CTBTO
PREPARATORY COMMISSION
preparatory commission for the comprehensive nuclear-test-ban treaty organization

Annual Report 2009

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Message
from the Executive Secretary

I am pleased to share with you, in this report, the results of the work of the CTBTO Preparatory Commission in 2009. The year generated a strong momentum for nuclear disarmament and non-proliferation in which support for the early entry into force of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) was prominent.

The Treaty was placed in the spotlight at the sixth Conference on Facilitating the Entry into Force of the CTBT, which was held in New York on 24–25 September. With an impressive attendance, this conference offered further opportunities for a renewal of commitment to the Treaty and support for the work of the Commission. Media coverage of the Treaty and the work of the Commission was unprecedented. The United Nations Security Council summit on 24 September, chaired by President Obama of the United States of America, recognized the importance of the Treaty and called on all States to sign and ratify so as to bring it into force at an early date.

Additional countries joined the ranks of the signatories and ratifiers. With 182 signatures and 151 ratifications, the Treaty now stands among the international norms that enjoy the greatest number of adherents.

Significant progress was also achieved in development of the Treaty's verification system, increasing its capabilities to detect a nuclear test explosion. In this respect, build-up and certification of facilities in the International Monitoring System continued. By the end of the year, 83% of the entire network was installed.

The reliability of operation of the International Data Centre and the capacity to transmit the ever increasing volume of monitoring data and data products were similarly improved. A state of health system was installed in the Operations Centre. This is to help ensure accuracy of the information from the stations and the proper working of all parts of the verification system.

The Commission conducted a thorough review of the 2008 Integrated Field Exercise. Following the review, a comprehensive on-site inspection (OSI) action plan was developed. This plan will guide further development of the Treaty's OSI regime in the coming years.

The International Scientific Studies Conference, held in June, was a platform for strengthening the interaction of the Commission with the world scientific community. It assisted in making an independent assessment of the capabilities and readiness of the verification regime and in identifying developments that might enhance these capabilities.

On 25 May, the Democratic People's Republic of Korea announced that it had conducted a nuclear test. Though presenting a major challenge to the established international norm against nuclear tests, the event prompted a strong rallying of support for the Treaty. It equally served as a performance test for the verification system. The system proved its true value by performing in a timely, coherent and effective manner.

I have given here just a brief account of some of our collective achievements. I am confident that the Commission's progress in 2009, as detailed in this annual report, sets a solid ground for further advances in 2010.

Tibor Tóth
Executive Secretary
CTBTO Preparatory Commission
Vienna, February 2010

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.

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

The year 2009 was a crucial one for the Comprehensive Nuclear-Test-Ban Treaty (CTBT). It was characterized by strengthened efforts to achieve universalization of the Treaty and by the significant progress made in advancing the operational readiness of the verification system.

The sixth Conference on Facilitating the Entry into Force of the CTBT, which was held in New York on 24–25 September, provided an opportunity for ratifying and signatory States and civil society to voice the call of the international community for the early entry into force and universality of the Treaty. The conference enjoyed the attendance of an unprecedented number of high level dignitaries, with representatives from 103 States – comprising 87 ratifying States, 13 signatory States and 3 non-signatory States – taking part. The United Nations Security Council summit, held on 24 September, and its unanimously adopted resolution which called for the entry into force of the CTBT, served to further promote the importance of the Treaty as one of the core components of the international security agenda. Owing to the high level attention and a carefully crafted public information strategy, media coverage of the CTBT was comprehensive.

The year also saw Liberia, the Marshall Islands and Saint Vincent and the Grenadines ratify the Treaty, with Trinidad and Tobago joining the ranks of the States Signatories. As of 31 December 2009, the CTBT had been signed by 182 States and ratified by 151 States. The ratifying States included 35 of the 44 States listed in Annex 2 to the Treaty, whose ratification is required for it to enter into force.

As the work on sustainment of the International Monitoring System (IMS) continued, significant progress in all four of its technologies was achieved. By the end of 2009, 268 IMS stations were installed, representing 83% of the entire network. A total of 24 noble gas systems were also established, corresponding to 60% of the total planned. Station design, especially in infrasound technology, also evolved, resulting in an increased capability of detection. The total number of certified IMS stations and laboratories, which was zero in 2000, had risen to 254 by the end of 2009. Such a sharp increase has been a source of much improved coverage and network resilience.

In 2009, operation and maintenance activities for the Global Communication Infrastructure (GCI) focused on consolidating the enhanced capabilities of the new GCI network, whose availability continued to improve. The volume of data traffic carried by the GCI and by special links to the IDC and in the other direction, from the IDC to remote sites, increased during the year.

Through new software applications, the detection capacity of the IDC and the reliability of IDC operation were strengthened, and the means of access of authorized users in States Signatories to IDC data and data products were developed further.

A major achievement was the installation of the state of health system in the Operations Centre. This system collects and manages information on the state of health from all components of the IMS, including stations, GCI links, IDC programs and servers and any other source of data that may be relevant to the operation and maintenance of the IMS.

In response to the announced nuclear test of 25 May 2009 by the Democratic People's Republic of Korea, the monitoring system operated satisfactorily. The key components of the system, including the IMS network, the GCI and the IDC, as well as National Data Centres (NDCs), performed in accordance with established standards. The event was detected and automatically located using 23 primary seismic stations, as reported in the initial list of events (Standard Event List 1 or SEL1) issued by the IDC. SEL1 was made available to authorized users within about one hour. Owing to the interest in this event, the IDC expedited the production of its Reviewed Event Bulletin (REB) for the events of 25 May. The REB included observations from 31 primary seismic stations and 30 auxiliary seismic stations. Publicity was generated worldwide on an unprecedented scale by the performance of the monitoring system.

As a follow-up to the 2006 "Synergies with Science" symposium, the International Scientific Studies (ISS) Conference was held from 10 to 12 June in the Hofburg, Vienna. The ISS project aims to help the CTBTO Preparatory Commission keep pace with the latest advances in science and technology and to forge long term cooperative links with the scientific community. The conference attracted over five hundred scientists from about one hundred countries, together with diplomats and journalists. The results of the conference, as well as the final publication and the more than two hundred scientific posters presented at the meeting, were made available on the public web site and distributed to target audiences worldwide.

In the area of on-site inspection (OSI), a comprehensive review of the 2008 Integrated Field Exercise was conducted. This resulted in the collection of almost nine hundred observations, from which recommendations for subsequent implementation were developed. The exercise culminated in the preparation of a comprehensive action plan for further development of the OSI regime, which was approved by the Commission at its Thirty-Third Session. The action plan has five core projects: policy planning and operations, operations support and logistics, techniques and equipment, training, and procedures and documentation.

The achievements of 2009 and the renewed momentum in favour of the Treaty and the work of the Commission provided a strong stimulus to reinvigorate the political determination to achieve entry into force and universality of the Treaty.

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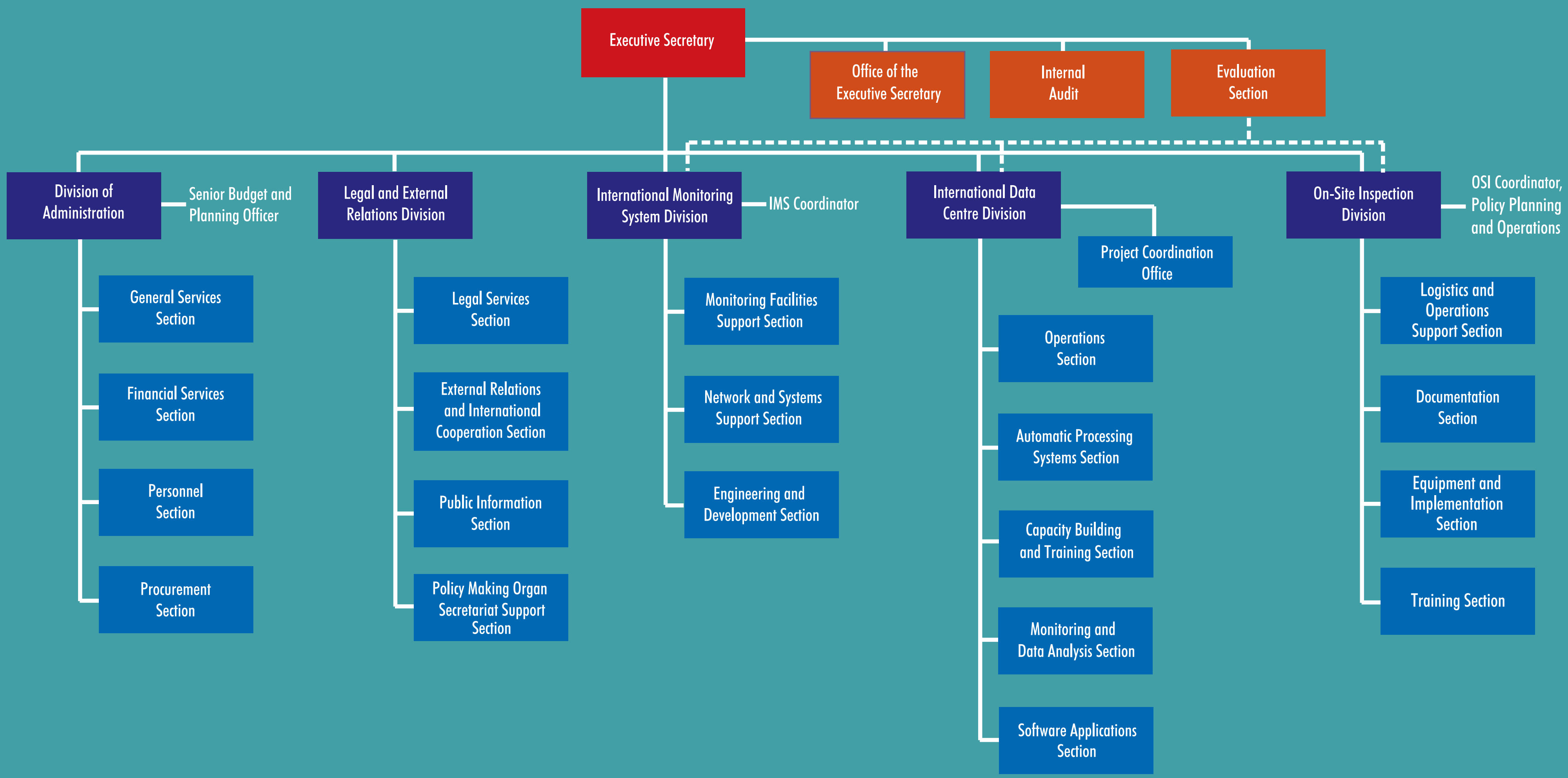
Abbreviations

CIF	Capital Investment Fund
DOTS	Database of the Technical Secretariat
GCI	Global Communications Infrastructure
IAEA	International Atomic Energy Agency
IDC	International Data Centre
IFE	Integrated Field Exercise
IMS	International Monitoring System
INGE	International Noble Gas Experiment
IRS	IMS Reporting System
ISS	International Scientific Studies
KPI	key performance indicator
MPLS	multiprotocol label switching
NDC	National Data Centre
NGO	non-governmental organization
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
OSI	on-site inspection
PCA	post-certification activity
PTS	Provisional Technical Secretariat
REB	Reviewed Event Bulletin
SAMS	Seismic Aftershock Monitoring System
SEL	Standard Event List
SOH	state of health
VPN	virtual private network
VSAT	very small aperture terminal
WMO	World Meteorological Organization

Organizational Structure of the Provisional Technical Secretariat
(31 December 2009)



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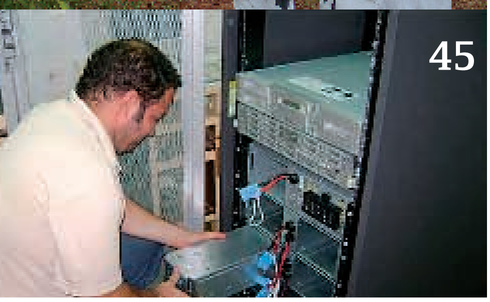

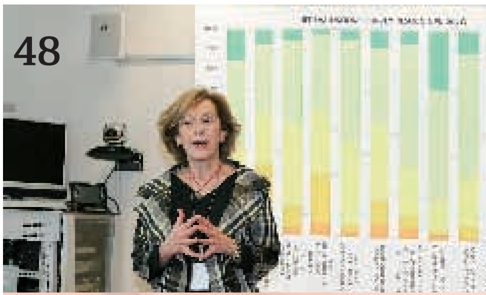
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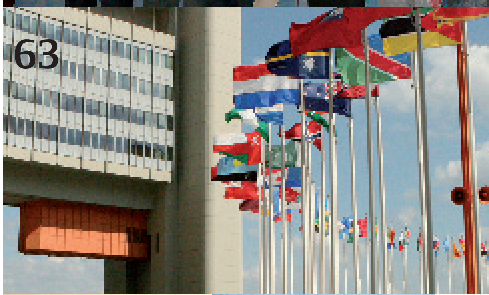
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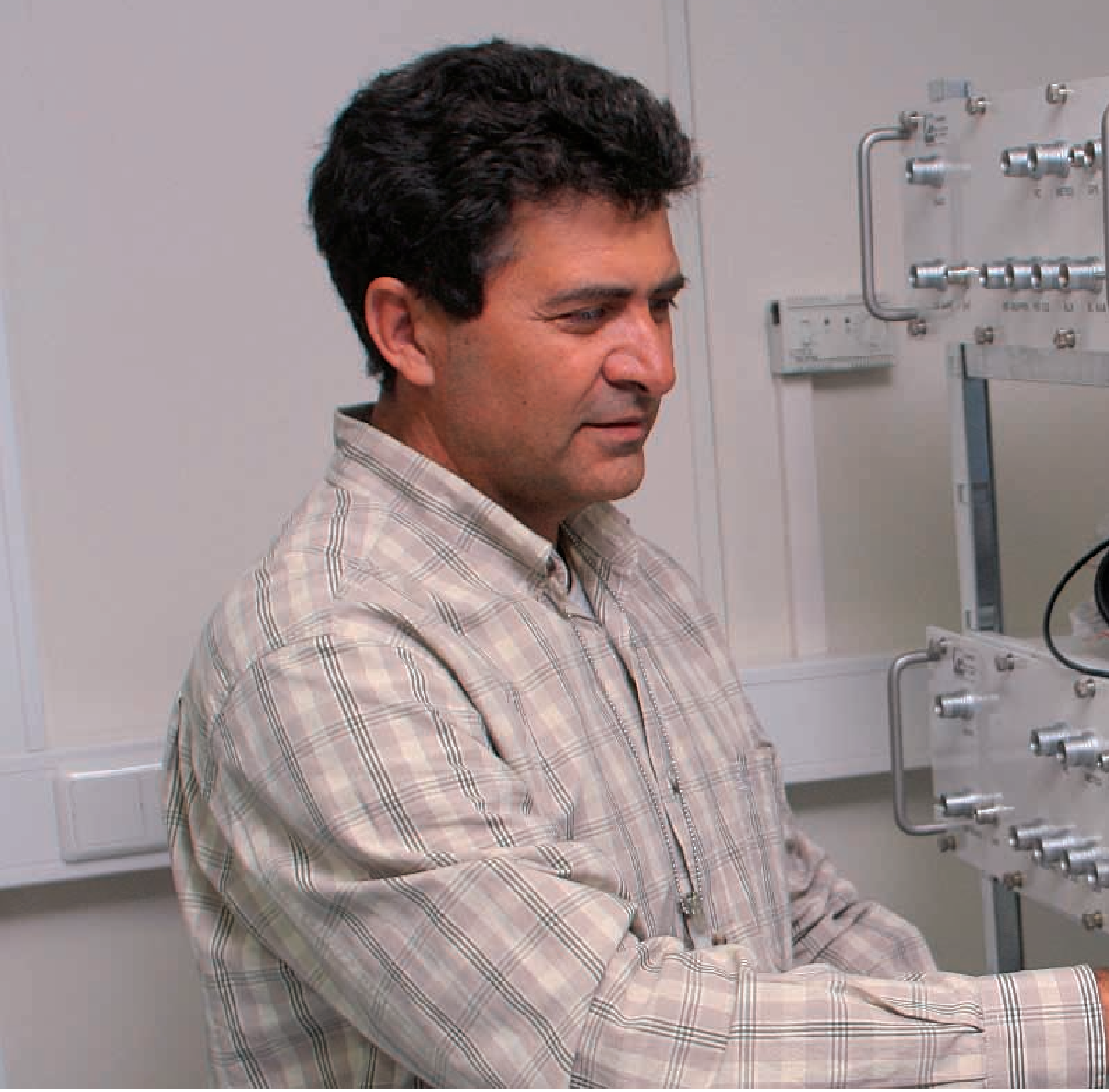


International Monitoring System

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.

Putting an End to
Nuclear Explosions

International Monitoring System

HIGHLIGHTS IN 2009

- Certification of the 250th IMS facility in November
- Increased data availability at certified stations
- External access to the Database of the Technical Secretariat

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 unit of the IMS.

ESTABLISHING THE INTERNATIONAL MONITORING SYSTEM

The Preparatory Commission reached an important milestone on 16 November 2009 with the certification of radionuclide station RN14 in Sidney, British Columbia, Canada: this was the 250th IMS facility to be certified as meeting all the stringent technical requirements of the Commission. The total number of certified IMS stations and laboratories, which was zero at the beginning of 2000, reached 254 at the end of 2009. The sharp increase in the number of stations installed and certified has been a source of improvement for coverage and network resilience. Station design, especially in the infrasound technology, has also evolved, resulting in a higher detection capability.

During the year, 9 stations were certified, bringing the total number of certified stations to 244 (76% of the station network). The number of certified radionuclide laboratories at the end of the year was 10 (63% of the total).

Significant progress was made towards the completion of the IMS, with the continued build-up of the system in all four technologies (seismic, hydroacoustic, infrasound and radionuclide). Four stations and four noble gas systems were installed. Thus, by the end of 2009, 268 IMS stations were installed, representing 83% of the entire network. A total of 24 noble gas systems were also established, corresponding to 60% of the total planned. Six additional noble

The 250th IMS facility to be certified: radionuclide station RN14, Sidney, British Columbia, Canada.

Table 1. Status of the Station Installation and Certification Programme
(31 December 2009)

IMS Station Type	Installation Complete: Certified	Installation Complete: Not Certified	Under Construction	Contract Under Negotiation	Not Started
Primary seismic	40	5	2	0	3
Auxiliary seismic	94	13	7	0	6
Hydroacoustic	10	1	0	0	0
Infrasound	42	0	7	0	11
Radionuclide	58	5	6	4	7
Total	**244**	**24**	**22**	**4**	**27**

Table 2. Status of Noble Gas System Installations
(31 December 2009)

Total Number of Noble Gas Systems	Installed Noble Gas Systems
40	24

Table 3. Status of Radionuclide Laboratory Certifications
(31 December 2009)

Total Number of Laboratories	Certified Laboratories
16	10

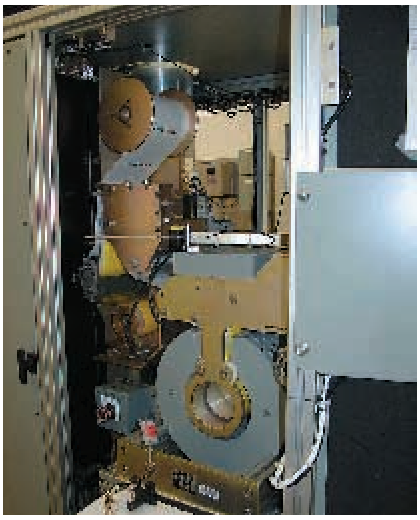
gas systems were purchased in 2009 for installation in the course of 2010.

The experience gained with extensive testing of noble gas systems over the past four years indicates that systems are capable of operating in a remote environment, thereby fulfilling the minimum requirements for noble gas monitoring set by the Commission. Certification of noble gas systems is therefore expected to commence in 2010. Preparations to this end started in 2009.

AGREEMENTS FOR MONITORING FACILITIES

Facility agreements and arrangements are concluded between the Commission and those States hosting IMS facilities in order to regulate activities such as site surveys, installation or upgrading work and certification, as well as post-certification activities (PCAs). They come into effect either upon signature by the parties or on the date on which the State informs the Commission that the national requirements have been fulfilled for the agreement or arrangement to take effect. The agreements and arrangements are based on the model adopted by the Commission at its Sixth Session in 1998.

In April, a facility agreement with Namibia was concluded and entered into force, resulting in a total of 38 facility agreements or arrangements signed, of which 32 have entered into force. At the end of 2009, the Commission was in negotiation with 12 of the 51 host States which have not yet concluded a facility agreement or arrangement. Of the remainder, negotiations have stalled with 9 States and 30 others have yet to respond to the efforts of the Provisional Technical Secretariat (PTS) to initiate negotiations.



Detector at radionuclide station RN72, Melbourne, Florida, USA.

Global Communications Infrastructure VSAT antenna (small dish) relaying data via satellite from hydroacoustic station HA8, located on Diego Garcia in the Chagos Archipelago (United Kingdom), to the International Data Centre in Vienna.

Auxiliary seismic station AS10, Pitinga, Brazil.

In order to carry out the functions of efficiently and effectively establishing and sustaining the IMS facilities, the Commission needs immunity from taxation, customs duties and restrictions. 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. In practice, this may imply that the host State would adopt the necessary national measures to that effect.

In its latest report, Working Group B of the Commission noted that a significant cause of delays in shipments of equipment for IMS facilities was the lack of established facility agreements and of subsequent adoption of necessary national measures to ensure prompt customs clearance and, where applicable, tax exemption. Noting that this had a direct effect on data availability, Working Group B requested the PTS to provide more detailed and specific examples and analysis of this issue in 2010 and encouraged host countries to cooperate closely with the PTS to resolve this issue.

AFTER CERTIFICATION

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

PCA contracts are the fixed-cost contracts between the PTS and the station operators. These contracts cover station operations and some preventive maintenance activities. The total PCA expenditure in 2009 of US$15 800 000 was distributed among 133 facilities, including the 10 certified radionuclide laboratories.

