 Feb. 2006
Zimbabwe	13 Oct. 1999	

[a] Annex 1 to the Treaty provides the list of States at the time of its conclusion. South Sudan has since been recognized by the United Nations as an independent State.

STATUS OF SIGNATURE AND RATIFICATION OF THE TREATY BY GEOGRAPHICAL REGION (31 DECEMBER 2013)

Africa
(54 States)

51 Signatories
42 Ratifiers

Middle East and South Asia
(26 States)

21 Signatories
16 Ratifiers

Eastern Europe
(23 States)

23 Signatories
23 Ratifiers

North America and Western Europe
(28 States)

28 Signatories
27 Ratifiers

Latin America and the Caribbean
(33 States)

31 Signatories
31 Ratifiers

South-East Asia, the Pacific and the Far East
(32 States)

29 Signatories
22 Ratifiers