CTBTO PREPARATORY COMMISSION

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

Annual Report 2008

www.ctbto.org

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

Annual Report 2008

Published by the Provisional Technical Secretariat of the
Preparatory Commission for the
Comprehensive Nuclear-Test-Ban Treaty Organization
Vienna International Centre
P.O. Box 1200
1400 Vienna
Austria

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

The boundaries and presentation of material on maps contained in this document do not imply the expression of any opinion on the part of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention of names of specific companies or products (whether or not indicated as registered) does not imply any intention to infringe proprietary rights, nor should it be construed as an endorsement or recommendation on the part of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization.

Printed in Austria
June 2009

Based on document CTBT/PC-32/INF.2, Annual Report 2008

Message
from the Executive Secretary

In 2008, the CTBTO Preparatory Commission proceeded with an ambitious agenda.

There was the first ever on-site inspection exercise of its kind under the concept of Treaty inspection, which was conducted in Kazakhstan over a four week period. The entire Global Communications Infrastructure – a network of some 250 independent communication terminals located around the globe – was migrated to a new technological platform in the course of the year.

Activities undertaken to promote the Treaty resulted in a number of successful regional and international outreach activities, as well as the launching of a new state of the art online resource. Collaboration with other international organizations led to new arrangements for the provision of tsunami warning information to specialized alert centres as well as new avenues of cooperation with the World Meteorological Organization.

All of this was accomplished against the backdrop of the Commission's more routine duties and in the interest of fulfilling its mandate of preparing for entry into force of the Comprehensive Nuclear-Test-Ban Treaty.

It was a very successful year for the Commission at a time when a new determination amongst the international community added increased urgency to the need for a global ban on nuclear testing. That determination propelled us forward in the execution of our work and the Commission begins 2009 with a lot done, more to do, and the ability and momentum to see it through.

The report provides details on the work of the Commission and some of the highlights in 2008. More information can be found online at *www.ctbto.org*.

Thank you for reading this report.

Tibor Tth
Executive Secretary

CTBTO Preparatory Commission

Vienna, February 2009

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

A major focus for the Preparatory Commission in 2008 was promotion of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The most significant event in this regard was the Ministerial Meeting in support of the Treaty which was held in New York and attended by government ministers from across the globe. In all, 96 governments endorsed the joint statement that was issued from the meeting.

In the course of the year, two countries signed the Treaty, increasing the total number of signatures to 180. Seven more countries ratified the Treaty, bringing the total number of ratifications to 148. This number includes, significantly, 35 of the 44 ratifications required for entry into force of the Treaty.

Build-up of the CTBT verification regime also saw important progress. By the end of the year, 73% of the stations of the International Monitoring System (IMS) had been certified and were transmitting data on a provisional basis to the International Data Centre (IDC) in Vienna. Furthermore, 110 countries had set up secure communications with the IDC through their National Data Centres (NDCs) and almost 1100 users were regularly accessing the data.

A new Global Communications Infrastructure, known as GCI II, was successfully launched and began transmitting data between IMS sites and the IDC, as well as to NDCs. This involved transferring over 200 independent communications terminals in various locations around the world to a new technology platform. The new GCI is more robust than its predecessor and will ensure near complete communications availability across the system at all times.