PCA contractual agreements for three new stations and one radionuclide laboratory were agreed.

SUSTAINING MONITORING FACILITIES

As the IMS installation and certification phase approaches completion, the importance of reviewing and improving operation and support of the facilities increases. Sustainment of monitoring facilities and of the IMS network itself involves management, coordination and support for the full life cycle of each facility component, performed as efficiently and effectively as possible. In addition, recapitalization of all components of each IMS facility must be planned.

In order to ensure more timely corrective maintenance of IMS facilities where data availability is being affected, the Commission amended Financial Rule 11.5.10 to raise the procurement threshold for unscheduled maintenance activities. The amendment allows these activities to be handled administratively in the same way as a miscellaneous purchase and therefore more swiftly.

Infrasound station IS43, Dubna, Russian Federation.

Multi-beam swathe sonar for imaging the ocean floor in preparation for cable laying operations at hydroacoustic stations.

Hoisting a remotely operated vehicle into the water to take video recordings of the data transmission cable connecting the hydrophones of hydroacoustic station HA1 to the shore at Cape Leeuwin, Western Australia, during inspection in 2009.

Work in the area of logistics support concentrated on further defining a systematic approach to resolving customs and shipment issues and on optimizing the storage of PTS equipment. Logistics support for IMS facilities was further streamlined and optimized in cooperation with the station operators. A workshop was held for evaluating logistics support analysis software. It was expected that such a software tool would be put into use in 2010.

The validation, review and improvement of configuration management for IMS facilities continued in 2009. At the end of the year, baseline data had been established in the Database of the Technical Secretariat (DOTS) for 237 of the 244 certified stations. Moreover, DOTS was enhanced with the addition of information related to the security level of the stations, the support level of the station operators, the associated Global Communications Infrastructure (GCI) equipment and links, and equipment logistics data. The new version of DOTS was rolled out successfully. Finally, external access to part of DOTS was provided to various station operators as well as to some Permanent Missions upon request.

Radionuclide station RN42, Tanah Rata, Malaysia.

The PTS increased its efforts in developing a station by station strategy for preventive and planned maintenance activities. Station specific documentation was developed further and processes for maintenance, station upgrades and recapitalization were refined. Several major equipment maintenance, replacement and recapitalization projects were initiated or completed. Among the projects were the initiation of recapitalization at 20 stations (including the purchase of 80 computer systems), 20 station visits and 7 additional preventive maintenance visits, as well as an underwater cable inspection at hydroacoustic station HA1 at Cape Leeuwin in Western Australia. In addition, the preparation of the largest IMS station repair so far in terms of financial investment started at hydroacoustic station HA3 in the Juan Fernández Islands (Chile).

The long term operation and sustainment of auxiliary seismic stations attracted greater political attention in 2009. Countries hosting auxiliary seismic stations which present design deficiencies or obsolescence problems were asked

AGREEMENTS OR ARRANGEMENTS WITH STATES HOSTING FACILITIES OF THE CTBT INTERNATIONAL MONITORING SYSTEM

Facility agreement/arrangement in force
Facility agreement/arrangement not yet in force
Exchange of letters concluded
Exchange of letters not yet concluded

State	Date of Entry into Force	Number of Facilities
Argentina	2 Mar. 2004	9
Armenia		1
Australia	17 Aug. 2000	21
Austria		1
Bangladesh		1
Bolivia (Plurinational State of)		3
Botswana		1
Brazil		7
Cameroon		1
Canada	19 Oct.1998	16
(Articles 6, 8 and 9 on 1 Mar. 2000)		
Cape Verde		1
Central African Republic		2
Chile		7
China		12
Colombia		1
Cook Islands	14 Apr. 2000	2
Costa Rica		1
Côte d'Ivoire		2
Czech Republic	29 Jan. 2004	1
Denmark		2
Djibouti		2
Ecuador		2
Egypt		2
Ethiopia		2
Fiji		2
Finland	6 Jun. 2000	2
France	1 May 2004	17
Gabon		1
Germany		4
Germany/South Africa[a]		1
Greece		1
Guatemala	2 Jun. 2005	1
Iceland	26 Jan. 2006	2
To be determined		4
Indonesia		6
Iran (Islamic Republic of)		5
Israel		3
Italy		2
Japan		10
Jordan	11 Nov. 1999	1
Kazakhstan	5 Dec. 2008	5
Kenya	29 Oct. 1999	2
Kiribati		1
Kuwait		1
Kyrgyzstan		1
Libyan Arab Jamahiriya		1

State	Date of Entry into Force	Number of Facilities
Madagascar		2
Malaysia		1
Mali		1
Mauritania	17 Sep. 2003	1
Mexico		5
Mongolia	25 May 2001	3
Morocco		1
Namibia	1 Apr. 2009	2
Nepal		1
New Zealand	19 Dec. 2000	7
Niger	24 Nov. 2000	2
Norway	10 Jun. 2002	6
Oman		1
Pakistan		2
Palau	29 Apr. 2002	1
Panama	26 Nov. 2003	1
Papua New Guinea		4
Paraguay	27 Jan. 2006	2
Peru	8 Jul. 2002	2
Philippines	8 Jan. 2004	3
Portugal		3
Republic of Korea		1
Romania	13 Oct. 2004	1
Russian Federation	27 Dec. 2006	32
Samoa		1
Saudi Arabia		2
Senegal	24 Mar. 2006	1
Solomon Islands		1
South Africa	20 May 1999	5
Spain	12 Dec. 2003	1
Sri Lanka		1
Sweden		2
Switzerland		1
Thailand		2
Tunisia		2
Turkey		1
Turkmenistan		1
Uganda		1
Ukraine	20 Apr. 2001	1
United Kingdom	16 Jun. 2004	12
United Republic of Tanzania	10 Dec. 2007	1
United States of America		39
Venezuela (Bolivarian Republic of)		2
Zambia	20 Oct. 2001	1
Zimbabwe		1
Total		**337**

[a] Germany and South Africa are jointly responsible for an auxiliary seismic station in Antarctica.

Auxiliary seismic station AS41, Jayapura, Irian Jaya, Indonesia.

about their ability to cover the cost of upgrading the stations. This resulted in corrective actions by some hosting countries to restore or improve data flow at several stations. However, the challenge of obtaining the appropriate level of technical and financial support remains for several countries hosting auxiliary seismic stations.

Cost effective solutions were developed to resolve engineering problems arising at IMS stations. Initiatives were also launched to enhance the performance and capabilities of IMS monitoring technologies. Significant progress was made on a number of projects, including the failure analysis of radionuclide particulate stations, enhancement of the operational robustness and configuration redundancy of seismic arrays to improve their mission capability, and the development of an infrasound test kit.

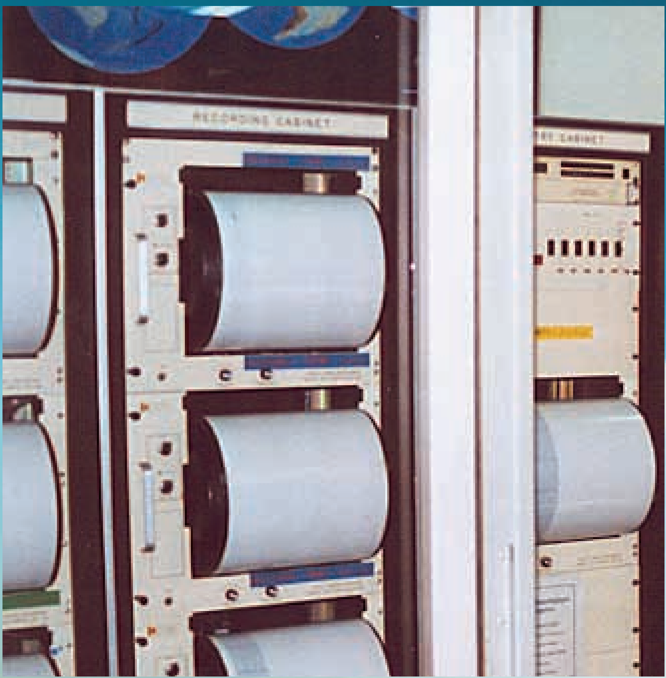
Significant efforts were dedicated to quality management. A project was initiated to establish relevant processes and procedures to calibrate the IMS. This involves the determination and continuous monitoring, by measurement or comparison against a standard, of parameters needed to properly interpret signals recorded by IMS facilities.

The PTS developed and implemented a quality assurance/quality control programme to monitor the performance of the network of radionuclide particulate stations, with the aim of ensuring that data produced are of acceptable quality. The programme verifies that stations conform to their certified operational tolerances, prescribes preventive action to avoid non-conformance and initiates corrective action when non-conformance is discovered. In addition to the yearly Proficiency Test Exercise, a surveillance review was conducted at several radionuclide laboratories. Finally, a preliminary quality assurance/quality control process was defined and implemented for noble gas stations.

All of the activities mentioned above contributed to increasing the data availability of the certified IMS stations in 2009 by over 4% in comparison with 2008. In an ever growing but also ageing IMS network, activities undertaken in 2009 and in previous years have thus not only mitigated the effects of obsolescence in the network but also reversed the decreasing trend in data availability observed in 2008.

One of the instrument pits forming the seismic array of auxiliary seismic station AS104, Eskdalemuir, United Kingdom.

Profiles of the Monitoring Technologies



SEISMIC STATION

The objective of seismic monitoring is to detect and locate underground nuclear explosions. Earthquakes and other natural events and events of human origin 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 seconds 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.

Seismic Monitoring

- 170 stations – 50 primary and 120 auxiliary – in 76 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 all 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 have to function for 20–25 years 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 highly complex affair. It involves the hiring of ships, extensive underwater work and the use of specially designed materials and equipment.

Hydroacoustic Monitoring

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

Infrasound Monitoring

- **60 stations in 35 countries around the world**

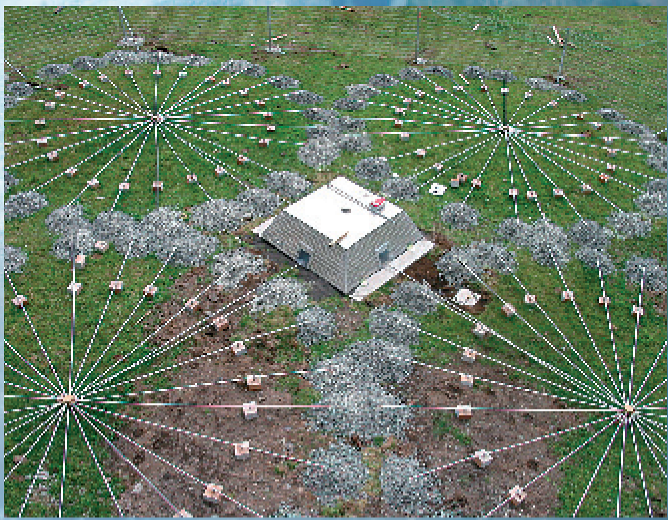
INFRASOUND STATION

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, ideal sites for deploying an infrasound station are within a dense forest, where it is protected from prevailing winds, or at locations with the lowest possible background noise in order to improve signal reception.

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.



RADIONUCLIDE STATION

The 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 others 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.

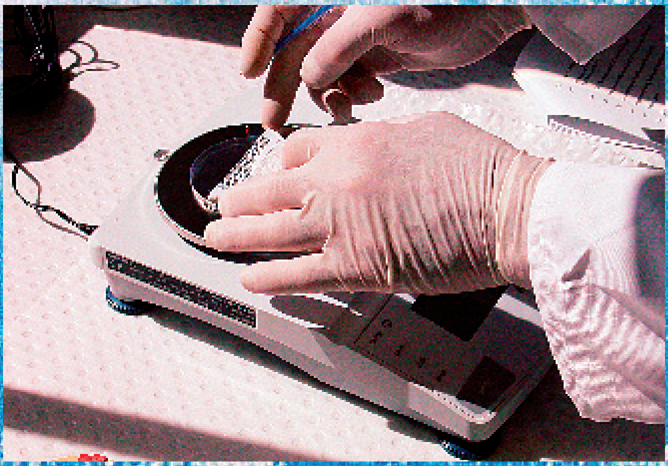
Radionuclide stations detect radionuclide particles in the air. Each station contains an air sampler, detection equipment, computers and a communication set-up. At the air sampler, air is forced through a filter, which retains most particles that reach it. The used filters are examined and the gamma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

NOBLE GAS DETECTION SYSTEM

By the time of entry into force of the Treaty, 40 radionuclide stations will need 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 will strengthen the capacity of the IMS and continue the cutting-edge approach to the creation of the verification system.

The name 'noble gases' emphasizes 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 only be produced 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".)

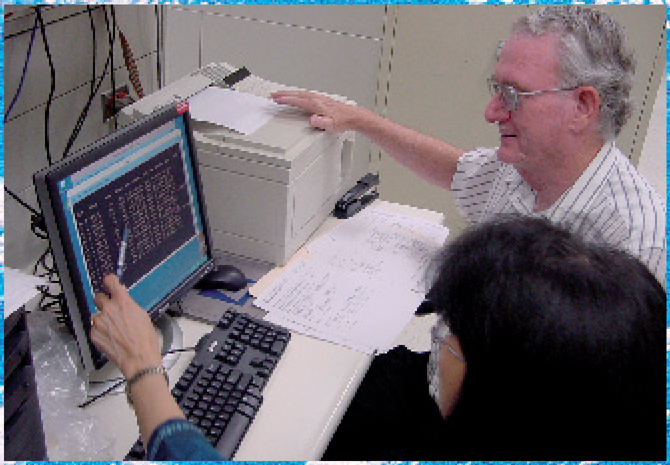
All of the noble gas detection systems in the IMS work in a similar way. Air is pumped into a charcoal-containing purification device where xenon is isolated. Contaminants of different kinds, such as dust, water vapour and other chemical elements, are eliminated. The resulting air contains higher concentrations 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 by the PTS 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 the annual Proficiency Test Exercise organized by the PTS.



Radionuclide Monitoring

- 80 stations and 16 laboratories in 27 countries around the world, with additional noble gas detection capabilities at 40 of the stations

Facilities of the CTBT International Monitoring System

The map on the facing page shows the approximate locations of IMS 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 reporting to the initial session of the Conference of the States Parties following entry into force of the Treaty. Details of the facilities are presented in the following tables.

PS Primary seismic array station
PS Primary seismic three component station
Total: 50 primary seismic stations
(PS20: details to be determined)

AS Auxiliary seismic array station
AS Auxiliary seismic three component station
Total: 120 auxiliary seismic stations
(AS39: details to be determined)

IS Infrasound station
Total: 60 infrasound stations
(IS28: details to be determined)

HA Hydroacoustic (T phase) station
HA Hydroacoustic (hydrophone) station
Total: 11 hydroacoustic stations

RN Radionuclide station
Total: 80 radionuclide stations
(RN35: details to be determined)

RL Radionuclide laboratory
Total: 16 radionuclide laboratories

PRIMARY SEISMIC STATIONS

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Argentina			
PS1	Paso Flores	40.7S	70.6W	3-C
	Australia			
PS2	Warramunga, NT	19.9S	134.3E	Array
PS3	Alice Springs, NT	23.7S	133.9E	Array
PS4	Stephens Creek, NSW	31.9S	141.6E	3-C
PS5	Mawson, Antarctica	67.6S	62.9E	3-C
	Bolivia (Plurinational State of)			
PS6	La Paz	16.3S	68.1W	3-C
	Brazil			
PS7	Brasilia	15.6S	48.0W	3-C
	Canada			
PS8	Lac du Bonnet, Man.	50.2N	95.9W	3-C
PS9	Yellowknife, N.W.T.	62.5N	114.6W	Array
PS10	Schefferville, Quebec	54.8N	66.8W	3-C
	Central African Republic			
PS11	Bangui	5.2N	18.4E	3-C
	China			
PS12	Hailar	49.5N	119.8E	Array
PS13	Lanzhou	36.0N	103.7E	Array
	Colombia			
PS14	El Rosal	4.9N	74.3W	3-C
	Côte d'Ivoire			
PS15	Dimbokro	6.7N	4.9W	3-C
	Egypt			
PS16	Luxor	26.0N	33.5E	Array
	Finland			
PS17	Lahti	61.4N	26.1E	Array
	France			
PS18	Tahiti	17.6S	149.6W	3-C
	Germany			
PS19	Freyung	48.8N	13.7E	Array
	To be determined			
PS20	To be determined	To be determined		
	Iran (Islamic Republic of)			
PS21	Tehran	35.9N	51.1E	3-C
	Japan			
PS22	Matsushiro	36.5N	138.2E	Array
	Kazakhstan			
PS23	Makanchi	46.8N	82.3E	Array
	Kenya			
PS24	Kilimambogo	1.1S	37.3E	3-C
	Mongolia			
PS25	Songino	47.8N	106.4E	Array
	Niger			
PS26	Torodi	13.1N	1.7E	Array
	Norway			
PS27	Hamar	60.8N	10.8E	Array
PS28	Karasjok	69.5N	25.5E	Array
	Pakistan			
PS29	Pari	33.7N	73.3E	Array
	Paraguay			
PS30	Villa Florida	26.3S	57.3W	3-C
	Republic of Korea			
PS31	Wonju	37.5N	127.9E	Array
	Russian Federation			
PS32	Khabaz	43.7N	42.9E	3-C
PS33	Zalesovo	53.9N	84.8E	Array
PS34	Norilsk	69.3N	87.5E	3-C
PS35	Peleduy	59.6N	112.6E	Array
PS36	Petropavlovsk-Kamchatskiy	53.1N	157.7E	Array
PS37	Ussuriysk	44.2N	132.0E	Array
	Saudi Arabia			
PS38	Haleban	23.4N	44.5E	Array
	South Africa			
PS39	Boshof	28.6S	25.3E	3-C
	Spain			
PS40	Sonseca	39.7N	4.0W	Array
	Thailand			
PS41	Chiang Mai	18.5N	98.9E	Array
	Tunisia			
PS42	Kesra	35.7N	9.3E	3-C
	Turkey			
PS43	Keskin	39.7N	33.6E	Array
	Turkmenistan			
PS44	Alibeck	37.9N	58.1E	Array
	Ukraine			
PS45	Malin	50.7N	29.2E	Array
	United States of America			
PS46	Lajitas, TX	29.3N	103.7W	Array
PS47	Mina, NV	38.4N	118.3W	Array
PS48	Pinedale, WY	42.8N	109.6W	Array
PS49	Eielson, AK	64.8N	146.9W	Array
PS50	Vanda, Antarctica	77.5S	161.9E	3-C

Note. For facilities that were certified by the end of 2009, the number of the facility has the background colour corresponding to the facility type (see legend to world map).

AUXILIARY SEISMIC STATIONS

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Argentina			
AS1	Coronel Fontana	31.6S	68.2W	3-C
AS2	Ushuaia	54.8S	68.4W	3-C
	Armenia			
AS3	Garni	40.1N	44.7E	3-C
	Australia			
AS4	Charters Towers, QLD	20.1S	146.3E	3-C
AS5	Fitzroy Crossing, WA	18.1S	125.6E	3-C
AS6	Narrogin, WA	32.9S	117.2E	3-C
	Bangladesh			
AS7	Bariadhala, Chittagong	22.7N	91.6E	3-C
	Bolivia (Plurinational State of)			
AS8	San Ignacio	16.0S	61.1.W	3-C
	Botswana			
AS9	Lobatse	25.0S	25.6E	3-C
	Brazil			
AS10	Pitinga	0.7S	60.0W	3-C
AS11	Riachuelo	5.8S	35.9W	3-C
	Canada			
AS12	Iqaluit, NU	63.7N	68.5W	3-C
AS13	Dease Lake, B.C.	58.4N	130.0W	3-C
AS14	Sadowa, Ont.	44.8N	79.1W	3-C
AS15	Bella Bella, B.C.	52.2N	128.1W	3-C
AS16	Resolute, Nunavut	74.7N	94.9W	3-C
AS17	Inuvik, N.W.T.	68.3N	133.5W	3-C
	Chile			
AS18	Easter Island	27.1S	109.3W	3-C
AS19	Limon Verde	22.6S	68.9W	3-C
	China			
AS20	Baijiatuan	40.0N	116.2E	3-C
AS21	Kunming	25.1N	102.7E	3-C
AS22	Sheshan	31.1N	121.2E	3-C
AS23	Xi'an	34.0N	108.9E	3-C
	Cook Islands			
AS24	Rarotonga	21.2S	159.8W	3-C
	Costa Rica			
AS25	Las Juntas de Abangares	10.3N	85.0W	3-C
	Czech Republic			
AS26	Vranov	49.3.N	16.6E	3-C
	Denmark			
AS27	Søndre Strømfjord, Greenland	67.0N	50.6W	3-C
	Djibouti			
AS28	Arta Tunnel	11.5N	42.8E	3-C
	Egypt			
AS29	Kottamya	29.9N	31.8E	3-C
	Ethiopia			
AS30	Furi	8.9N	38.7E	3-C
	Fiji			
AS31	Monasavu, Viti Levu	17.7S	178.1E	3-C
	France			
AS32	Mont Dzumac	22.1S	166.4E	3-C
AS33	Saul, French Guiana	3.6N	53.2W	3-C
	Gabon			
AS34	Masuku	1.7S	13.6E	3-C
	Germany/South Africa			
AS35	SANAE Station, Antarctica	71.7S	2.8W	3-C
	Greece			
AS36	Anogia, Crete	35.3N	24.9E	3-C
	Guatemala			
AS37	El Apazote	15.0N	90.5W	3-C
	Iceland			
AS38	Borgarnes	64.7N	21.3W	3-C
	To be determined			
AS39	To be determined	To be determined		
	Indonesia			
AS40	Lembang, Jawa Barat	6.8S	107.6E	3-C
AS41	Jayapura, Irian Jaya	2.5S	140.7E	3-C
AS42	Sorong, Irian Jaya	0.9S	131.3E	3-C
AS43	Parapat, Sumatera	2.7N	98.9E	3-C
AS44	Kappang, Sulawesi Selatan	5.0S	119.8E	3-C
AS45	Baumata, Timur	10.2S	123.7E	3-C
	Iran (Islamic Republic of)			
AS46	Kerman	30.0N	56.8E	3-C
AS47	Shushtar	32.1N	48.8E	3-C
	Israel			
AS48	Eilath	29.7N	35.0E	3-C
AS49	Mount Meron	33.0N	35.4E	Array
	Italy			
AS50	Valguarnera, Sicily	37.5N	14.4E	3-C
	Japan			
AS51	Ohita, Kyushu	33.1N	130.9E	3-C
AS52	Kunigami, Okinawa	26.8N	128.3E	3-C
AS53	Hachijojima, Izu Islands	33.1N	139.8E	3-C
AS54	Kamikawa-asahi, Hokkaido	44.1N	142.6E	3-C
AS55	Chichijima, Ogasawara	27.1N	142.2E	3-C
	Jordan			
AS56	Tel-Alasfar	32.2N	36.9E	3-C
	Kazakhstan			
AS57	Borovoye	53.0N	70.4E	Array
AS58	Kurchatov	50.7N	78.6E	Array
AS59	Aktyubinsk	50.4N	58.0E	3-C

AUXILIARY SEISMIC STATIONS

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Kyrgyzstan			
AS60	Ala-Archa	42.6N	74.5E	3-C
	Madagascar			
AS61	Ambohidratompo	18.6S	47.2E	3-C
	Mali			
AS62	Kowa	14.5N	4.0W	3-C
	Mexico			
AS63	Tepich, Quintana Roo	20.4N	88.5W	3-C
AS64	Colonia Cuauhtémoc, Matias Romero, Oaxaca	17.1N	94.9W	3-C
AS65	La Paz, Baja California Sur	24.1N	110.3W	3-C
	Morocco			
AS66	Midelt	32.8N	4.6W	3-C
	Namibia			
AS67	Tsumeb	19.2S	17.6E	3-C
	Nepal			
AS68	Everest	28.0N	86.8E	3-C
	New Zealand			
AS69	Rata Peaks, South Island	43.7S	171.1E	3-C
AS70	Raoul Island	29.3S	177.9W	3-C
AS71	Urewera, North Island	38.3S	177.1E	3-C
	Norway			
AS72	Spitsbergen	78.2N	16.4E	Array
AS73	Jan Mayen	71.0N	8.5W	3-C
	Oman			
AS74	Wadi Sarin	23.2N	58.6E	3-C
	Papua New Guinea			
AS75	Port Moresby	9.4S	147.2E	3-C
AS76	Keravat	4.3S	152.0E	3-C
	Peru			
AS77	Atahualpa	7.0S	78.4W	3-C
AS78	Nana	12.0S	76.8W	3-C
	Philippines			
AS79	Davao, Mindanao	7.1N	125.6E	3-C
AS80	Tagaytay, Luzon	14.1N	120.9E	3-C
	Romania			
AS81	Muntele Rosu	45.5N	25.9E	3-C
	Russian Federation			
AS82	Kirov	58.6N	49.4E	3-C
AS83	Kislovodsk	44.0N	42.7E	Array
AS84	Obninsk	55.1N	36.6E	3-C
AS85	Arti	56.4N	58.6E	3-C
AS86	Seymchan	62.9N	152.4E	3-C
AS87	Talaya	51.7N	103.6E	3-C
AS88	Yakutsk	62.0N	129.7E	3-C
AS89	Kuldur	49.2N	131.8E	3-C
AS90	Bilibino	68.0N	166.4E	3-C
AS91	Tiksi	71.6N	128.9E	3-C
AS92	Yuzhno-Sakhalinsk	47.0N	142.8E	3-C
AS93	Magadan	59.6N	150.8E	3-C
AS94	Zilim	53.9N	57.0E	3-C
	Samoa			
AS95	Afiamalu	13.9S	171.8W	3-C
	Saudi Arabia			
AS96	Dhaban Al-Janub	17.7N	43.5E	3-C
	Senegal			
AS97	Babate	14.7N	16.6W	3-C
	Solomon Islands			
AS98	Honiara, Guadalcanal	9.4S	159.9E	3-C
	South Africa			
AS99	Sutherland	32.4S	20.8E	3-C
	Sri Lanka			
AS100	Pallekele	7.3N	80.7E	3-C
	Sweden			
AS101	Hagfors	60.1N	13.7E	Array
	Switzerland			
AS102	Davos	46.8N	9.9E	3-C
	Uganda			
AS103	Mbarara	0.6S	30.7E	3-C
	United Kingdom			
AS104	Eskdalemuir	55.3N	3.2W	Array
	United States of America			
AS105	Guam, Marianas Islands	13.6N	144.9E	3-C
AS106	Palmer Station, Antarctica	64.8S	64.0W	3-C
AS107	Tuckaleechee Caverns, TN	35.7N	83.8W	3-C
AS108	Piñon Flat, CA	33.6N	116.5W	3-C
AS109	Yreka, CA	41.7N	122.7W	3-C
AS110	Kodiak Island, AK	57.8N	152.6W	3-C
AS111	Albuquerque, NM	34.9N	106.5W	3-C
AS112	Attu Island, AK	52.9N	173.2E	3-C
AS113	Elko, NV	40.7N	115.2W	3-C
AS114	South Pole, Antarctica	89.9S	145.0E	3-C
AS115	Newport, WA	48.3N	117.1W	3-C
AS116	San Juan, PR	18.1N	66.2W	3-C
	Venezuela (Bolivarian Republic of)			
AS117	Santo Domingo	8.9N	70.6W	3-C
AS118	Puerto la Cruz	10.2N	64.6W	3-C
	Zambia			
AS119	Lusaka	15.3S	28.2E	3-C
	Zimbabwe			
AS120	Matopos	20.4S	28.5E	3-C

Note. For facilities that were certified by the end of 2009, the number of the facility has the background colour corresponding to the facility type (see legend to world map).

INFRASOUND STATIONS

Station Number	State Responsible and Location	Latitude	Longitude
	Argentina		
IS1	Bariloche	41.2S	70.9W
IS2	Ushuaia	54.6S	67.3W
	Australia		
IS3	Davis Base, Antarctica	68.4S	77.6E
IS4	Shannon, WA	34.6S	116.4E
IS5	Hobart, TAS	42.5S	147.7E
IS6	Cocos Islands	12.2S	96.8E
IS7	Warramunga, NT	19.9S	134.3E
	Bolivia (Plurinational State of)		
IS8	La Paz	16.2S	68.5W
	Brazil		
IS9	Brasilia	15.6S	48.0W
	Canada		
IS10	Lac du Bonnet, Man.	50.2N	96.0W
	Cape Verde		
IS11	Cape Verde Islands	15.2N	23.2W
	Central African Republic		
IS12	Bangui	5.2N	18.4E
	Chile		
IS13	Easter Island	27.1S	109.4W
IS14	Robinson Crusoe Island	33.6S	78.8W
	China		
IS15	Beijing	39.6N	115.9E
IS16	Kunming	25.3N	102.7E
	Côte d'Ivoire		
IS17	Dimbokro	6.7N	4.9W
	Denmark		
IS18	Qaanaaq, Greenland	77.5N	69.3W
	Djibouti		
IS19	Djibouti	11.5N	43.2W
	Ecuador		
IS20	Isla Santa Cruz, Galápagos Islands	0.6S	90.4W
	France		
IS21	Marquesas Islands	8.9S	140.2W
IS22	Port Laguerre, New Caledonia	22.2S	166.8E
IS23	Kerguelen	49.3S	70.3E
IS24	Tahiti	17.8S	149.3W
IS25	Kourou, French Guiana	5.2N	52.9W
	Germany		
IS26	Freyung	48.9N	13.7E
IS27	Georg von Neumayer, Antarctica	70.7S	8.3W
	To be determined		
IS28	To be determined	To be determined	
	Iran (Islamic Republic of)		
IS29	Tehran	35.7N	51.4E
	Japan		
IS30	Isumi	35.3N	140.3E

Station Number	State Responsible and Location	Latitude	Longitude
	Kazakhstan		
IS31	Aktyubinsk	50.4N	58.0E
	Kenya		
IS32	Nairobi	1.3S	36.8E
	Madagascar		
IS33	Antananarivo	19.0S	47.3E
	Mongolia		
IS34	Songino	47.8N	106.4E
	Namibia		
IS35	Tsumeb	19.2S	17.6E
	New Zealand		
IS36	Chatham Island	43.9S	176.5W
	Norway		
IS37	Bardufoss	69.1N	18.6E
	Pakistan		
IS38	Rahimyar Khan	28.2N	70.3E
	Palau		
IS39	Palau	7.5N	134.5E
	Papua New Guinea		
IS40	Keravat	4.3S	152.0E
	Paraguay		
IS41	Villa Florida	26.3S	57.3W
	Portugal		
IS42	Graciosa, Azores	39.0N	28.0W
	Russian Federation		
IS43	Dubna	56.7N	37.3E
IS44	Petropavlovsk-Kamchatskiy	53.1N	157.7E
IS45	Ussuriysk	44.2N	132.0E
IS46	Zalesovo	53.9N	84.8E
	South Africa		
IS47	Boshof	28.6S	25.3E
	Tunisia		
IS48	Kesra	35.8N	9.3E
	United Kingdom		
IS49	Tristan da Cunha	37.1S	12.3W
IS50	Ascension	7.9S	14.4W
IS51	Bermuda	32.3N	64.7W
IS52	BIOT/Chagos Archipelago	7.4S	72.5E
	United States of America		
IS53	Fairbanks, AK	64.9N	147.9W
IS54	Palmer Station, Antarctica	64.8S	64.1W
IS55	Windless Bight, Antarctica	77.7S	167.6E
IS56	Newport, WA	48.3N	117.1W
IS57	Piñon Flat, CA	33.6N	116.5W
IS58	Midway Islands	28.2N	177.4W
IS59	Hawaii, HI	19.6N	155.9W
IS60	Wake Island	19.3N	166.6E

HYDROACOUSTIC STATIONS

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Australia			
HA1	Cape Leeuwin, WA	34.3S	115.2E	Hydro-phone
	Canada			
HA2	Queen Charlotte Islands, B.C.	53.3N	132.5W	T phase
	Chile			
HA3	Juan Fernández Islands	33.6S	78.8W	Hydro-phone
	France			
HA4	Crozet Islands	46.4S	51.9E	Hydro-phone
HA5	Guadeloupe	16.3N	61.1W	T phase
	Mexico			
HA6	Socorro Island	18.7N	110.9W	T phase
	Portugal			
HA7	Flores	39.4N	31.2W	T phase
	United Kingdom			
HA8	BIOT/Chagos Archipelago	7.3S	72.4E	Hydro-phone
HA9	Tristan da Cunha	37.1S	12.3W	T phase
HA10	Ascension	8.0S	14.4W	Hydro-phone
	United States of America			
HA11	Wake Island	19.3N	166.6E	Hydro-phone

RADIONUCLIDE STATIONS

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Argentina			
RN1	Buenos Aires	34.5S	58.5W	Noble gas
RN2	Salta	24.8S	65.4W	
RN3	Bariloche	41.1S	71.2W	
	Australia			
RN4	Melbourne, VIC	37.7S	145.1E	Noble gas
RN5	Mawson, Antarctica	67.6S	62.9E	
RN6	Townsville, QLD	19.2S	146.8E	
RN7	Macquarie Island	54.5S	159.0E	
RN8	Cocos Islands	12.2S	96.8E	
RN9	Darwin, NT	12.4S	130.9E	Noble gas
RN10	Perth, WA	31.9S	116.0E	
	Brazil			
RN11	Rio de Janeiro	23.0S	43.4W	Noble gas
RN12	Recife	7.8S	35.1W	
	Cameroon			
RN13	Edea	3.8N	10.2E	Noble gas

Note. For facilities that were certified by the end of 2009, the number of the facility has the background colour corresponding to the facility type (see legend to world map).

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Canada			
RN14	Sidney, B.C.	48.7N	123.5W	
RN15	Resolute, NU	74.7N	95.0W	
RN16	Yellowknife, N.W.T.	62.5N	114.5W	Noble gas
RN17	St John's, N.L.	47.6N	52.7W	Noble gas
	Chile			
RN18	Punta Arenas	53.1S	70.9W	
RN19	Hanga Roa, Easter Island	27.1S	109.3W	Noble gas
	China			
RN20	Beijing	40.0N	116.4E	Noble gas
RN21	Lanzhou	36.0N	104.2E	
RN22	Guangzhou	23.1N	113.3E	Noble gas
	Cook Islands			
RN23	Rarotonga	21.2S	159.8W	
	Ecuador			
RN24	Isla Santa Cruz, Galápagos Islands	0.7S	90.3W	
	Ethiopia			
RN25	Addis Ababa	9.1N	38.8E	Noble gas
	Fiji			
RN26	Nadi	17.8S	177.4E	
	France			
RN27	Papeete, Tahiti	17.6S	149.6W	Noble gas
RN28	Pointe-à-Pitre, Guadeloupe	16.3N	61.5W	
RN29	Réunion	20.9S	55.6E	Noble gas
RN30	Port-aux-Français, Kerguelen	49.4S	70.3E	Noble gas
RN31	Kourou, French Guiana	5.2N	52.7W	Noble gas
RN32	Dumont d'Urville, Antarctica	66.7S	140.0E	
	Germany			
RN33	Schauinsland/Freiburg	47.9N	7.9E	Noble gas
	Iceland			
RN34	Reykjavik	64.1N	21.9W	
	To be determined			
RN35	To be determined	To be determined		Noble gas
	Iran (Islamic Republic of)			
RN36	Tehran	35.0N	52.0E	Noble gas
	Japan			
RN37	Okinawa	26.5N	127.9E	
RN38	Takasaki, Gunma	36.3N	139.1E	Noble gas
	Kiribati			
RN39	Kiritimati	2.0N	157.4W	
	Kuwait			
RN40	Kuwait City	29.3N	47.9E	

RADIONUCLIDE STATIONS

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Libyan Arab Jamahiriya			
RN41	Misratah	32.4N	15.0E	
	Malaysia			
RN42	Tarah Rata	4.5N	101.4E	
	Mauritania			
RN43	Nouakchott	18.1N	15.9W	Noble gas
	Mexico			
RN44	Guerrero Negro, Baja California	28.0N	114.1W	Noble gas
	Mongolia			
RN45	Ulaanbaatar	47.9N	106.3E	Noble gas
	New Zealand			
RN46	Chatham Island	43.8S	176.5W	Noble gas
RN47	Kaitaia	35.1S	173.3E	
	Niger			
RN48	Agadez	17.0N	8.0E	Noble gas
	Norway			
RN49	Spitsbergen	78.2N	15.4E	Noble gas
	Panama			
RN50	Panama City	9.0N	79.5W	Noble gas
	Papua New Guinea			
RN51	Kavieng, New Ireland	2.6S	150.8E	
	Philippines			
RN52	Tanay	14.6N	121.4E	
	Portugal			
RN53	Ponta Delgada, São Miguel, Azores	37.7N	25.7W	
	Russian Federation			
RN54	Kirov	58.6N	49.4E	
RN55	Norilsk	69.3N	87.5E	Noble gas
RN56	Peleduy	59.6N	112.6E	
RN57	Bilibino	68.0N	166.4E	
RN58	Ussuriysk	44.2N	132.0E	Noble gas
RN59	Zalesovo	53.9N	84.8E	
RN60	Petropavlovsk-Kamchatskiy	53.1N	158.8E	Noble gas
RN61	Dubna	56.7N	37.3E	Noble gas
	South Africa			
RN62	Marion Island	46.9S	37.8E	Noble gas
	Sweden			
RN63	Stockholm	59.4N	17.9E	Noble gas
	United Republic of Tanzania			
RN64	Dar es Salaam	6.8S	39.2E	
	Thailand			
RN65	Bangkok	14.0N	100.0E	Noble gas

Station Number	State Responsible and Location	Latitude	Longitude	Type
	United Kingdom			
RN66	BIOT/Chagos Archipelago	7.3S	72.4E	Noble gas
RN67	St Helena	15.9S	5.7W	
RN68	Tristan da Cunha	37.1S	12.3W	Noble gas
RN69	Halley, Antarctica	76.0S	28.0W	Noble gas
	United States of America			
RN70	Sacramento, CA	38.7N	121.4W	
RN71	Sand Point, AK	55.3N	160.5W	
RN72	Melbourne, FL	28.1N	80.6W	
RN73	Palmer Station, Antarctica	64.8S	64.1W	
RN74	Ashland, KS	37.2N	99.8W	Noble gas
RN75	Charlottesville, VA	38.0N	78.4W	Noble gas
RN76	Salchaket, AK	64.7N	147.1W	
RN77	Wake Island	19.3N	166.6E	Noble gas
RN78	Midway Islands	28.2N	177.4W	
RN79	Oahu, HI	21.5N	158.0W	Noble gas
RN80	Upi, Guam	13.6N	144.9E	

RADIONUCLIDE LABORATORIES

Lab Number	State Responsible	Name and Location
RL1	Argentina	National Board of Nuclear Regulation, Buenos Aires
RL2	Australia	Australian Radiation Protection and Nuclear Safety Agency, Melbourne, VIC
RL3	Austria	ARC Seibersdorf research GmbH (ARCS), Seibersdorf
RL4	Brazil	Institute of Radiation Protection and Dosimetry, Rio de Janeiro
RL5	Canada	Health Canada, Ottawa, Ont.
RL6	China	Beijing
RL7	Finland	Radiation and Nuclear Safety Authority, Helsinki
RL8	France	Atomic Energy Commission, Bruyères-le-Châtel
RL9	Israel	Soreq Nuclear Research Centre, Yavne
RL10	Italy	Laboratory of the National Agency for the Protection of the Environment, Rome
RL11	Japan	Japan Atomic Energy Agency, Tokai, Ibaraki
RL12	New Zealand	National Radiation Laboratory, Christchurch
RL13	Russian Federation	Central Radiation Control Laboratory, Ministry of Defence Special Verification Service, Moscow
RL14	South Africa	Atomic Energy Corporation, Pelindaba
RL15	United Kingdom	AWE Aldermaston, Reading, Berkshire
RL16	United States of America	Pacific Northwest National Laboratory, Richmond, WA

Global Communications

The Global Communications Infrastructure (GCI) is designed to transmit 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 have not been tampered with.

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 99.50% availability for satellite communication links and 99.95% availability for terrestrial communication links, and to provide data within seconds from transmitter to receiver. It began provisional operation in mid-1999.

Global Communications

HIGHLIGHTS IN 2009

- Improvement in GCI availability
- Addition of one very small aperture terminal (VSAT), one new multiprotocol label switching (MPLS) terrestrial communication link and nine new virtual private network (VPN) links established as backups to VSAT links
- Increase in volume of data traffic carried by the GCI and by special links to the IDC, and from the IDC to remote sites

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 geosynchronous satellites. The satellites route the transmissions to hubs on the ground and the data are then sent to the IDC by terrestrial links.

A virtual private network (VPN) utilizes existing telecommunications networks to conduct private data transmissions. Most of the VPNs for GCI II (the new version of the GCI) use the basic public infrastructure of the Internet together with a variety of specialized protocols to support private and secure 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 redundant communication link in case of failure of a VSAT link.

EXPANDING GLOBAL COMMUNICATIONS

In 2009, operation and maintenance activities for the GCI entered a decisive period. While the expansion of the network in terms of GCI sites slowed down naturally (90.77% of the network is already in place), the availability continued to improve. The use of encryption allowed further expansion of the use of Internet resources. A pilot project was carried out in cooperation with several States Signatories to enhance the technical capabilities of four stations by providing dual path connectivity – the primary path over satellite and the failover path via the Internet. Such a configuration is also used in providing

VSATs under construction and (on the facing page) after completion on Tristan da Cunha (United Kingdom), the site of infrasound station IS49 and radionuclide noble gas station RN66.

independent subnetworks on terrestrial MPLS links, one terrestrial MPLS link for US stations located in Antarctica, four satellite hubs (two in Norway and two in the USA), six satellites, one network operations centre (Maryland, USA), one service management desk (Vienna) and a core terrestrial network operated by a major service provider. The satellites cover the Pacific Ocean region, Japan, North America, the Atlantic Ocean, Europe and the Middle East, and the Indian Ocean region.

IDC products to National Data Centres (NDCs) and in the capacity building programme for NDCs.

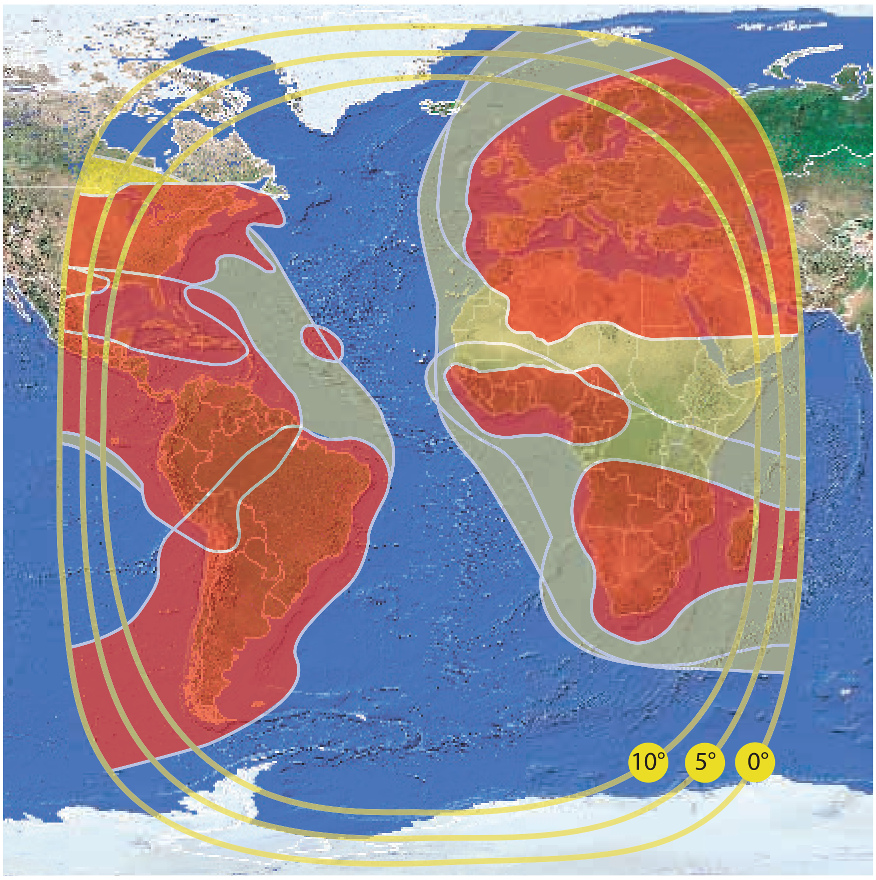
One new VSAT, one new multiprotocol label switching (MPLS) terrestrial communication link and nine new VPN links used as backups to VSAT links were installed in 2009. The volume of data traffic carried by the GCI and by special links to the IDC increased during the year, as did the flow of data in the other direction from the IDC to remote sites.