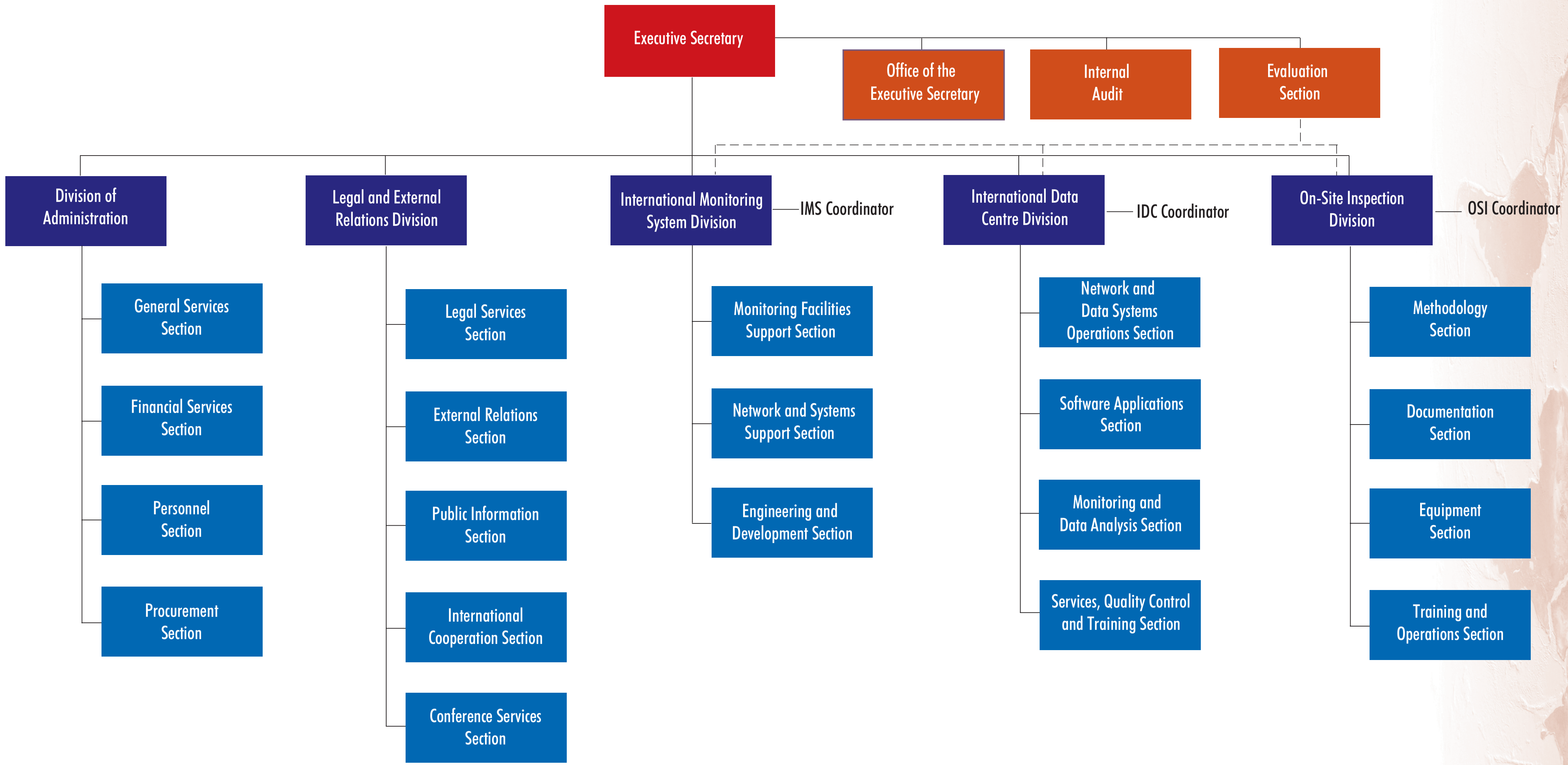
Possibly the most significant achievement for the Commission in 2008 was made in the area of on-site inspection preparations. The most elaborate exercise of its kind to date, testing all elements of an inspection under realistic conditions, was conducted at the former Soviet nuclear weapon test site of Semipalatinsk in Kazakhstan. Some 200 participants, including 47 inspectors, took part over a four week period. Equipment amounting to 50 tonnes was transported from Vienna for use in the field.

An International Scientific Studies (ISS) project was initiated to carry out an independent assessment of the readiness and capability of the verification regime. This project is a worldwide scientific undertaking, open to experts and institutions from around the globe.

Other highlights in 2008 included the conclusion of several formal arrangements and agreements for the provision of IMS data to tsunami early warning centres approved by the United Nations Educational, Scientific and Cultural Organization. A joint response system set up by the Commission with the World Meteorological Organization became operational, strengthening the atmospheric backtracking capabilities of the verification regime to locate the source of radioactive material collected in air samples. And a new web site dedicated to the Treaty was launched to serve as the primary online information resource on the history of the nuclear test ban effort.

It was a defining year for the Commission, in terms of both progress made in building up the verification system and improved prospects for entry into force of the Treaty.