GCI II: FIRST YEAR OF OPERATION

Activities during the year focused on consolidating the enhanced capabilities available on the GCI II network for the provision of secure and reliable data delivery.

The link availability of GCI II underwent a process of improvement and stabilization in 2009. This was a natural development after the migration of the sites in 2008.

Currently, GCI II includes 209 VSAT stations, 26 VPNs managed by the PTS, two stand-alone VPN links managed by the GCI II contractor, 14 backup VPN links, five



GCI coverage of the Americas, Europe, Africa and the Middle East is provided by NSS-7, a powerful C- and Ku-band satellite located over the Atlantic Ocean at 338˚ E.

International Data Centre

The International Data Centre (IDC) is designed to collect, process, analyse and report on data received from facilities of the International Monitoring System, including the results of analyses conducted at certified radionuclide laboratories. The data and products are then transmitted to States Signatories for their final assessment. Data and products are received and distributed through the Global Communications Infrastructure.

The IDC is situated at the Headquarters of the CTBTO Preparatory Commission in the Vienna International Centre. A relational database management system forms the core of all information management. Full network redundancy has been created at the IDC to ensure high availability. A mass storage system provides archiving capacity for more than 10 years of verification data. The software utilized in operating the IDC is mostly developed specifically for the CTBT verification regime.

Putting an End to Nuclear Explosions

International Data Centre

HIGHLIGHTS IN 2009

- Satisfactory performance of the monitoring system demonstrated with reference to the second announced nuclear test by the Democratic People's Republic of Korea
- Transfer of 16 noble gas systems into IDC operations
- Installation of the state of health system in the Operations Centre

SUPPORT AND BUILD-UP

In 2009, support and build-up of the IMS continued with the testing and evaluation of data from new stations. Newly installed or upgraded stations were introduced into IDC operations. Other stations were installed in the IDC test bed.

IDC application software has been converted, as far as possible, to run on open source systems (Linux), and replacement software has been written for parts that could not be converted. The software was implemented and thoroughly tested on the IDC test bed, and by the end of 2009 the majority of the software was ready to be put to operational use in January 2010. Only the interactive radionuclide analysis software has been held back owing to preparations for noble gas processing in operations, but this will be moved to operations in early 2010.

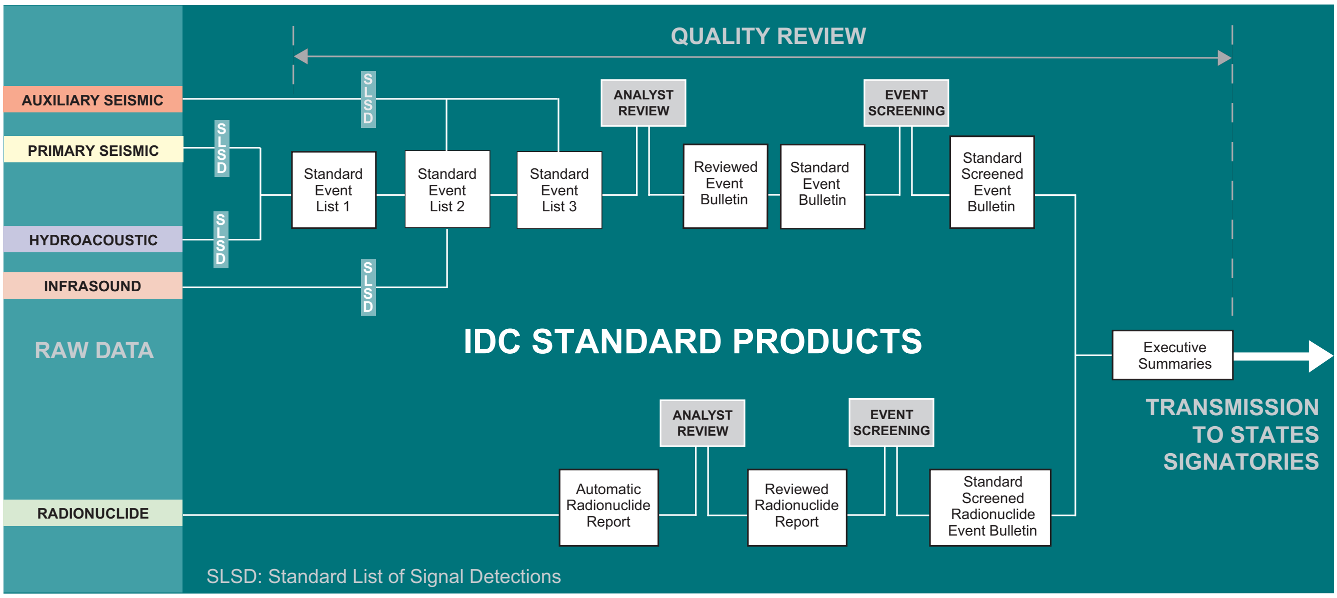
FROM RAW DATA TO FINAL PRODUCT

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

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

Analysts subsequently review events recorded in SEL3 to prepare the Reviewed Event Bulletin (REB). The REB for a given day contains all those events detected at IMS seismic, hydroacoustic and infrasound stations which meet specific 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, it is planned to release the REB within approximately 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 particulate data undergo both automatic and reviewed processing to produce an Automatic Radionuclide Report and then a Reviewed Radionuclide Report (RRR) for each full gamma ray spectrum received. The information in the REB and RRR will eventually be fused, associating seismoacoustic events with radionuclide detections.



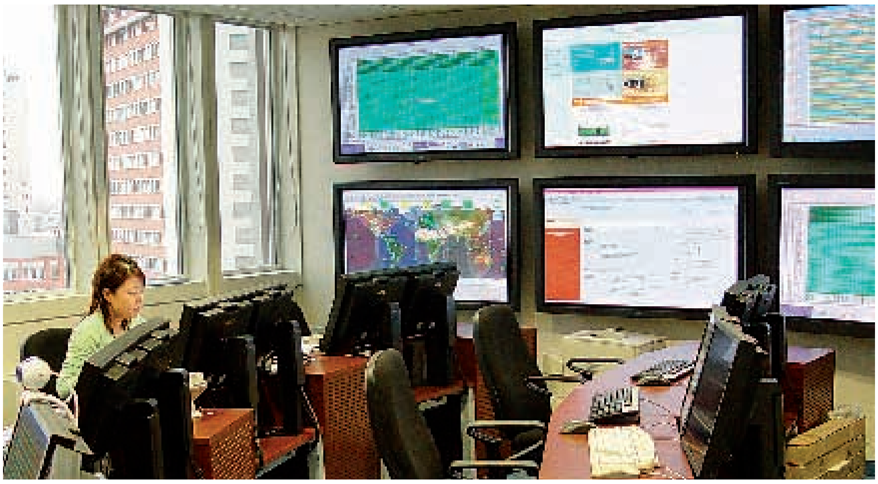
OPERATIONS CENTRE

As the focal point for operational activities, the Operations Centre is a crucial part of integrated operations. It consists of control, escalation and multimedia rooms and is equipped with state of the art technology. From there, staff of the PTS monitor the IMS facilities in real time. Activities of the centre include status reporting, operational incident management, and GCI data, network and systems operations.

Over 3800 incidents at facilities were reported and resolved in the Operations Centre in 2009. Key performance indicators (KPIs) based on statistics from data availability, the IMS Reporting System (IRS) and the GCI have been updated in the performance reporting tool (PRTool) and have been made available to authorized users.

IRS Client, a new high performance version of the IRS for use by station operators, was developed and tested and is being delivered to the operators. It employs email for communication between station operators and the PTS, and avoids the use of tokens, VPNs and direct connection to the PTS databases.

A major achievement was the installation of the state of health (SOH) system in the Operations Centre. The system collects and manages SOH information from all components of the IMS, including stations, GCI links, IDC programs and servers and any other source of data that may be relevant to the operation and maintenance of the IMS. A tool for monitoring SOH parameters and triggering reports based on these was designed and a prototype was being tested.

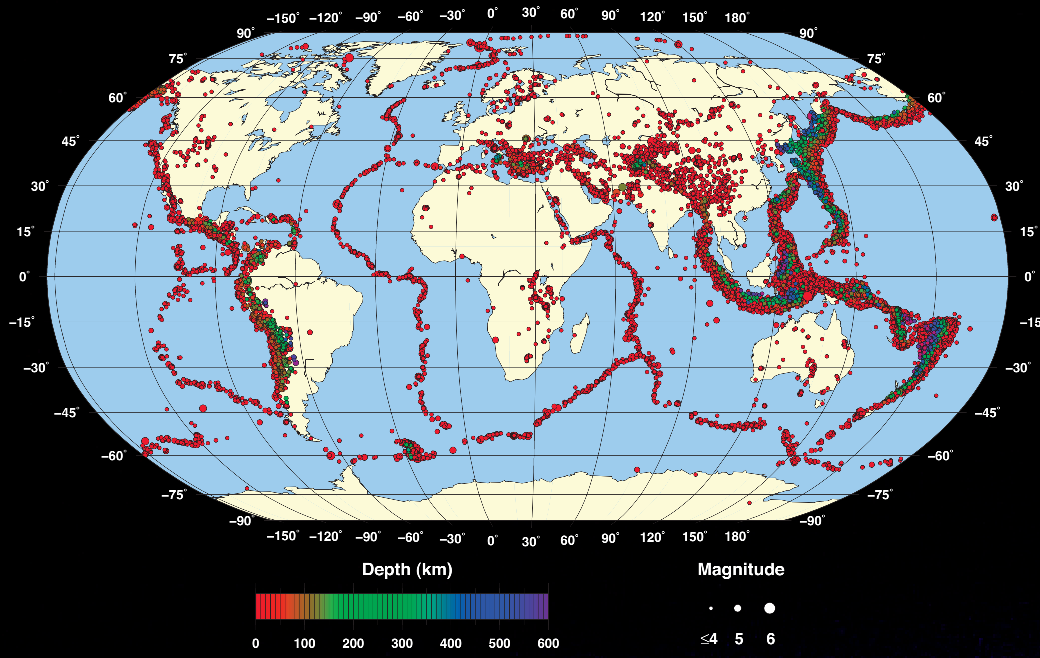


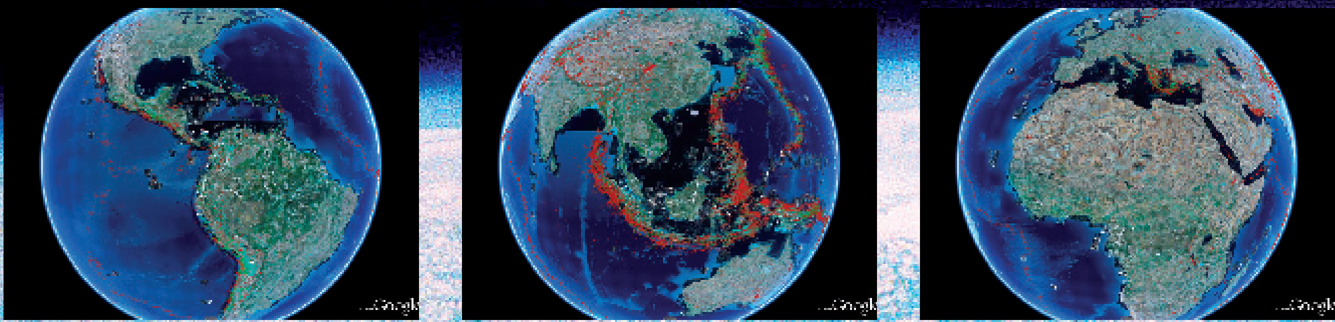
Control room of the Operations Centre.

NATIONAL DATA CENTRES

A National Data Centre (NDC) is an organization with technical expertise in the CTBT verification technologies. Its functions may include sending IMS data to the IDC and receiving data and products from the IDC.

36 308 Events from the IDC 2009 Reviewed Event Bulletin





Global Distribution of the 149 729 Events from the REB, 2005–2009

The ‘NDC in a box’ is a software package developed by the IDC for use at NDCs, enabling them to receive, process and analyse IMS data. In 2009, efforts were devoted to training in the use of the software and to making the package more reliable.

A total of 113 secure signatory accounts, one for each requesting State Signatory, had been established by the end of the year and 1134 users from these States Signatories had been authorized to access IMS data and IDC products and receive technical support.

INTERNATIONAL NOBLE GAS EXPERIMENT

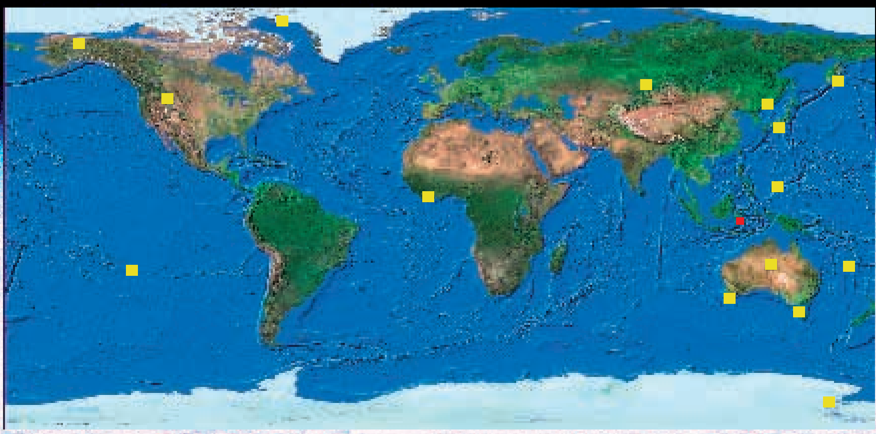
The PTS transferred 16 noble gas systems (installed at 15 IMS stations and one cooperating national facility) into IDC operations during 2009. Specific software has been included to enable SOH parameters to be monitored.

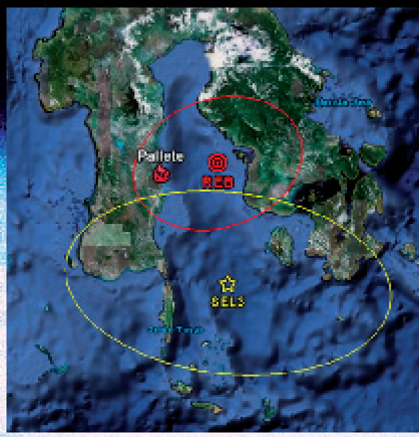
Xenon analysis software for automatic and manual spectrum processing has been further developed and is approaching the operational stage. Analysts were trained to use the review software. New procedures for product delivery using XML based techniques were successfully tested with some NDCs.

Distinguishing the civil anthropogenic background level of airborne radionuclides from radiation emissions due to Treaty-relevant events is still a challenging task that involves nuclear physicists, statisticians and meteorologists. The PTS has worked on understanding data collected from the continuously increasing number of IMS noble gas systems in its database and created historical data sets for testing the method of categorization. Site

A scheduled surface detonation of about 82 tonnes of explosives was conducted for calibration purposes at the Sayarim Military Range, Israel (indicated by a red star), on 26 August 2009 and was detected by two IMS infrasound stations (IS26 at Freyung, Germany, and IS48 at Kesra, Tunisia) as well as by the PTS portable infrasound array (I62IT in Italy) that had been especially set up to detect the event.

The explosion of a large meteorite in the atmosphere was heard over a radius of 17 km around the village of Pallete in the district of Bone on the island of Sulawesi, Indonesia, on 8 October 2009. This was the largest event ever recorded by the IMS infrasound network: the event was detected by 15 IMS infrasound stations over distances of up to 14 000 km. Below left: map of the infrasound stations (yellow) that detected the meteorite (REB location indicated in red). Below: location and error ellipse of the automatic SEL3 solution (yellow) and of the REB event (red) for the meteorite exploding in the atmosphere above Sulawesi. The event was automatically built at the IDC on the basis of the data from six infrasound stations. The location solution was refined when data from another nine stations were added at the analysis stage.





specific descriptive parameters have been developed for use in attaching indicators to spectra and for distinguishing abnormal radioxenon concentrations from typical background. This has been done in cooperation with scientists from more than twenty institutions worldwide in the International Noble Gas Experiment (INGE) and discussed at workshops and scientific meetings.

A project funded by the European Union to support PTS activities to explore the anthropogenic xenon background through field campaigns in several parts of the world was completed successfully. Six campaigns lasting between one week and three months with continuous sampling and spot sampling in Europe, South Africa, the Middle East and South Asia delivered additional insight into civil xenon sources, their mode of operation and the impact of emissions. The findings have substantially refined the picture of the global radioxenon inventory. Additional information on isotopic background levels strengthened source identification capabilities. The outcome of the project serves as a good basis for discussions on how radiopharmaceutical facilities affect CTBT noble gas analysis. In a follow-up project, new transportable systems are under procurement for use in selected locations for longer campaigns, which will thus cover atmospheric variations that better represent real conditions.

TRACKING RADIONUCLIDES THROUGH THE ATMOSPHERE

The CTBTO–WMO response system continued into its second year of provisional operation. This system enables the Commission to send requests to the World Meteorological Organization for assistance in the case of suspicious radionuclide detections. Nine WMO Regional Specialized Meteorological Centres or National Meteorological Centres located around the world respond to these requests, submitting their computations to the Commission with a target response time of 24 hours.

This system is intended to corroborate the backtracking calculations of the Commission, and all centres will benefit from the feedback and evaluation of the backtracking systems and methods in use. In order to maintain the response system at a high level of preparedness, it was agreed that unannounced, limited-scope system tests would take place quarterly and an announced full scale exercise would be conducted annually.

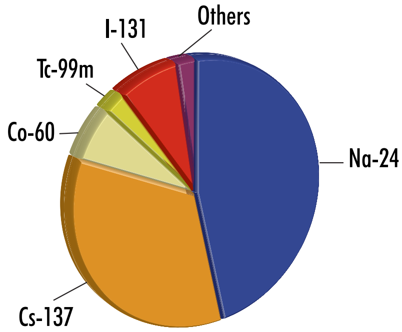
The PTS continued to enhance its capabilities to perform atmospheric transport modelling and reliably deliver high quality products to States Signatories. Atmospheric backtracking calculations are performed daily with near real time meteorological data obtained from the European Centre for Medium-Range Weather Forecasts. Using software developed by the PTS, these calculations are combined with nuclide specific parameters to provide the source–receiver sensitivity, field of regard and potential source region for observations at each of the IMS stations.

PERFORMANCE OF THE VERIFICATION SYSTEM: THE SECOND ANNOUNCED NUCLEAR TEST BY THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

On 25 May 2009, the Democratic People's Republic of Korea announced that it had conducted its second nuclear test. Since the announcement by this country of its first nuclear test in 2006, the IMS network had grown considerably, with 65 stations having being certified in the meantime.

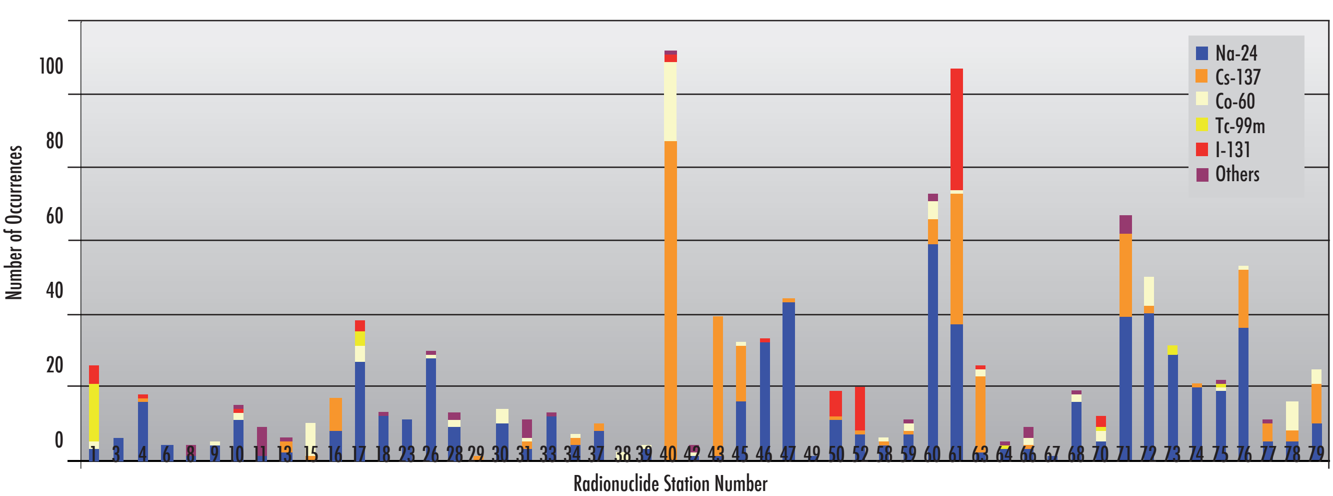
The event on 25 May was automatically located using 23 primary seismic stations, as reported in the initial list of events (Standard Event List 1) which was issued by the IDC about an hour after the event. This initial location estimate had an 'uncertainty ellipse' with an area of 860 square kilometres, which overlapped with that of the event of 2006. The IDC produces three automatic bulletins, which are produced one, four and six hours after the event. The second and third bulletins incorporate additional data for 20 minute intervals. These later bulletins included observations from the 23 primary seismic stations and from 16 auxiliary seismic stations, which reduced the uncertainty ellipse to 582 square kilometres. The infrasound and hydroacoustic monitoring networks of the IMS did not observe any signals which could have been associated with this event.

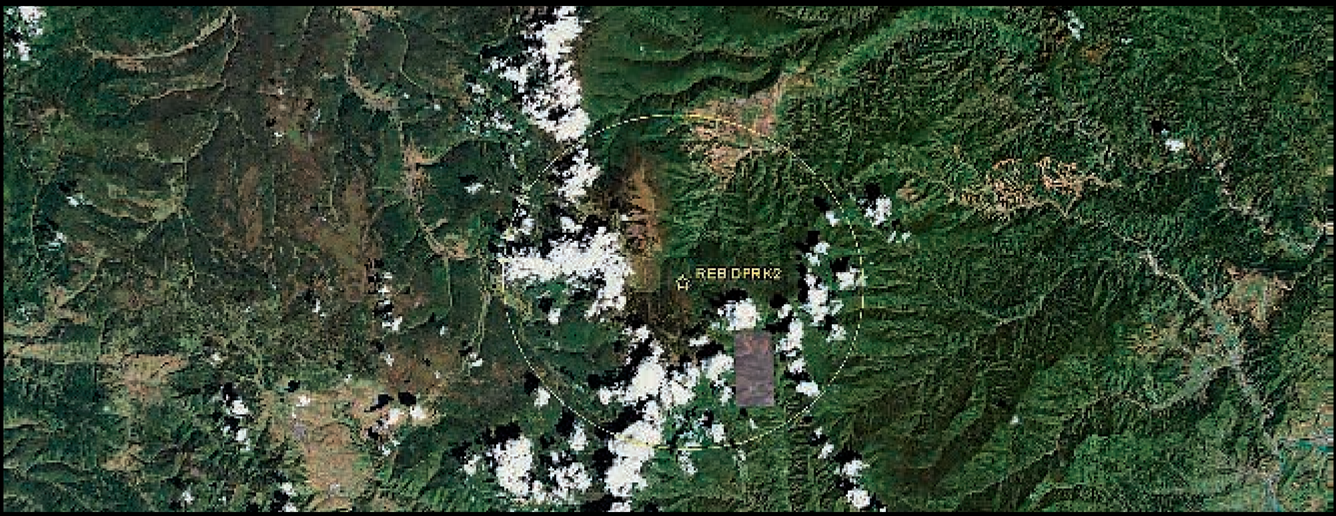
Overall Distribution of Treaty-Relevant Radionuclide Occurrences in 2009



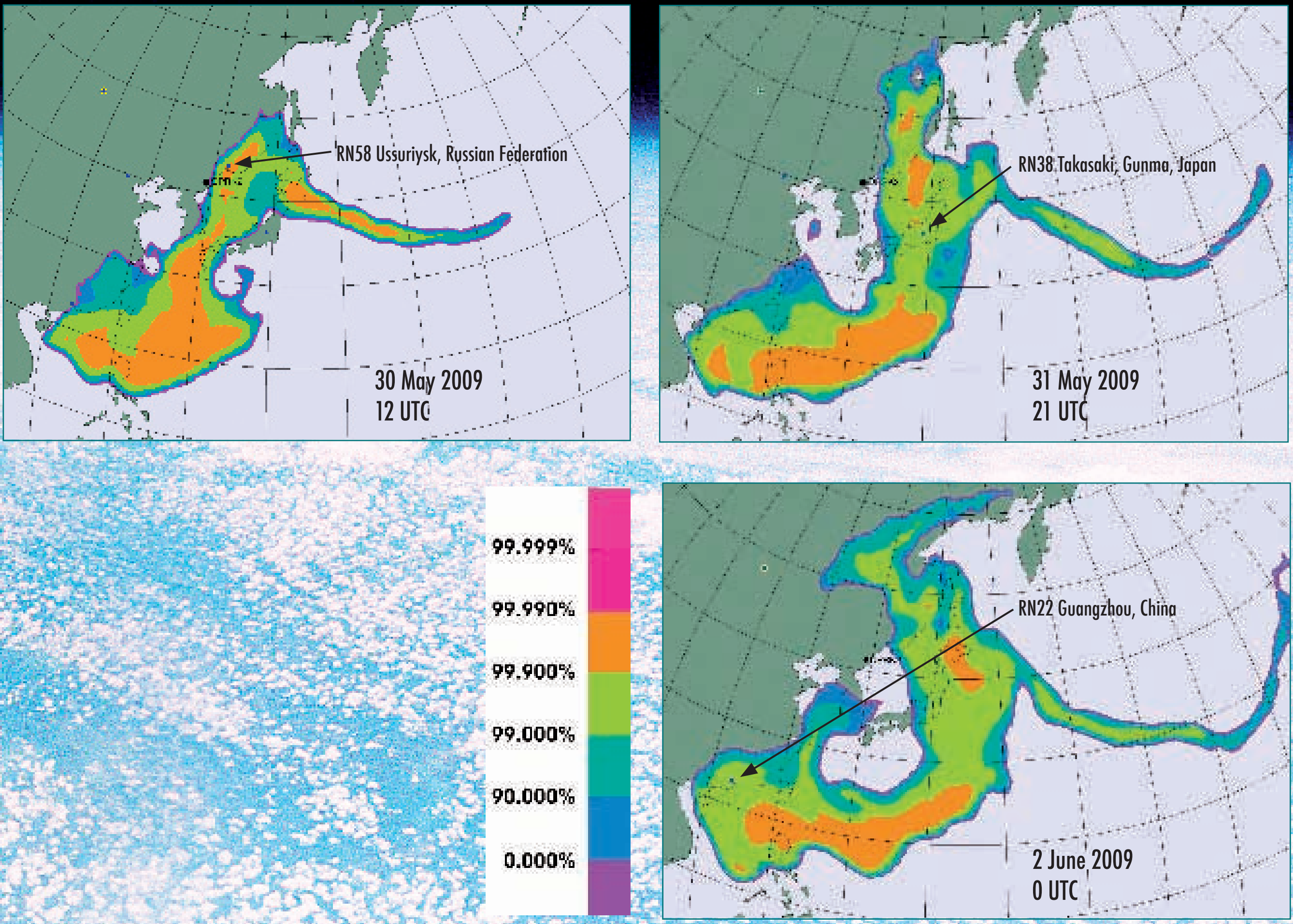
Most detections refer to three nuclides, sodium-24, caesium-137 and cobalt-60, which are primarily due to cosmic radiation, to resuspension of fallout from the Chernobyl accident in 1986 or to historical atmospheric tests.

Occurrence of Anthropogenic Nuclides by Station in 2009

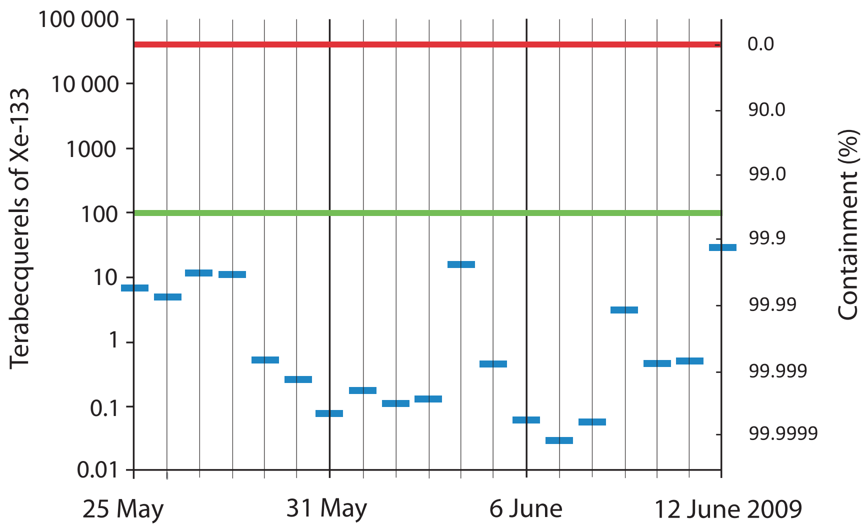




Location and uncertainty ellipse for the 2009 event in the Democratic People's Republic of Korea ("DPRK2") based on IMS seismic data. The final estimate obtained after analyst review of all data was issued in the REB within two days.



Evolution of the detectable radioactive plume from the nuclear test of 25 May 2009 in the Democratic People's Republic of Korea according to the level of containment of the assumed immediate venting. Snapshots of the plume originating from the "DPRK2" event are shown at the times when it would have been at its maximum xenon-133 activity concentration, and therefore most easily detected, at radionuclide noble gas monitoring station RN58 (Ussuriysk, Russian Federation) and subsequently at RN38 (Takasaki, Gunma, Japan) and RN22 (Guangzhou, China). The size of the detectable plume (whose activity concentration must therefore exceed the minimum detectable concentration of 0.2 millibecquerel per cubic metre) is colour coded on a logarithmic scale against possible values for the degree of containment of the DPRK2 test – the stronger the containment the smaller the extent of the plume. An entirely uncontained test corresponds to an immediate release of 40 000 terabecquerels of xenon-133. This source strength is consistent with the seismic signals that were associated by the IDC with the DPRK2 event. The noble gas stations operating at the time of the test are indicated by blue dots. At the time of the first announced nuclear test by the Democratic People's Republic of Korea, on 9 October 2006, the only noble gas station operating in the region was RN45 (Ulaanbaatar, Mongolia); this is indicated by a yellow circle around the dot.



The blue bars show the maximum possible daily release of radioactive xenon at the location of the DPRK2 event which would be consistent with non-detection at the radionuclide noble gas monitoring stations RN58, RN38 and RN22. The red line denotes an immediate release, with 0% containment, of 40 000 terabecquerels of Xe-133 – the blue bars show that such an event would have been detectable. The green line denotes the minimum required release sensitivity (baseline) against which the IMS global monitoring coverage is evaluated – the blue bars therefore show that the actual monitoring capability in the region exceeds this minimum.

Owing to the interest in this event, the IDC expedited the production of the REB of waveform data for the events of 25 May. The REB included observations from 31 primary seismic stations and 30 auxiliary seismic stations and was issued on 27 May, in accordance with the bulletin production schedule envisaged for operation after entry into force of the Treaty. The REB reduced the uncertainty ellipse further to 264 square kilometres.

After the REB becomes available, the IDC applies experimental event screening procedures to exclude events which are “consistent with natural phenomena or non-nuclear, man-made phenomena”, as specified in the Treaty. The results of event screening are made available by the IDC as the Standard Screened Event Bulletin (SSEB), which comprises those REB events which have not been screened out. The SSEB for 25 May 2009 contained 43 such events, from the 79 events in the REB. The event in the Democratic People’s Republic of Korea was among the 43 events in the SSEB. It is important to bear in mind that the Treaty specifies that States retain the responsibility for passing judgement concerning the origin of any event.

The monitoring system performed well for a variety of reasons. The key components of the system, including the IMS network, the GCI and the IDC, as well as NDCs, were operating satisfactorily. In addition to properly running computer systems, key staff were available to address issues as needed.

Radionuclides are transported through the atmosphere much more slowly than seismic waves travel through the earth. Consequently, radionuclides generated by an event can only be observed several days, or even weeks, after the event, depending on atmospheric conditions and the distance between the source and the observing stations. Atmospheric transport modelling can be performed in a forecast mode to simulate how radionuclides produced by an event with an assumed release scenario will disperse in the atmosphere. This forward modelling was used to predict when the IMS radionuclide stations in the region could expect to observe radionuclides relevant to the event of 25 May.

During the weeks after the event, the IMS radionuclide stations in the region worked well, with the three closest noble gas stations and seven closest radionuclide particulate stations providing good quality data. Both noble gas and particulate data were reviewed daily, including at weekends, and processing and reviewing tools worked with no significant problems. More than five hundred noble gas spectra were reviewed after the event and data were accessible to States Signatories through the IDC secure web site within 24 hours of spectrum analysis. Despite a detection capability of neighbouring noble gas detectors during this time of 0.2 millibecquerel per cubic metre or lower (where 1 becquerel is 1 radioactive disintegration per second), there was no noble gas detection that could be associated with the event of 25 May. Similarly, particulate data did not show any trace related to the event.

Objective criteria based on multiple xenon-133 measurements and atmospheric backtracking were used to determine the corresponding detection threshold across the area of the event. A consistently good detection threshold was encountered. This implies that if there had been a xenon-133 release of the order of 10 terabecquerels, several detections would have been made by the noble gas network. This finding confirms that the event did not have a substantial immediate release (i.e. over 0.1% of the total yield), nor was there a substantial, slow seepage.

Although there were no radionuclide observations which could be associated with the 2009 event in the Democratic People's Republic of Korea, the observed data could be used to place a constraint on the level of containment of noble gases. The lack of indicative radionuclide observations in the IMS noble gas network also shows the importance of on-site inspection (OSI) as a component of the verification regime, since local noble gas signatures may be detectable up to four to six months after an underground nuclear test in the case where there is venting or seepage.

TSUNAMI EARLY WARNING SYSTEMS

In November 2006, the Commission endorsed a recommendation to provide continuous IMS data in real time to relevant tsunami warning organizations. The PTS subsequently entered into agreements and arrangements with a number of tsunami warning centres approved by the United Nations Educational, Scientific and Cultural Organization (UNESCO) to provide data for warning purposes. In 2009, an agreement was finalized with the tsunami warning centre in Thailand. This brought to seven the number of such agreements and arrangements that the PTS has entered into: with Australia, Indonesia, Japan, the Philippines, Thailand and the USA (Alaska and Hawaii). Additional agreements or arrangements were being developed with Malaysia, Myanmar and Sri Lanka. Approximately 1.2 gigabytes of data were being sent in near real time each day to the warning centres. To facilitate these efforts, during its Thirty-Third Session the Commission approved a memorandum of understanding between the Commission and UNESCO.

International Scientific Studies

The CTBT verification system relies on the latest advances in science and technology and it is of strategic importance for the Commission to stay attuned to scientific developments and to attract competent scientists to work for it. The International Scientific Studies (ISS) project, initiated in 2008, is a PTS-wide long term effort to further develop connections and cooperation with the scientific community, and is a follow-up to the "Synergies with Science" symposium held in August–September 2006.

The ISS Conference was held at the Hofburg Congress Centre in Vienna from 10 to 12 June. Over five hundred scientists from about one hundred countries joined diplomats and journalists for the meeting. There were eight panel discussions with some sixty contributors and about twenty invited presentations. The global community contributed more than two hundred scientific posters. The meeting was summarized in a publication, which was distributed worldwide and made available on the CTBTO public web site, entitled *Science for Security: Verifying the Comprehensive Nuclear-Test-Ban Treaty.*

The poster sessions at the conference covered eight themes: the three waveform technologies (seismology, hydroacoustics and infrasound), radionuclide monitoring, atmospheric transport modelling, system performance, OSI and data mining. The presentations were generally of a high scientific quality and drew useful conclusions regarding the overall verification capabilities of the IMS as well as recommendations about new directions that may be fruitfully pursued.

As a follow-up to the ISS meeting, a workshop on multi-sensor data fusion was held in Vienna in November. This meeting included presentations on applications of data fusion by PTS scientists and experts from the global research community. Special emphasis was placed on new results from active data mining research projects.

Children's choir at the opening ceremony.

Demetrius Perricos (formerly of the United Nations Monitoring, Verification and Inspection Commission), speaker on OSI.

From left to right: Gideon Frank (Israel) and Yves Caristan (France) in the panel discussion on the readiness and capability of the CTBT verification regime.

Ola Dahlman (Sweden), Chairperson of the ISS Conference.

Panellists in the discussion on atmospheric nuclear explosions.

Andreas Stohl (Norway), speaker on atmospheric transport modelling.

Hugo Yepes (Ecuador), speaker on capacity building.

Raymond Jeanloz (USA), speaker on science for security.

Dmitry A. Storchak (International Seismological Centre), speaker on seismology.

From left to right: Michael Spindelegger (Minister for European and International Affairs of Austria), Tibor Tóth (Executive Secretary of the CTBTO Preparatory Commission), Wolfgang Hoffmann (Executive Secretary Emeritus) and Ola Dahlman (Chairperson of the ISS Conference).

Alexis Le Pichon (France), speaker on infrasound technology.

Preparing for On-Site Inspections

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 has entered 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.

Putting an End to Nuclear Explosions

Preparing for On-Site Inspections

HIGHLIGHTS IN 2009

- Review and follow-up of the Integrated Field Exercise and development of the OSI action plan
- Directed exercise in Finland and noble gas field test in Slovakia
- Tabletop exercise and OSI introductory courses in Austria

FOLLOW-UP OF THE INTEGRATED FIELD EXERCISE

Upon conclusion of the Integrated Field Exercise (IFE), the PTS carried out a comprehensive review and follow-up process with the involvement of all IFE stakeholders so as to determine what lessons should be learned from the exercise. As a result of a thorough review of the different exercise phases from October 2008 until January 2009, almost nine hundred observations were collected and analysed by PTS staff and led to the development of recommendations for subsequent implementation.

On the podium at OSI Workshop-16, Brunn am Gebirge, Austria, May 2009 (from left to right): Mr Jerry Sweeney, Rapporteur (Lawrence Livermore National Laboratory, USA), Mr Boris Kvok, Director of the OSI Division of the CTBTO Preparatory Commission, and Mr Vitaliy Shchukin, Co-Chairperson and Working Group B Task Leader for OSI (Russian Federal Nuclear Center, Russian Federation).

A workshop dedicated to this issue (OSI Workshop-16: IFE Lessons Learned and Follow-Up) was held from 3 to 7 May 2009 in Brunn am Gebirge, Austria, and brought together 60 experts from 16 States Signatories, representatives from Permanent Missions and members of the PTS. The workshop report suggested several areas that should be given priority for the next stage of build-up of the OSI regime, such as radionuclide detection and supporting techniques, logistical deployment facilities and operations in the field. Given the strategic importance of the IFE for moving further towards OSI readiness, an extraordinary session of Working Group B was held in May 2009 to assess and evaluate the outcome of the exercise.

ACTION PLAN

Work that was carried out subsequent to the IFE review and follow-up process eventually culminated in the preparation of a comprehensive OSI action plan. This was presented to Working Group B at its Thirty-Third Session in August 2009. The action plan also addresses issues which were not tested or evaluated during the conduct of the IFE but which are considered essential for moving towards operational readiness and require development.

The action plan describes the proposed OSI 'road map' for developing the OSI regime further as far as 2013 and includes five main projects: policy planning and operations, operations support and logistics, techniques and equipment, training, and procedures and documentation. The plan foresees a staged approach and focuses on developing inspection techniques and procedures that have a high impact on the conduct of an OSI. In addition, efforts will be concentrated on those aspects that were assessed during the IFE as requiring most improvement. Work on a number of activities has been initiated.

POLICY PLANNING AND OPERATIONS

Conceptual work on the further development of the field information management system and related data flow management has started. Furthermore, taking up the numerous lessons from the IFE related to exercise planning, the PTS has started to develop a set of guidelines on exercise management. This should facilitate the preparation, conduct and follow-up activities for future field exercises.

Another task that has been initiated is concerned with refining the structure of the inspection team and the possible role assigned to each function according to the type of triggering event. The scope of this subproject is strongly related to the search logic to be applied by the team, depending on the event, and therefore to the definition of an initial inspection plan. At the same time, it is closely related to the identification of the main signatures associated with an underground nuclear explosion and to the evaluation of the different technologies allowed by the Treaty in detecting these signatures.

Participants in the expert meeting on radiation safety, Buenos Aires, November 2009.

OPERATIONS SUPPORT AND LOGISTICS

On the basis of the results of the IFE review and follow-up process, one of the main tasks was to conduct a study of operations support and logistics requirements. Consequently, a concept was developed which outlines the high level systems architecture for an integrated inspection support system. This system will be designed to be capable of providing the OSI verification regime with the right personnel, equipment and supplies at the right time, in the right place and in the right quantities.

Responding to the IFE review and follow-up process in the area of health and safety and radiation protection, the PTS held an expert meeting on radiation safety from 23 to 27 November in Buenos Aires. The meeting was attended by 35 experts from 14 States Signatories, the International Atomic Energy Agency and the PTS. The overall aim of the meeting was to improve health and safety methodology (both in general and in relation to radiation protection) and relevant parts of the training curriculum for OSI inspectors.

Relative gravimetric measurement during the directed exercise, Finland, July–August 2009.

TECHNIQUES AND EQUIPMENT

A directed exercise was conducted between 28 July and 12 August in Finland with the participation of

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1. Acceptance testing of a relative gravimeter during a field exercise, Heviz, Hungary, November 2009.
2. Drilling in preparation for noble gas subsoil sampling during the noble gas field operation test, Stupava, Slovakia, October 2009.
3. Operation of an ARIX field sampling unit in harsh weather conditions during the noble gas field operation test, Stupava, Slovakia, October 2009.
4. Participants in the tabletop exercise, Baden, Austria, July 2009.
5. Inspection team leader giving instruction to the sub-team for continuation period techniques during the tabletop exercise, Baden, Austria, July 2009.
6. Participants discussing the checking-out procedure for field activities during the Regional OSI Introductory Course (IC16) for the North America and Western Europe geographical region, Puchberg am Schneeberg, Austria, September 2009.
7. Participants practising decontamination procedures during the Regional OSI Introductory Course (IC16) for the North America and Western Europe geographical region, Puchberg am Schneeberg, Austria, September 2009.