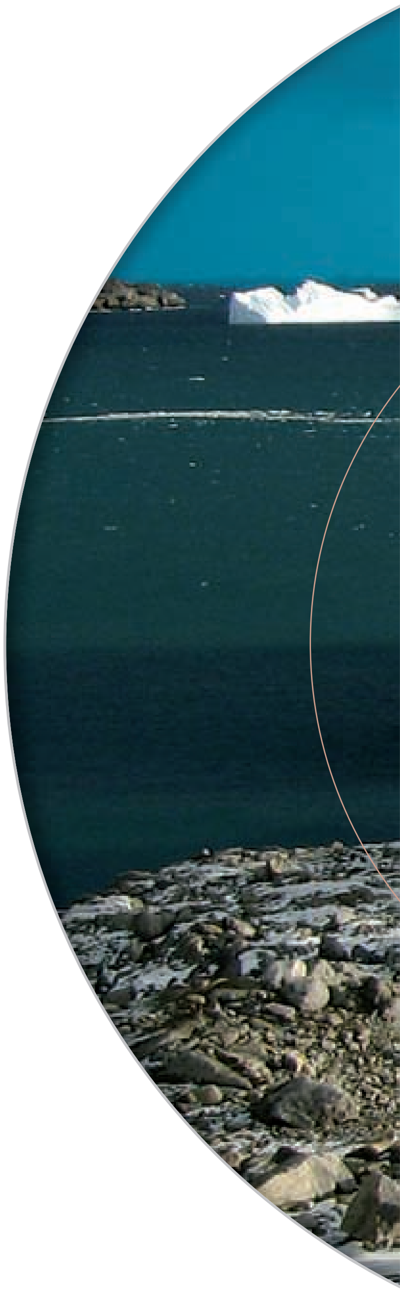
Organizational Structure of the Provisional Technical Secretariat
(31 December 2008)



Contents

Abbreviations

CIF	Capital Investment Fund
ECS	Experts Communication System
EU	European Union
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
IPU	Inter-Parliamentary Union
ISN	independent subnetwork
ISP	inspected State Party
ISS	International Scientific Studies
KPI	key performance indicator
MPLS	multiprotocol label switching
NDC	National Data Centre
NGO	non-governmental organization
NPE	NDC Preparedness Exercise
OPCW	Organisation for the Prohibition of Chemical Weapons
OSC	Operations Support Centre
OSI	on-site inspection
PCA	post-certification activity
PMO	Policy Making Organ
PTS	Provisional Technical Secretariat
QMS	Quality Management System
REB	Reviewed Event Bulletin
RRR	Reviewed Radionuclide Report
SEL	Standard Event List
SOH	state of health
UNEG	United Nations Evaluation Group
UNESCO	United Nations Educational, Scientific and Cultural Organization
VPN	virtual private network
VSAT	very small aperture terminal
WMO	World Meteorological Organization



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.

HIGHLIGHTS IN 2008

CERTIFICATION of 21 stations

INSTALLATION of 15 stations and four noble gas systems

ESTABLISHMENT of an engineering and development programme to enhance the technological capabilities of the IMS.

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

In 2008, 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). Fifteen stations and four noble gas systems were installed. Thus, by the end of 2008, 264 IMS stations were established, representing 82% of the entire network. Twenty noble gas systems were also established, corresponding to 50% of the total planned.

Table 1. Status of the Station Installation Programme (31 December 2008)

IMS Station Type	Installation Complete		Under Construction	Contract Under Negotiation	Not Started
	Certified	Not Certified			
Primary seismic	40	4	2	1	3
Auxiliary seismic	89	17	5	3	6
Hydroacoustic	10	1	0	0	0
Infrasound	41	0	5	3	11
Radionuclide	55	7	7	4	7
Total	**235**	**29**	**19**	**11**	**27**

Table 2. Status of Radionuclide Laboratory Certifications (31 December 2008)

Total Number of Laboratories	Certified Laboratories
16	10

Table 3. Status of Noble Gas System Installations (31 December 2008)

Total Number of Noble Gas Systems	Installed Noble Gas Systems
40	20

During the year, 21 stations were certified, bringing the total number of certified stations to 235 (73% of the entire network). At the end of 2008, there were 10 certified radionuclide laboratories (63% of the total).

AGREEMENTS FOR MONITORING FACILITIES

Facility agreements and arrangements are concluded between the Preparatory 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.

In December, a facility agreement with Kazakhstan entered into force. At the end of the year, legal arrangements (in the form of facility agreements or arrangements, or exchanges of letters) were in place to enable the establishment of 329 facilities in 86 countries, indicating the strong support for the establishment of the global verification regime. Thirty-seven facility agreements or arrangements have been concluded and 31 of these have entered into force. The Commission was in negotiation with 17 of the 52 countries where a facility agreement or arrangement has not yet been concluded and was seeking to initiate negotiations with the others.