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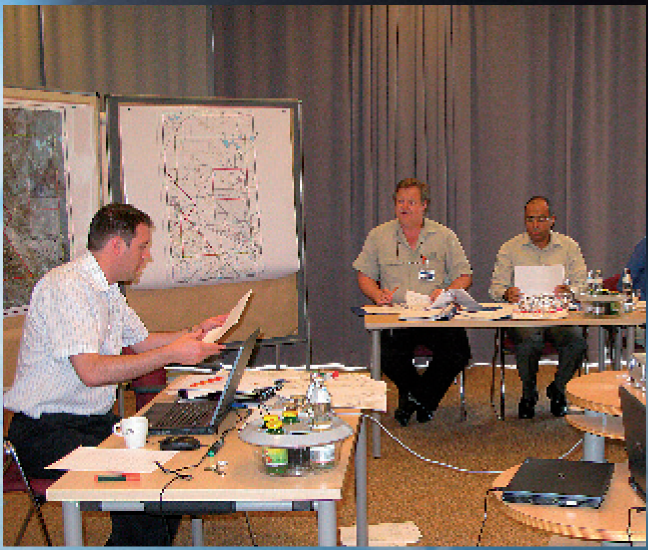
38 scientific experts from 15 States Signatories as well as from the PTS. The exercise site was chosen for its well known geological structure, which has relevance for OSI. Ongoing tunnel excavation and controlled blasting at the site provided an outstanding opportunity to test the capabilities of the Seismic Aftershock Monitoring System (SAMS). The exercise was designed around two core activities: application of SAMS and continuation period techniques. In addition, two cross-cutting operational aspects, data flow management and communications within an inspection team, were exercised successfully.

An OSI noble gas field operation test was conducted between 12 and 23 October in Stupava, Slovakia. A total of 51 noble gas experts from 17 States Signatories and the PTS participated. The main objective was to test available OSI equipment for monitoring noble gases (xenon and argon) under field conditions. The secondary objective was to compare two types of bulk gas sampling strategy and the resulting field constraints. The participants used several types of sampling equipment and practised taking gas samples from various boreholes.

The pool of OSI core equipment was extended with a commercially available relative gravimeter. Upon delivery during the second quarter of 2009, acceptance tests for the instrument were carried out successfully during two field exercises: in Heviz, Hungary, for the mapping of a geological structure relevant to OSI and noble gas monitoring, and during the directed exercise in a scenario involving measurements at shallow depth with high resolution. With the aim of completing SAMS, 20 fully equipped mini-arrays were procured.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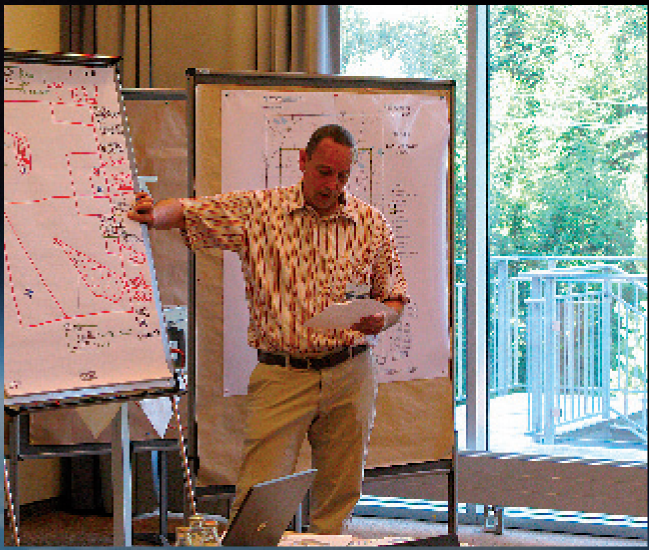
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TRAINING

The conduct of the IFE, its evaluation and the review of lessons learned enabled the PTS to gain proper insight into training needs. This also helped in preparing the second training cycle for surrogate inspectors in accordance with the OSI action plan. The identified training needs have been addressed through a number of activities carried out in the course of the year.

Two consultancy planning meetings on advanced training courses for visual observation and continuation period techniques were held in November and December respectively. The preparation of documentation and of draft training packages for radionuclide and SAMS techniques has also been initiated. A smooth transition from the introductory stage to proficiency in applying the targeted levels of OSI related knowledge and skills has been ensured by this preparatory work, which started in 2009 with the involvement of all stakeholders.

A tabletop exercise was held in Baden, Austria, in July to refine continuation period techniques and the role of the sub-team responsible for these techniques within the inspection team. The exercise led to the creation of training material suitable for further training in these techniques as part of the second training cycle.

New e-learning modules on OSI techniques and signatures of underground nuclear explosions were developed and tested. Also, an educational film on the IFE was produced and has been used in training. In addition, work on the set-up of an OSI technical and scientific library has been initiated.

This will eventually enable the planning of all segments of training to be based on relevant and reliable research.

The 17th OSI Introductory Course was held from 19 to 22 May for a total of 31 diplomatic staff members from 21 Permanent Missions in Vienna. It was received positively and resulted in the renewed interest of States Signatories in supporting OSI activities. This has been demonstrated by the increased communication and discussion regarding training opportunities. A Regional OSI Introductory Course for the North America and Western Europe geographical region was conducted in Puchberg am Schneeberg, Austria, from 20 to 26 September for 18 participants from nine countries. Again, the activity was well received.

PROCEDURES AND DOCUMENTATION

With the substantive assistance of the PTS, Working Group B during its 2009 sessions continued its elaboration of the draft OSI Operational Manual and started the third round of this process. The PTS will continue to provide, as a priority, support to this process.

The PTS collected and reviewed about fifty lessons from the IFE review and follow-up process that related to OSI documentation and the draft OSI Operational Manual, and established corresponding projects for the action plan. A number of lessons were referred to the Working Group B Task Leader for the draft OSI Operational Manual.

In accordance with the action plan, work was initiated on a project to develop standard operating procedures, which will start in 2010. Its aim is to ensure standardization and consistency with the Treaty and the draft OSI Operational Manual as well as to develop new procedures to complete the set of procedural guidance necessary for an OSI.

Capacity Building

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.

HIGHLIGHTS IN 2009

- NDC development workshops in the Dominican Republic and Mexico
- Advanced NDC capacity building courses in Chile, Morocco and the United Republic of Tanzania
- Infrasound, noble gas and laboratory workshops

TRAINING STATION OPERATORS

A diverse range of training events for station operators and NDC technical staff was provided in 2009. Station operators benefited from eight courses, largely on the use and maintenance of equipment.

TRAINING ANALYSTS

Review of data and generation of reviewed data products are core functions of the Commission. Analysts sift through volumes of data, providing an accurate accounting of all events that meet specific criteria. The job is demanding and requires a high degree of skill. The IDC analysts' course is the longest of the training courses offered by the Commission; it lasts more than three months and requires a large commitment from the participants. From the numerous applicants, only 10 were chosen to come to Vienna in 2009 for the demanding course of instruction. Most of the course offered hands-on training with the analytical tools, preceded by a succinct theoretical introduction. By the end of such a course, the trainees leave in a much stronger position to apply for analyst posts in the organization.

NDC DEVELOPMENT WORKSHOPS

Two NDC development workshops were conducted in 2009, one from 25 to 27 May in Santo Domingo, Dominican Republic, and the other from 12 to 14 August in Mexico City. Each was attended by 20 persons. Their purpose was to promote understanding of the Treaty and the work of the Commission, to enhance national capabilities of States Signatories in the implementation of the Treaty, to promote the exchange of experience and expertise among States Signatories in the establishment, operation and management of an

NDC, and to promote 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 presentations from representatives of NDCs in all stages of development.

TRAINING NDC TECHNICAL STAFF

Following an NDC development workshop, NDC technical staff are trained over a two week period in accessing IMS data and IDC products, downloading and installing the NDC in a box software, and analysing data with the tools provided. A total of 60 NDC technical staff were trained during 2009 in three such courses held in Chile, Morocco and the United Republic of Tanzania.

NDC CAPACITY BUILDING EQUIPMENT

As part of the PTS capacity building strategy, several sets of equipment necessary for establishing an adequate technical infrastructure at NDCs were purchased. The equipment, including a server, workstation, uninterruptible power supply, backup system, rack and printer, has been delivered to six NDCs, and additional deliveries are pending. The equipment, provided as part of the technical assistance given to States Signatories to establish or strengthen their NDCs, enhances the capacity of an NDC to participate in the verification regime and to develop civil and scientific applications according to the perceived needs.

Participants of the 10th International Noble Gas Experiment Workshop, Daejeon, Republic of Korea, November 2009.

Participants in the capacity building workshop for NDC technical staff, Santiago, Chile, November 2009.

System installation at the NDC of the Dominican Republic, May 2009.

INFRASOUND, NOBLE GAS AND LABORATORY WORKSHOPS

Brasilia

The 2009 Infrasound Technology Workshop, organized by the Seismological Observatory of the University of Brasilia with the support of the Commission and the Federal District Research Support Foundation, took place from 2 to 6 November in Brasilia. The current status of the IMS infrasound network and IDC processing was presented. Other major topics covered at the workshop included data processing and modelling, including detection algorithms, source categorization, propagation simulations and improvement of the existing atmospheric models, instrumentation and calibration techniques.

Daejeon

The Korean Institute of Nuclear Safety hosted the 10th International Noble Gas Experiment (INGE) Workshop in Daejeon, Republic of Korea, from 9 to 13 November with support from the Commission. The workshop focused on major topics related to noble gas measurements as an integral part of the verification regime, namely: developments in science and technology; data analysis techniques; operations, performance and new developments in noble gas systems; certification of IMS systems; requirements and applications in OSI; laboratory quality assurance/quality control and calibration; atmospheric transport modelling; and xenon spectrum and event categorization.

The workshop recommended the study by the PTS of resources needed to bring noble gas systems into provisional operation as requested by Working Group B. It further recommended that discussion continue on OSI related issues within the framework of INGE.

Seattle

The Pacific Northwest National Laboratory in Richland, Washington, USA, which also hosts a certified CTBT radionuclide laboratory (RL16), hosted the 2009 Informal Radionuclide Laboratories Workshop from 7 to 9 December in technical cooperation with the Commission. The workshop addressed issues related to the Proficiency Test Exercises organized by the PTS, in particular the criteria for evaluating the results and consequences for failing these criteria. Presentations were also given regarding laboratory operation, results of the network quality assurance/quality control programme, analysis by laboratories of Level 5 samples (which contain multiple anthropogenic nuclides and are therefore Treaty-relevant) and techniques in analysis of IMS samples. The workshop made several recommendations, including the introduction of a new grading scheme for Proficiency Test Exercises while retaining the principal tests used to evaluate results in previous exercises.

E-LEARNING

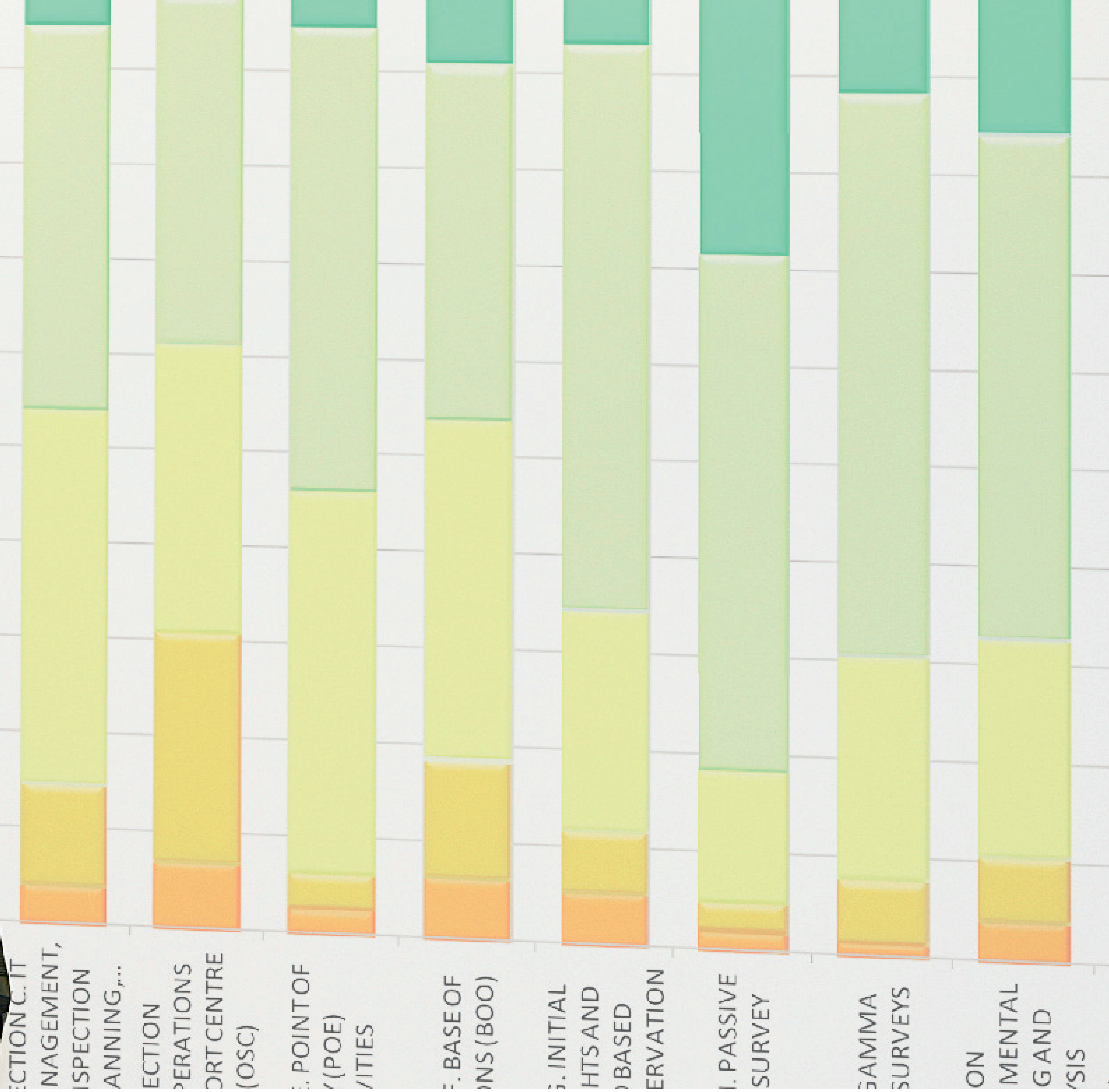
Traditional training activities by the Commission have been mostly typical classroom training and field exercises. To enhance the learning opportunities for States Signatories and staff of the Commission, e-learning is provided to complement classroom training and to broaden the reach of the training programmes for station operators, NDC technical staff and potential OSI inspectors. The e-learning platform can also be used to train staff of the Commission and to offer educational material to States Signatories.

The primary objectives of the e-learning project are as follows: (a) to increase the number of participants in training activities of the Commission; (b) to prepare individuals prior to their participation in traditional classroom training and field exercises; (c) to reduce lecture room time in favour of field activity or hands-on exercises; (d) to provide a means for individuals to learn at their own pace where appropriate; and (e) to broaden the base of potential candidates for posts with the Commission, thereby assisting recruitment.

The e-learning system benefited in 2009 from the development of several e-learning modules with support from the European Union. The modules cover topics ranging from the history of the CTBT and national implementation to verification technologies, data collection and processing, and data and product distribution. The modules were used for the first time in 2009 as an integral part of training courses and were well received. Many of the existing modules will be translated into the six official languages of the United Nations, and additional modules are scheduled for development in 2010.

Improving Performance and Efficiency

Throughout the process of establishing the verification system, the Provisional Technical Secretariat of the CTBTO Preparatory Commission aims for effectiveness, efficiency and continual improvement through the implementation of its Quality Management System (QMS). The QMS 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.

Putting an End to Nuclear Explosions

Improving Performance and Efficiency

HIGHLIGHTS IN 2009

- Further consolidation of the Quality Management System (QMS)
- Preparation of the first inventory of QMS related procedures
- NDC Evaluation Workshop in Beijing

DEVELOPING THE QUALITY MANAGEMENT SYSTEM

The function of the Quality Management System (QMS) is to identify and put into effect KPIs for evaluating PTS processes and products, thus facilitating management review and continual improvement. KPIs are metrics used to quantify progress in reaching objectives and to indicate the strategic performance of an organization. They are primarily employed to assess the status of an organization and to prescribe a course of action. The aim of the QMS is to support the objective of consistently meeting verification system requirements. It encompasses all contributing PTS processes and work products.

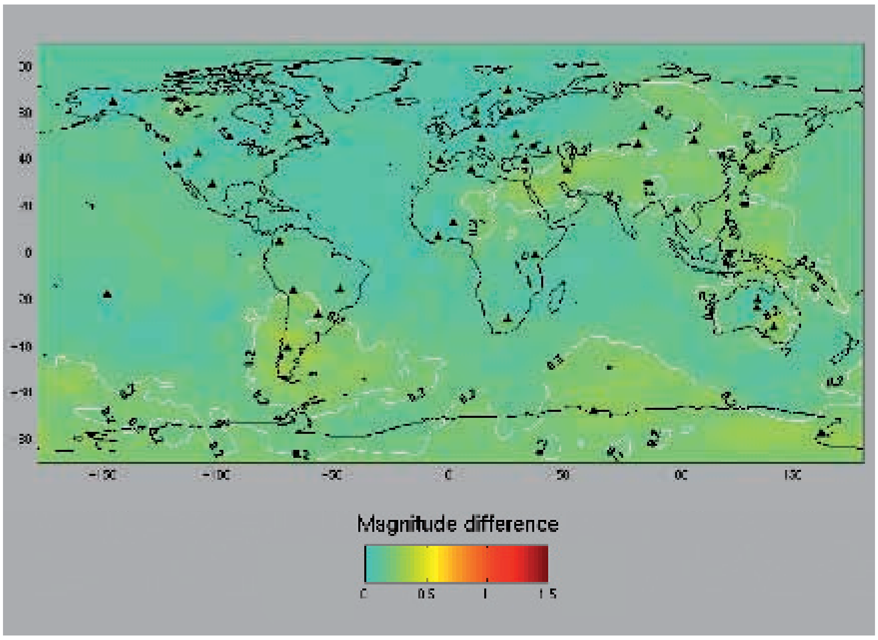
In 2009, work on the QMS concentrated on further consolidating and testing waveform KPIs as well as the prototype performance reporting tool (PRTool) for displaying KPI measurements. Work began on a QMS glossary of verification related terms and on a review of quality management related PTS procedures to serve as a basis for performance monitoring and testing activities.

Progress has been made in the definition and implementation of KPIs, such as those related to radionuclide product quality, noble gases and atmospheric transport; waveform product quality, e.g. missed events, bogus events and mislocations, based on the comparison of bulletins from the IDC with those of other networks; and PTS sustainment processes, based on data from the IRS, DOTS and the procurement system (e.g. time to repair and time between failures).

EVALUATING ON-SITE INSPECTION ACTIVITIES

During OSI field exercises, standard operating procedures, equipment or software packages related to the inspection activities and techniques outlined in the Protocol to the Treaty are tested and evaluated under realistic field conditions. The evaluation of such exercises permits identification of those aspects that need improvement in order to further develop inspection techniques.

In 2009, following the completion of the draft evaluation report on the IFE, which factored in the results of surveys and interviews of participants, an IFE Evaluation Reporting Workshop was held from 2 to 5 March in Baden, Austria. The main objective was to contribute to moving the OSI regime further towards operational readiness through presentations on the elements of the IFE Evaluation Report and discussions with the participants in the IFE itself. The workshop addressed four themes: areas of agreement and differences between the Report of OSI Workshop-15 and the IFE Evaluation Report; the limitations and constraints that governed the preparation for and conduct of the IFE, as these have a direct bearing on how lessons learned should be viewed; concepts of OSI



Improvement in Seismic Detection Capability

As there were no newly certified primary seismic monitoring stations in the IMS network during 2009, the map of the estimated detection capability at the end of 2009, relative to that of the complete IMS primary seismic network under ideal conditions (full station availability and low background noise), is identical to that of 2008. Relative detection capability is shown as a difference in body wave magnitude. An event is considered detected when its signal exceeds the noise level by a factor of 3 at three or more stations. Overall, magnitude differences in several parts of the world are now below 0.2. Further, for continental areas, residuals above 0.2 appear to be confined to areas where the remaining primary seismic stations are to be built or installed.

readiness to assist the PTS in its planning and developmental work; and priority follow-up actions for the PTS and Working Group B. The workshop permitted an enriching exchange of views and was perceived as a useful step in taking forward work on building the OSI regime.

The Report of the IFE Evaluation Reporting Workshop, which included the IFE Evaluation Report and the related workshop discussions and recommendations, was presented to the extraordinary session of Working Group B in May. An evaluation plan was also prepared for presentation to the Thirty-Third Session of Working Group B in August, which covered the OSI programme for 2009–2010 as well as the IFE review and follow-up process.

In addition, evaluations were conducted on the OSI tabletop exercise held in Austria in July, on the directed exercise held in Finland in July–August and on the noble gas field test in Slovakia in October. The evaluation activities were performed with the strong involvement of the OSI Division and in real time during these OSI events.

FEEDBACK FROM NATIONAL DATA CENTRES

In its Quality Policy, the PTS underlines its focus on customers. NDCs, as the main users of PTS products and services, meet in annual NDC evaluation workshops in order to provide their feedback to the PTS.

The 2009 NDC Evaluation Workshop, held in Beijing from 18 to 23 May, was hosted by the Government of China and jointly organized with the PTS. There were over seventy participants representing thirty States Signatories, NDCs and the PTS.

The main objective of the workshop was achieved in that experts from NDCs provided evaluation input to further improve the performance of the verification system. In particular, and as requested by Working Group B, the workshop provided feedback from NDCs to elaborate further the framework proposed by the PTS for testing system performance.

The workshop highlighted the need for further synergies among experts in all the IMS technologies as fundamental to enhancing Treaty verification capacity. The workshop recommended that the scope of the NDC Preparedness Exercise (NPE) in 2009 be expanded to include seismic, radionuclide and infrasound technology data.

Participants recognized the importance of the NPEs and recommended that high priority continue to be given to the completion of the IMS network and to the provisional operation of as many stations as possible so that the overall availability of certified primary and auxiliary seismic stations is improved. They also considered that NPEs should become part of the performance assessment system.

Participants of the IFE Evaluation Reporting Workshop, Baden, Austria, March 2009.

Setting up the Seismic Aftershock Monitoring System during the OSI directed exercise, Finland, July–August 2009.

Participants in the 2009 NDC Evaluation Workshop, Beijing, May 2009.

Workshop participants during a scientific visit to the Chinese NDC, May 2009.

The workshop discussed the need to support emerging and developing NDCs. The NDC Forum, which is an Internet portal, proved to be a key element in the continuously growing cooperation among NDCs. NDCs and the PTS acknowledged the efforts made by the Italian National Institute of Geophysics and Volcanology (INGV) in the development and maintenance of the portal. The virtual machine software environment contributed by the INGV to facilitate utilization by new NDCs of Geotool, the software system for displaying IMS data, regardless of NDC hardware and software limitations, was also highly appreciated.

EVALUATION PRACTICES AND THE UNITED NATIONS

The United Nations Evaluation Group (UNEG) brings together the units responsible for evaluation in the United Nations system, including the specialized agencies, programmes and affiliated organizations. It aims to strengthen the objectivity, effectiveness and visibility of the evaluation function across the United Nations system and to advocate the importance of evaluation for learning, decision making and accountability. UNEG provides a forum for members to share experience and information, discuss the latest evaluation issues and promote simplification and harmonization of reporting practices.

The annual meeting of UNEG took place in March 2009. The PTS representatives shared evaluation practices and experience with counterparts from other United Nations organizations and played a leading role in moderating sessions. The PTS continued to participate in the panel for peer-reviewing evaluation practices of the United Nations Industrial Development Organization and in the development of UNEG evaluation quality standards.

Policy Making

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. The plenary, as the Policy Making Organ, is assisted by two Working Groups.

Working Group A deals with budgetary and administrative matters facing the organization, while Working Group B 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 of qualified experts serves in a supporting role, advising the Commission through its Working Groups on financial, budgetary and associated administrative matters.

HIGHLIGHTS IN 2009

- Extension of the project to promote the participation of developing countries in official technical meetings of the Commission
- Appointment of Mr Michael Weston (United Kingdom) as Chairperson of the Advisory Group for three years
- Changes to the system of official documentation and further advances in establishing the Information System with Hyperlinks on Tasks Assigned by the Resolution Establishing the Preparatory Commission

MEETINGS IN 2009

In 2009, the Thirty-Second Session of the Preparatory Commission was held on 8–9 June and was chaired by Ambassador Peter Shannon, Permanent Representative of Australia. At its Thirty-Second Session, the Commission appointed Mr Michael Weston (United Kingdom) as the Chairperson of the Advisory Group for a term of three years starting from 16 June 2009. The Thirty-Third Session of the Commission was held on 16–17 November with Ambassador Michael Potts, the new Permanent Representative of Australia, as Chairperson.

Working Group A was chaired by Ambassador Abdulkadir Bin Rimdap (Nigeria) and held its Thirty-Fifth Session from 14 to 15 May and its Thirty-Sixth Session from 5 to 6 October. Working Group B was chaired by Mr Hein Haak (Netherlands) and held its Thirty-Second Session from 9 to 27 February and its Thirty-Third Session from 17 August to 4 September. From 11 to 12 May, Working Group B held an extraordinary session to assess the reports by the PTS and others on evaluation of the IFE. The Advisory Group, chaired by Mr André Gué (France), held the first and second parts of its Thirty-Second Session from 20 to 24 April and from 4 to 8 May. From 14 to 17 September, the group held its Thirty-Third Session, which was chaired by its new Chairperson, Michael Weston.

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 strengthen the universal character of the Commission and capacity building in developing countries.

The PTS introduced a number of improvements to the implementation of the project. These included the provision to newly selected experts of a package of basic information material on the Treaty and the work of the Commission, and the identification of possible regional technical meetings and workshops in which the experts could participate.

In 2009, two experts supported in 2007 and 2008 left the project and five new experts were selected, bringing the total number of experts supported to nine for the first time (one each from Ethiopia, Kenya, Mexico, Mongolia, the Philippines, Samoa, Sri Lanka, Tunisia and Turkmenistan). Experts from two least developed countries were therefore supported under the project.

The experts took part in sessions of Working Group B and other technical meetings, including OSI Workshop-16 and the NDC Evaluation Workshop in May and the ISS Conference in June. In addition, the experts benefited from a series of technical briefings and discussions with the PTS on key verification related issues. The expert from Kenya led discussions as the Task Leader for Issues Related to NDCs at both of the regular sessions of Working Group B.

The project was financed in 2009 by voluntary contributions from Austria, China, Finland, Hungary, Indonesia, Luxembourg, Malaysia, Morocco, the Netherlands, New Zealand, Norway, Oman, Qatar, the Republic of Korea, Slovenia, South Africa, Spain, Turkey and the United Kingdom. In addition, a voluntary contribution was received from the OPEC Fund for International Development.

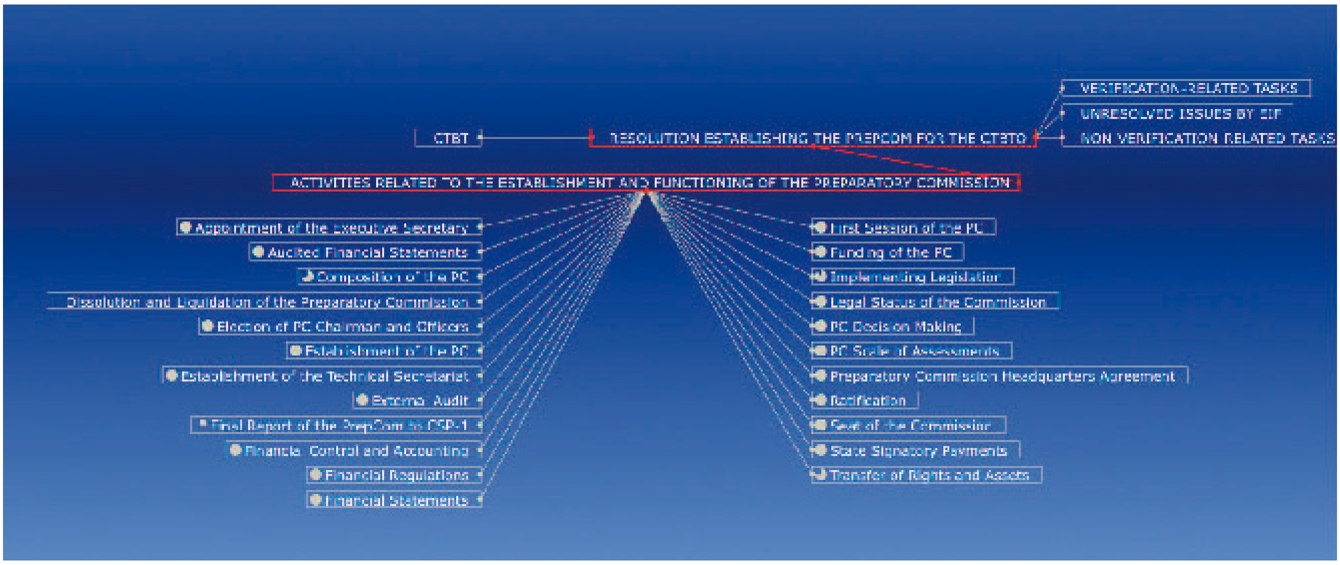
On the basis of an implementation report prepared by the PTS, at its November session the Commission expressed its appreciation to the donor countries for their contributions and to the PTS for its reports on, and management of, the project. Moreover, the Commission decided to continue the project for a further three years on the basis of the decision made by the Commission at its Twenty-Seventh Session and of the management guidelines and selection criteria that were developed at the end of 2006, and subject to availability of sufficient funds through voluntary contributions.

Discussion involving some of the experts from developing countries who were able to travel to Vienna to participate in technical meetings of the Commission as a result of support from a special PTS project.

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. From organizing conference facilities and arranging interpretation to drafting official documents of the various sessions and advising 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



Information System with Hyperlinks on Tasks Assigned by the Resolution Establishing the Preparatory Commission (ISHTAR). The screenshot shows the degree of completion (indicated by partial or full circles) of activities in one of the main categories of tasks. Each title is linked to relevant background documents of the Commission.

States ratifiers. It similarly supported the 2009 Conference on Facilitating the Entry into Force of the CTBT, which was held in New York in September.

Improving Official Documentation

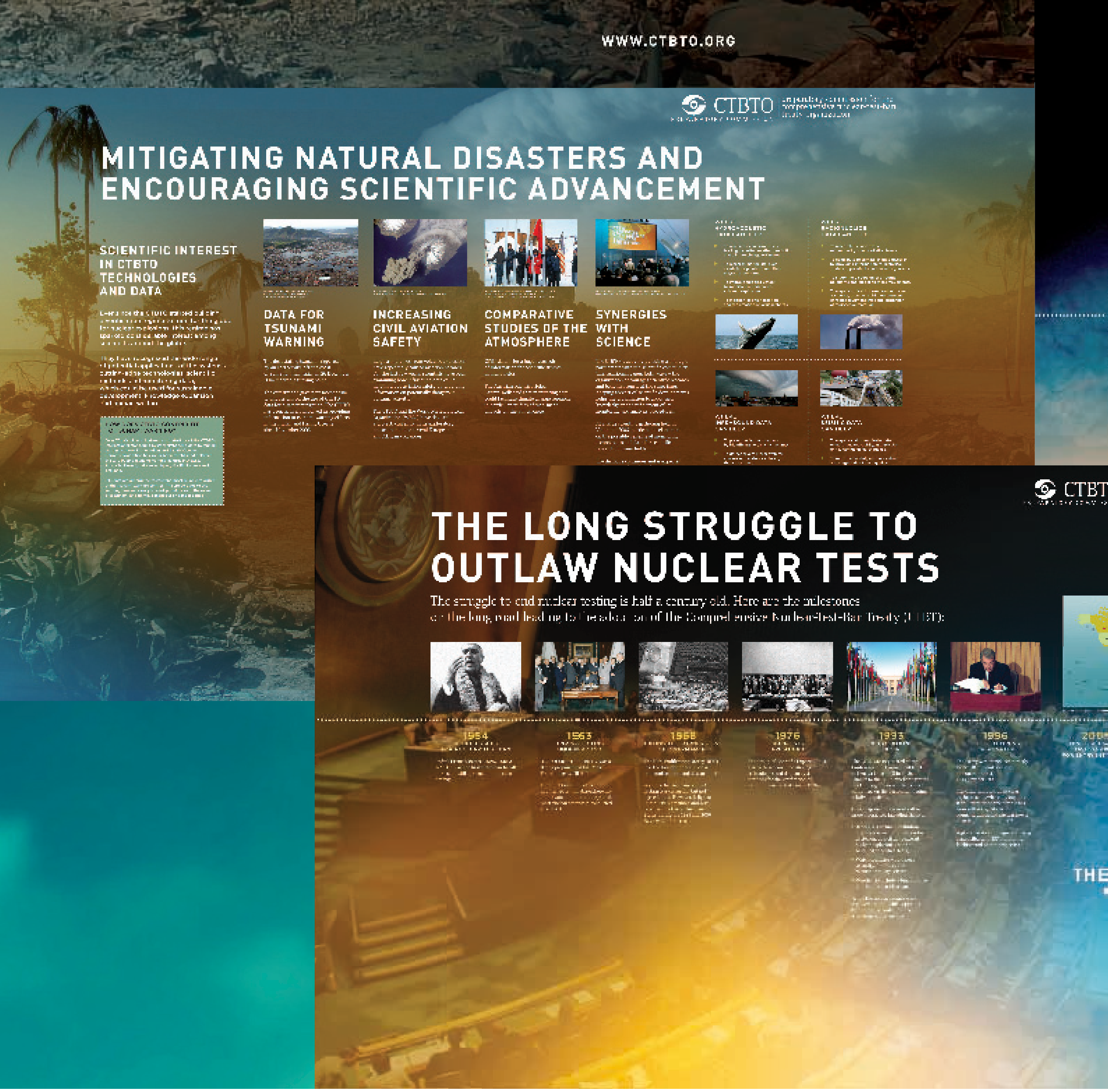
Following consultations in 2008 with the Chairpersons of the Commission and Working Groups A and B, in 2009 the PTS introduced several changes to the system of official documentation. In addition to lowering costs, the changes are intended to facilitate the work of delegations and of the Commission and its subsidiary bodies by making the system more user friendly. The major change was the reduction in the number of documents annexed to reports of the Commission.

Information System on Progress in Fulfilling the Mandate of the Treaty

Further advances were made in establishing the Information System with Hyperlinks on Tasks Assigned by the Resolution Establishing the Preparatory Commission (ISHTAR). Using hyperlinks to the official documentation of the Commission as its basis, the aim of the ISHTAR project is to monitor 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 enable the Commission to determine which tasks remain to be completed in terms of preparations for the establishment of the CTBTO at entry into force.

Creating a 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 Experts Communication System (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.



Outreach

A key mandate of the Provisional Technical Secretariat of the CTBTO Preparatory Commission is to promote understanding of the objectives and principles of the Treaty, the functioning of the Commission, the global CTBT verification regime, and the civil and scientific applications of the International Monitoring System. This is done through interaction with the international community, including States, international

organizations, academic institutions, non-governmental organizations, the media and the general public. The outreach activities involve educating the general public about the work of the Commission, promoting signature and ratification of the Treaty by States and fostering international cooperation in the exchange of verification related technologies.

Outreach

HIGHLIGHTS IN 2009

- Renewed commitment to the Treaty and its entry into force
- Ratification of the Treaty by Liberia, the Marshall Islands and Saint Vincent and the Grenadines, and signature of the Treaty by Trinidad and Tobago
- Unprecedented media coverage and publicity for the Treaty and its verification system

A WATERSHED YEAR FOR THE ORGANIZATION

Over the years, the PTS has energetically pursued its objectives of raising awareness and enhancing understanding of the Treaty, establishing the verification regime and installing IMS facilities, and promoting signature and ratification. However, several watershed events in 2009 heightened the salience of the CTBT as never before, creating renewed momentum for its entry into force and universality. The speech given by President Obama in April, the agreement in London between Presidents Medvedev and Obama to work towards entry into force, and the unanimous adoption of Security Council resolution 1887 calling for, inter alia, entry into force are illustrative of the new political determination gaining strength in support of the Treaty. This high level attention generated wide ranging media coverage and thereby increased public awareness of the CTBT worldwide.

The initiatives and statements in support of the Treaty by world leaders and numerous States have reinforced the collective faith in the contribution that the Treaty makes to nuclear disarmament and non-proliferation. The need for its entry into force has again become a major, if not one of the key objectives for the international community. At the same time, political momentum for nuclear disarmament and non-proliferation has increased, representing a defining change in the international political context. The political determination to take concrete actions to eliminate nuclear weapons is now more assertive. The CTBT is the embodiment of security, which is indivisible and underpinned by a multilateral, non-discriminatory verification system. This system is designed to limit the ability of nuclear weapon States to make qualitative improvements to their nuclear stockpiles while preventing additional States from developing such weapons.

For the PTS, this new momentum is accompanied not only by new opportunities but also by the responsibility to seize upon every suitable occasion to further its objectives. As the Executive Secretary of the Preparatory Commission declared at the opening of its Thirty-Third Session, the organization is now entering "the most defining period of its existence."

TOWARDS UNIVERSALITY OF THE TREATY

The Treaty moved closer to universalization in 2009 with ratification by the following three countries: Liberia, the Marshall Islands and Saint Vincent and the Grenadines. One country signed the Treaty: Trinidad and Tobago.

As of 31 December 2009, the CTBT had been signed by 182 States and ratified by 151 States, including 35 of the 44 States listed in Annex 2 to the Treaty, whose ratification is required for the Treaty to enter into force.

INTERACTING WITH THE INTERNATIONAL COMMUNITY

Continuing in its efforts to facilitate the implementation of the decisions of the Commission on the establishment of the verification regime and to promote participation in the work of the Commission, in 2009 the PTS maintained dialogue with States through bilateral visits in capitals and interactions with Permanent Missions in Vienna, Berlin, Geneva and New York. The major focus of such interactions was on States hosting IMS facilities and States that have not yet signed or ratified the Treaty (particularly those listed in Annex 2). The PTS also took advantage of various international, 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 Executive Secretary of the Preparatory Commission visited Belgium, China, Egypt, France, Hungary, Morocco, Namibia, Nigeria, Switzerland, Thailand, Turkey, the United Kingdom and the United States of America with a view to strengthening their interaction with the Commission and highlighting the significance of the entry into force of the Treaty.

NPT Preparatory Committee

On 7 May 2009, the Executive Secretary addressed the Third Session of the Preparatory Committee for the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). The last time an address was given to the parties to the NPT on behalf of the Commission was in 1999.

On the margins of the session, the Executive Secretary met with several delegations, including those from Annex 2 States, to discuss pending ratifications and prospects for entry into force. He also met with the United Nations Secretary-General, Mr Ban Ki-moon, and the United Nations Messenger of Peace, Mr Michael Douglas.

Conference on Facilitating the Entry into Force of the CTBT

On the margins of the Article XIV conference in New York from 24 to 25 September, the Executive Secretary held meetings with several high level delegates, including the Minister for Foreign Affairs of Australia, the Minister for European and International Affairs of Austria, the Minister for Foreign Affairs of Costa Rica, the Minister of Foreign and European Affairs of France, the Minister of Foreign Affairs and Cooperation of Morocco, the Minister for Foreign Affairs of the Philippines, the Minister for Foreign Affairs of the Russian Federation, the Secretary of State for Foreign Affairs of Spain, the Minister for Foreign Affairs of Sweden, the Minister for Foreign Affairs of Trinidad and Tobago, the Minister of State for Foreign and Commonwealth Affairs of the United Kingdom, the US Secretary of State, the US Under Secretary of State for Arms Control and International Security, the Under-Secretary General for Political Affairs, Ministry of Foreign Affairs of Brazil, the Under-Secretary for Policy, Department of Foreign Affairs of the Philippines, and the Vice Minister for Foreign Affairs of Viet Nam.

United Nations

The Executive Secretary visited Geneva on 12 March and met with the Secretary-General of the World Meteorological Organization and the Director of the Geneva Branch of the United Nations Office for Disarmament Affairs. On 2 September, in Geneva, he participated in a seminar of the United Nations Institute for Disarmament Affairs entitled "The CTBT: The Nexus between Politics and Science".

The Executive Secretary took part in the sixty-fourth session of the United Nations General Assembly in New York from 23 to 30 September. On the margins of the session, he met with a number of senior officials and government representatives. On 13 October, the Executive Secretary participated in the First Committee of the United Nations General Assembly and in the panel exchange on the "Current State of Affairs in the Field of Arms Control and Disarmament and the Role of the Respective Organizations".

During the year, PTS representatives participated in several conferences sponsored by the United Nations with the aim of strengthening cooperation with academics and practitioners in the field of disarmament and non-proliferation.

International Atomic Energy Agency

The Executive Secretary delivered his traditional address to the annual General Conference of the International Atomic Energy Agency in Vienna on 16 September. On the margins of the General

Conference, the Executive Secretary held meetings with high level officials, including the Minister for Environment, Science and Technology of Ghana, the Minister for Science and Technology of Iraq, the Secretary of Energy of the USA, the Deputy Prime Minister and Minister of Science and Technological Development of Serbia, the Deputy Minister for Energy of Angola, the Vice-Minister, Department of Foreign Affairs of Indonesia, the Under-Secretary of State, Ministry of Foreign Affairs of Italy, the Under Secretary for Nuclear Security of the Department of Energy and Administrator for Nuclear Security of the National Nuclear Security Administration, USA, the Ambassador of the Philippines to the United Nations, who is also President-elect of the 2010 Review Conference of the Parties to the NPT, the Board President of the Chilean Nuclear Energy Commission and the Director General of the Israel Atomic Energy Commission.

Multilateral Organizations

On 20 March, the Executive Secretary addressed the 2009 Nuclear Policy Symposium organized by the North Atlantic Treaty Organization (NATO) in Budapest. During a mission to Belgium in October, he visited NATO and held meetings with the Deputy Secretary General of NATO and the Assistant Secretary General for Political Affairs and Security Policy at NATO. The Executive Secretary also participated in the Annual NATO Conference on WMD Arms Control, Disarmament and Non-proliferation in Warsaw on 10–11 December, where he made a presentation on the CTBT.

The Executive Secretary briefed members of the Science and Technology Committee of the NATO Parliamentary Assembly on 27 April in Vienna on recent developments with regard to the CTBT as well as the build-up of the verification regime. The NATO parliamentarians also had the opportunity to visit the Operations Centre at the Headquarters of the Preparatory Commission.

During his visit to Namibia from 31 March to 1 April in connection with an international cooperation workshop in Windhoek, the Executive Secretary held a bilateral meeting with the President of the Inter-Parliamentary Union (IPU), who is also the Speaker of the National Assembly.

PTS delegations participated in the 120th and the 121st Assembly of the IPU, which were held from 5 to 10 April in Addis Ababa and from 19 to 21 October in Geneva. At the 120th Assembly, the IPU adopted a resolution entitled "Advancing nuclear non-proliferation and disarmament, and securing the entry into force of the Comprehensive Nuclear-Test-Ban Treaty: The role of parliaments".

The Executive Secretary attended the 15th Summit of Heads of State and Government and the preceding ministerial meeting of the Non-Aligned Movement, which were held from 13 to 16 July in Sharm el Sheikh, Egypt. There he met with several foreign ministers and leaders of delegations, including those from Annex 2 States. In the Final Document adopted at the end of the summit, the Heads of State stressed the significance of achieving universal adherence to the Treaty, including by all the nuclear weapon States. The Heads of State also considered that universal adherence to the Treaty would contribute to nuclear disarmament.

On 1 October, the Executive Secretary provided a briefing at the Subcommittee on Security and Defence of the European Parliament in Brussels.

Further Activities

In February, the Executive Secretary visited Washington, D.C., together with the Chairperson of the Preparatory Commission, Ambassador Hans Lundborg (Sweden), to take part in a hearing of the International Commission on Nuclear Non-proliferation and Disarmament, at which he stressed the central relevance of the CTBT. The Executive Secretary returned to the US capital in April to speak at the Carnegie International Nonproliferation Conference. Prior to the Article XIV conference in New York in September, the Executive Secretary and other senior members of the PTS visited Washington to discuss a number of issues related to the US ratification process with senior officials and relevant institutions.

INTERNATIONAL COOPERATION WORKSHOPS

The PTS holds regional and subregional workshops with the overall aim of encouraging political and technical cooperation in areas related to the CTBT, reviewing CTBT related achievements in support of the nuclear non-proliferation regime and promoting the entry into force and universality of the CTBT. Other objectives include enhancing the understanding of the Treaty as a regional security and confidence building measure, and developing national capabilities in the region for implementing the Treaty and participating in the verification regime. Participants also explore means of promoting the application of PTS data and products for civil and scientific purposes, and ways in which experience and expertise can be exchanged between the PTS and the relevant national agencies, as well as between the participating States.


Participants of the international cooperation workshop, Melekeok, Palau, May 2009.

In 2009, the PTS held three such international cooperation workshops: a Regional Workshop on CTBTO International Cooperation for Member States of the Southern African Development Community in Windhoek from 1 to 2 April; a Regional Workshop on CTBTO International Cooperation for States in the Pacific, in Melekeok, Palau, from 21 to 22 May; and a CTBTO Regional Workshop in Bangkok from 23 to 24 November. The third workshop was followed by a CTBT National Seminar on 25 November in Bangkok.


Saint Vincent and the Grenadines ratified the CTBT on 23 September 2009. The instrument of ratification was deposited with the United Nations Secretary-General by Sir Louis Straker (third from left), Deputy Prime Minister and Minister of Foreign Affairs, Commerce and Trade.

PROMOTING THE TREATY AND THE COMMISSION

Proactive Media Strategies

The PTS consolidated its public information strategy over the year, tailoring promotional activities and information products to specific events and audiences. Adopting a proactive approach in dealing with the media, the PTS engaged in interviews and background briefings with international journalists leading up to, during and following significant


Tibor Tóth (centre), Executive Secretary of the CTBTO Preparatory Commission, together with Thomas P. D'Agostino (centre left), Under Secretary for Nuclear Security of the United States Department of Energy and Administrator for Nuclear Security of the National Nuclear Security Administration, members of a delegation from the Department of Energy and staff members of the PTS in the Operations Centre during a visit to the Headquarters of the Commission in September 2009.

CTBT related events. Overall, the year saw a further increase in PTS interaction with the media, non-governmental organizations (NGOs), States, think tanks, public policy institutes and scientific and academic institutions. The public interest in Treaty related events and activities was unprecedented.

Information Products on the Second Announced Nuclear Test by the Democratic People's Republic of Korea

The nuclear explosion declared by the Democratic People's Republic of Korea in May 2009 was a test not only for the CTBT verification regime but also for the PTS in its interaction with the media and the public. The PTS devised a media strategy that allowed for the rapid and reliable dissemination of all relevant information. This included the immediate announcement to journalists of analysis results in a number of press briefings that were also broadcast via the public web site. A dedicated area of the web site presented updates in the form of press releases and feature articles as well as photographic and audiovisual background material. These efforts resulted in extensive international media coverage, with over five hundred printed articles on the event and on the Treaty being published.

Covering the International Scientific Studies Conference

The ISS Conference in June proved to be an excellent occasion to promote the Treaty and the effectiveness of its verification regime to a mostly scientific audience. The PTS public information strategy focused on the achievements in the build-up of the worldwide monitoring system and its proven ability to detect nuclear explosions anywhere on the planet.

Several new public information products were introduced at the conference. A new exhibition presented topical information on the history of nuclear testing and of the CTBT, the first declared nuclear test by the Democratic People's Republic of Korea in 2006, the IFE in 2008 and civil and scientific applications. Several electronic information products were launched at the conference, such as animations on the four monitoring technologies, a film on the IFE and a slide show on the history of the CTBT and its verification regime. Following the conference, the PTS produced a popular science publication with articles on the main discussion themes by leading experts in CTBT verification, and a DVD containing the scientific posters as well as other conference information.

Management

Effective and efficient management of the activities of the Provisional Technical Secretariat 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.

HIGHLIGHTS IN 2009

- Strengthening of oversight
- Zero real growth Programme and Budget
- Collection rates of annual assessed contributions for 2009 greater than in previous year

OVERSIGHT

Oversight is a key component of the strategic approach of the Commission to ensure the effectiveness of the organization and good governance. In 2009, the Commission undertook a self-assessment benchmarking of its oversight and risk management process against the recommendations of the United Nations Joint Inspection Unit and the United Nations Review of Governance and Oversight. Accordingly, an action plan to further strengthen oversight was established.

In July, the Internal Audit unit became fully staffed for the first time with three Professionals and one General Service staff member. Three internal audits were completed in the areas of call-off contracts, education grants, and processes and controls for the monitoring of unliquidated obligations. A risk based audit plan for the coming years was also prepared. Working with the technical Divisions, Internal Audit facilitated the initiation of an enterprise risk management (ERM) process which generated agreement on a common definition of risks, risk categorization, risk rating and criteria, and risk reporting requirements. This is an important step towards establishing a structured framework and consistent approach to risk management across the organization. The ERM initiative will be implemented in synchrony with other initiatives being taken by the PTS to improve management, such as a project management system.

Furthermore, synergy and collaboration between the evaluation and audit functions, effected through a joint review of processes and initiation of the development of a common repository of oversight recommendations, were strengthened.

The President of the Cour des comptes of France was appointed by the Commission as the External Auditor to the Preparatory Commission for the period 2009–2010. Support was provided by the PTS to the new External Auditor team in starting and conducting its work.

FINANCE

2009 Programme and Budget

The 2009 Programme and Budget was prepared within the constraint of 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 2009 amounted to US$52 614 400 and €48 543 600. At the budget exchange rate of 0.7960 euro to 1 US dollar, the total US dollar equivalent of the 2009 Budget was $113 592 600, representing a nominal growth of 2.0% but almost constant in real terms (a decrease of $120 200 or 0.001%).

On the basis of the actual average exchange rate in 2009 of 0.7202 euro to 1 US dollar, the final total US dollar equivalent of the 2009 Budget was $120 017 344 (Table 4). Of the total Budget, 79.03% originally was allocated to verification related activities, including an allocation of $17 992 275 to the Capital Investment Fund (CIF), established for the build-up of the IMS. This increased to $35 692 275 after a $2 700 000 transfer from the General Fund and the approval of supplementary appropriations of $15 000 000.

Table 4. Distribution of 2009 Budget

Area of Activity	U$$ (millions)[a]
International Monitoring System	38.8
International Data Centre	46.5
On-Site Inspection	7.5
Evaluation and Audit	2.0
Policy Making Organs	3.2
Administration, Coordination and Support	22.0
Total	**120.0**

[a] An average exchange rate of 0.7202 euro to 1 US dollar was used to convert the euro component of the 2009 Budget.

Assessed Contributions

As of 31 December 2009, the collection rates of the assessed contributions for 2009 amounted to 84.8% of the US dollar portion and 75.1% of the euro portion. In comparison, the 2008 collection rates as of 31 December 2008 were 77.7% and 77.6% respectively. The combined collection rate for the US dollar and euro portions in 2009 was 78.7%, compared with 78.0% in 2008.

The number of States that had paid their 2009 assessed contributions in full as of 31 December 2009 was 96, lower than 99 in 2008. Regarding 2008 assessed contributions, the collection rate as of 31 December 2009 amounted to 95.9%.

Expenditure

The expenditure against the 2009 Budget amounted to $117 604 928, of which $25 015 294 was from the CIF, $78 808 252 was from the General Fund and $13 781 382 was from the 2008 extended obligating authority. For the CIF, approximately 66.3% of the allotted funds were spent by the end of 2009.

PROCUREMENT

In 2009, the PTS obligated approximately $57.2 million through 521 contractual instruments and approximately $2.4 million for small value purchases. At the end of the year, there were 106 open requisitions for future obligation in the procurement pipeline with a total value of approximately $14.9 million: $9.4 million for the CIF, $0.1 million for extraordinary contributions, $4.0 million for the General Fund and $1.4 million for voluntary contributions.

The PTS brought five noble gas systems under contract for testing and evaluation and/or PCAs. In total, five additional IMS stations and the testing of five noble gas systems were placed under contract. As of 31 December 2009, 125 IMS stations, 9 radionuclide laboratories and the testing of 21 noble gas systems were under such contracts.

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,

Table 5. Regular Staff Members by Field of Work (31 December 2009)

Field of Work	Professional	General Service	Total
Evaluation Section	4	1	5
International Monitoring System Division	34	24	58
International Data Centre Division	69	17	86
On-Site Inspection Division	17	5	22
Total, verification related	*124 (73.37%)*	*47 (50.54%)*	*171 (65.27%)*
Office of the Executive Secretary	4	2	6
Internal Audit	3	1	4
Division of Administration	19	27	46
Legal and External Relations Division	19	16	35
Total, non-verification-related	*45 (26.63%)*	*46 (49.46%)*	*91 (34.73%)*
Total	**169**	**93**	**262**

Table 6. Professional Staff Members by Geographical Region (2004–2009)

Geographical Region	2004	2005	2006	2007	2008	2009
Africa	22	19	21	22	25	27
Eastern Europe	23	24	21	23	22	25
Latin America and the Caribbean	12	12	10	12	13	10
Middle East and South Asia	7	8	7	7	8	6
North America and Western Europe	70	82	73	70	74	71
South-East Asia, the Pacific and the Far East	24	30	29	24	27	30
Total	**158**	**175**	**161**	**158**	**159**	**169**

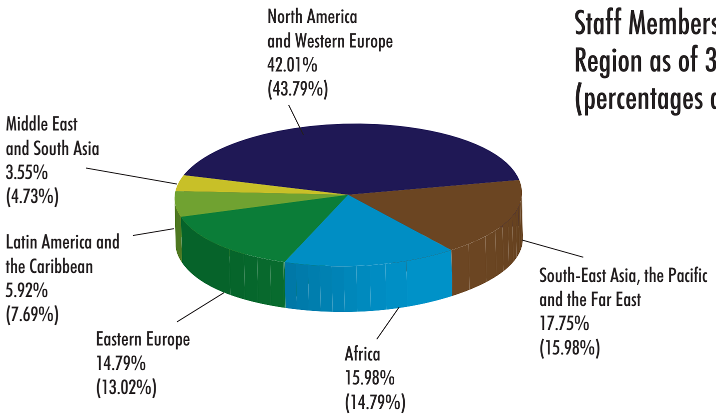
competence and integrity. Due regard was paid to the principle of equal employment opportunity, to the importance of recruiting staff on as wide a geographical basis as possible, and to other criteria stipulated in the relevant provisions of the Treaty as well as the Staff Regulations.

As of 31 December 2009, the PTS had 262 staff members from 74 countries, compared with 265 staff members from 75 countries at the end of 2008. The chart below 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.

The PTS continued its efforts to increase the representation of women in the Professional category. At the end of 2009, there were 52 women in Professional positions, corresponding to 30.77% of the Professional staff. In comparison with 2008, there was an increase of 20.00% in the number of female staff members at the P5 level. Also, there was an increase of 5.26% in the number of female staff members at the P3 level. On the other hand, there were decreases of 9.09% and 14.29% at the P4 and P2 levels respectively.

In 2009, the PTS appointed 40 new staff members. In addition, the PTS processed contracts for 108 consultants and 17 interns; 133 contracts were processed for short term staff.

The PTS continued to provide opportunities for staff to develop their 'soft' skills in courses tailored for the mutual benefit of the PTS in carrying out its work programmes and of staff members in their job performance and career development. During the year, several mandatory training seminars were conducted. Most Professional staff participated in stress management training, mediation training, information technology training and an executive leadership programme.



Staff Members in the Professional Category by Geographical Region as of 31 December 2009 (percentages as of 31 December 2008 are shown in brackets)

Facilitating the Treaty's Entry into Force

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 and 2009 and in Vienna in 2003 and 2007.

The Secretary-General of the United Nations convenes the conference at the request of States that have ratified the Treaty. Representatives of ratifying States are invited to participate in deliberations. Signatory States, non-signatory States, international organizations and NGOs are invited to attend as observers.

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

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 participated in the final stage of the negotiations of the Treaty in 1996 and possessed nuclear facilities at that time. So far, 35 of the 44 States have ratified the Treaty. Of the nine Annex 2 States that have still to ratify the Treaty, three have not yet signed it.

NEW YORK, 2009

Convened from 24 to 25 September 2009 at the United Nations Headquarters in New York, the sixth Conference on Facilitating the Entry into Force of the CTBT served as another indication of the strengthened political determination to achieve entry into force and universality. Representatives of 103 States, comprising 87 ratifying States, 13 signatory States and 3 non-signatory States, participated in the conference, which opened with an unprecedented number of high level dignitaries in attendance. Among the 13 signatory States were 6 whose ratification is required for the Treaty to enter into force: China, Egypt, Indonesia, the Islamic Republic of Iran, Israel and the United States of America. The three non-signatory States were Pakistan, Saudi Arabia and Trinidad and Tobago.

SHARED PRESIDENCY

The presidency of the conference was shared by the Foreign Ministers of France and Morocco, Bernard Kouchner and Taïb Fassi Fihri. This reflected the global nature of the Treaty. Calling on all States that have not yet signed or ratified to do so, Kouchner stressed that the Treaty "was never before so close to entry into force." He was supported in his appeal by Fassi Fihri, who emphasized that "a voluntary moratorium on nuclear testing cannot replace ratification of the CTBT."

EXPRESSIONS OF STRONG SUPPORT

The conference was characterized by numerous expressions of strong support for the Treaty and its entry into force. The conference was opened by the Secretary-General of the United Nations, Ban Ki-moon, who referred to the new political momentum in support of the CTBT. He said that this momentum must be maintained, and promised to devote all his time and energy to ensuring early entry into force, calling it "the right path to a world free of nuclear weapons." The Secretary-General described the CTBT as a fundamental building block of a world free of nuclear weapons and a major pillar of his five point proposal on nuclear non-proliferation and disarmament. Michael Douglas, United Nations Messenger of Peace, asserted that States must adjust their strategic policies in accordance with the new emphasis on nuclear disarmament, with the CTBT serving as a twenty-first century tool to progress towards this objective.

The US Secretary of State, Hillary Clinton, declared at the conference that the USA was pleased to return to the conference after nearly ten years. She added: "We will work in the months ahead both to seek the advice and consent of the United States Senate to ratify the Treaty, and to secure ratification by others so that the Treaty can enter into force." The Executive Secretary noted that, as evinced by the high profile attendance at the conference and the Security Council summit, the CTBT was once again at the top of the international arms control agenda. He also emphasized that it was time for leaders to lead on the "last mile of our long journey and to our final destination: the entry into force of our Treaty." Ambassador Jaap Ramaker of the Netherlands, announcing that he was stepping down from his role as Special Representative to promote the ratification process, also noted that political leaders must now throw their weight behind the Treaty. "The ball is fully in the court of the politicians," he added.

Adopted by consensus at the start of the conference, the strongly worded Final Declaration expressed the concern shared by States about nuclear testing and the delay in the entry into force of the Treaty. It called on 'holdout' States to sign and ratify the CTBT, particularly the nine Annex 2 States whose ratifications are necessary for entry into force. The Final Declaration also noted the international condemnation of the nuclear test carried out by the Democratic People's Republic of Korea in May 2009, and stated that the announced test "highlighted the urgent need for the early entry into force of the Treaty and hence the completion of the CTBT verification regime at its entry into force".

In a symbolic move, the United Nations Secretary-General, who is the Depositary of the CTBT, presented the news of the unanimously adopted Final Declaration to the assembled world media immediately before the summit meeting of the United Nations Security Council on nuclear non-proliferation and disarmament. He was accompanied by the co-presidents of the conference, Bernard Kouchner and Taïb Fassi Fihri, the United Nations Messenger of Peace, Michael Douglas, and the Executive Secretary of the CTBTO Preparatory Commission, Tibor Tóth.

UNITED NATIONS SECURITY COUNCIL: CALL FOR EARLY ENTRY INTO FORCE

On 24 September, the United Nations Security Council held a summit meeting in New York. The meeting, chaired by the US President, Barack Obama, addressed nuclear non-proliferation and disarmament. The CTBT was placed in the spotlight of the deliberations at the summit and in the unanimously adopted resolution. The resolution called on all States "to sign and ratify the Comprehensive Nuclear Test Ban Treaty (CTBT), thereby bringing the Treaty into force at an early date."

MESSAGE OF SUPPORT FROM NON-GOVERNMENTAL ORGANIZATIONS

The conference ended with a statement by Jessica Mathews, President of the Carnegie Endowment, on behalf of 40 NGOs from around the world. "Entry of the CTBT into force is vital and it is urgent," Mathews stated, adding that "nuclear proliferation is the biggest security threat of the twenty-first century and entry into force is an absolute prerequisite to the steps that have to be taken to plug the dangerous holes in the non-proliferation regime."

WORLDWIDE MEDIA COVERAGE

A multifaceted proactive media campaign resulted in unprecedented international media attention. Through direct targeting of journalists, a widely distributed media advisory in the six official languages of the United Nations, the use of social networking tools, and five well attended press conferences in Vienna, New York and Washington, D.C., awareness was raised worldwide about the conference, the Treaty and the CTBTO. This was reflected by exceptional news coverage in the print, broadcasting and Internet based media. Media coverage was widely spread internationally and included leading media outlets in China, Europe, India, Japan, the Middle East and the USA.

ARTICLE XIV
of the Treaty

ENTRY INTO FORCE

1. This Treaty shall enter into force 180 days after the date of deposit of the instruments of ratification by all States listed in Annex 2 to this Treaty, but in no case earlier than two years after its opening for signature.

2. If this Treaty has not entered into force three years after the date of the anniversary of its opening for signature, the Depositary shall convene a Conference of the States that have already deposited their instruments of ratification upon the request of a majority of those States. That Conference shall examine the extent to which the requirement set out in paragraph 1 has been met and shall consider and decide by consensus what measures consistent with international law may be undertaken to accelerate the ratification process in order to facilitate the early entry into force of this Treaty.

3. Unless otherwise decided by the Conference referred to in paragraph 2 or other such conferences, this process shall be repeated at subsequent anniversaries of the opening for signature of this Treaty, until its entry into force.

4. All States Signatories shall be invited to attend the Conference referred to in paragraph 2 and any subsequent conferences as referred to in paragraph 3, as observers.

5. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the 30th day following the date of deposit of their instruments of ratification or accession.

Facilitating the Treaty's Entry into Force

Ambassador Jaap Ramaker (Netherlands), Special Representative to promote ratification.

Ban Ki-moon, United Nations Secretary-General.

Carl Bildt, Minister for Foreign Affairs of Sweden.

Hillary Clinton, US Secretary of State.

The Honorable John Silk, Minister of Foreign Affairs of the Marshall Islands.

Kanat Saudabayev, Secretary of State and Minister of Foreign Affairs of Kazakhstan.

Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty

New York, 24–25 September 2009

Putting an end to nuclear test explosions

Jessica Mathews, President of the Carnegie Endowment for International Peace.

Maged Abdelaziz, Permanent Representative of Egypt to the United Nations.

Yu Myung-hwan, Minister of Foreign Affairs and Trade of the Republic of Korea.

Sergey A. Ryabkov, Deputy Minister of Foreign Affairs of the Russian Federation.

On the podium (from left to right): Michael Douglas (United Nations Messenger of Peace), Sergio Duarte (United Nations Under-Secretary-General and High Representative for Disarmament Affairs), Ban Ki-moon (United Nations Secretary-General), Bernard Kouchner (Minister of Foreign and European Affairs of France and co-president of the conference), Taïb Fassi Fihri (Minister of Foreign Affairs and Cooperation of Morocco and co-president of the conference) and Tibor Tóth (Executive Secretary of the CTBTO Preparatory Commission).

Juan Manuel Gómez-Robledo, Deputy Foreign Minister for Multilateral Affairs and Human Rights of Mexico.

Signature and Ratification

STATES WHOSE RATIFICATION IS REQUIRED FOR THE TREATY TO ENTER INTO FORCE (31 DECEMBER 2009)

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	
Iran (Islamic Republic of)	24 Sep. 1996	
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

41 Signed

35 Ratified

3 Not signed

9 Not ratified

Africa
(53 States)

51 Signatories
37 Ratifiers

Eastern Europe
(23 States)

23 Signatories
23 Ratifiers

STATUS OF SIGNATURE AND RATIFICATION OF THE TREATY (31 DECEMBER 2009)

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	
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	
Chad	8 Oct. 1996	

State	Date of Signature	Date of Ratification
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
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	
Greece	24 Sep. 1996	21 Apr. 1999

Latin America and the Caribbean (33 States)

31 Signatories
29 Ratifiers

Middle East and South Asia (26 States)

21 Signatories
15 Ratifiers

State	Date of Signature	Date of Ratification
Grenada	10 Oct. 1996	19 Aug. 1998
Guatemala	20 Sep. 1999	
Guinea	3 Oct. 1996	
Guinea-Bissau	11 Apr. 1997	
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	
Iran (Islamic Republic of)	24 Sep. 1996	
Iraq	19 Aug. 2008	
Ireland	24 Sep. 1996	15 Jul. 1999
Israel	25 Sep. 1996	
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
Libyan Arab Jamahiriya	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

State	Date of Signature	Date of Ratification
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
Nigeria	8 Sep. 2000	27 Sep. 2001
Niue		
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

North America and Western Europe (28 States)

28 Signatories
27 Ratifiers

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

28 Signatories
20 Ratifiers

State	Date of Signature	Date of Ratification
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
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

State	Date of Signature	Date of Ratification
Swaziland	24 Sep. 1996	
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	
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	

182 Signed   151 Ratified   13 Not signed   44 Not ratified