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, especially as prospects for entry into force of the Treaty in the near term improve. When data availability requirements of the Treaty have to be enforced, appropriate support will be essential to ensure that the downtime of facilities is kept to a minimum.

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, as well as planning for recapitalization of a new life cycle.

Several major equipment maintenance, replacement and recapitalization projects were initiated or completed during the year, at a total investment of US$5.4 million. These included a nearshore cable inspection of hydroacoustic station HA1 (Australia), the first phase of the multiyear project to repair the cable of station HA3 (Chile), preparations for the recapitalization of primary seismic stations PS26 and PS27 (Norway), replacement of old air sampling systems at radionuclide stations RN4 and RN10 (Australia), RN23 (Cook Islands) and RN46 and RN47 (New Zealand), and reconstruction of the power supply, destroyed by fire, for the three stations, HA9, IS49 and RN68, located on the island of Tristan da Cunha (United Kingdom).

An engineering and development programme was established to develop cost effective solutions to problems arising at IMS stations and initiatives to enhance monitoring performance. Significant progress was made on a number of projects, including improved lightning protection and the introduction of new station computers with very low power consumption.

The construction of a test facility was initiated at the Conrad Observatory, Austria, for devising ways to improve the performance of the waveform monitoring technologies. To this end, an infrasound portable array has been built. It will be tested in 2009 to categorize signals detected at designated infrasound monitoring arrays and thereby provide a better understanding of the various sources contributing to the detection background at IMS stations.

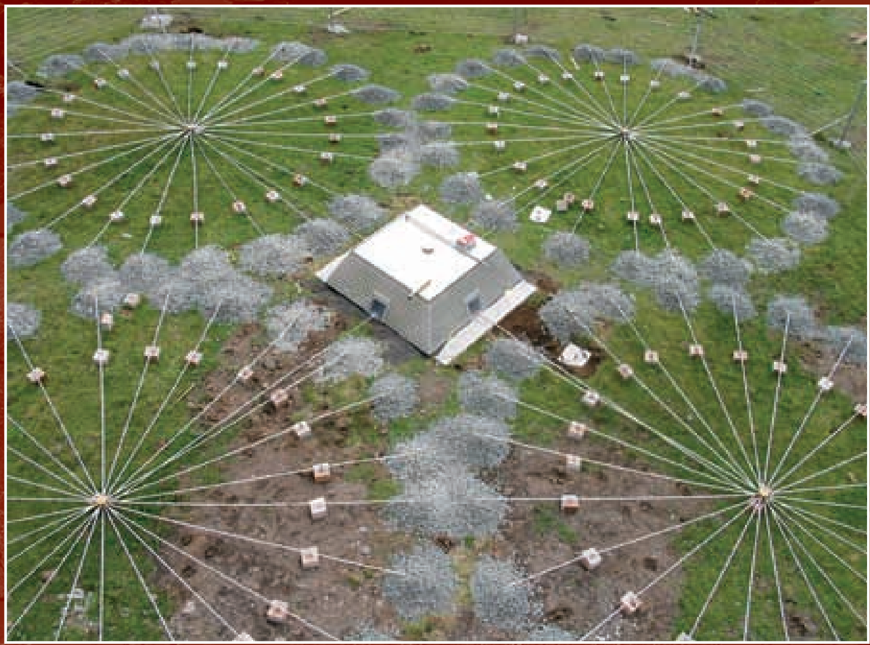
AFTER CERTIFICATION

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 Provisional Technical Secretariat (PTS) and station operators. The total PCA expenditure in 2008 of $15 670 000 was distributed among 138 facilities, including the 10 certified radionuclide laboratories. PCA contractual agreements for 11 new stations and 1 radionuclide laboratory were agreed and existing contracts for 18 stations were revised.

1

2



3

4

5

6

1. Array element of primary seismic station PS49 at Eielson, Alaska, United States of America.
2. Array element of infrasound station IS49, Tristan da Cunha (United Kingdom).
3. Auxiliary seismic station AS52 at Kunigami, Okinawa, Japan.
4. View of the Conrad Observatory, 1000 m above sea level in the Austrian Alps. The underground observatory is characterized by extremely low levels of background noise.
5. Positioning of the deployment vessel at the start of installation of two hydrophone triplets (identifiable by their bright orange subsurface floats) for hydroacoustic station HA3 in the Juan Fernández Islands (Chile).
6. Auxiliary seismic station AS37 at El Apazote, Guatemala, during the site preparation stage before certification in 2008.

7

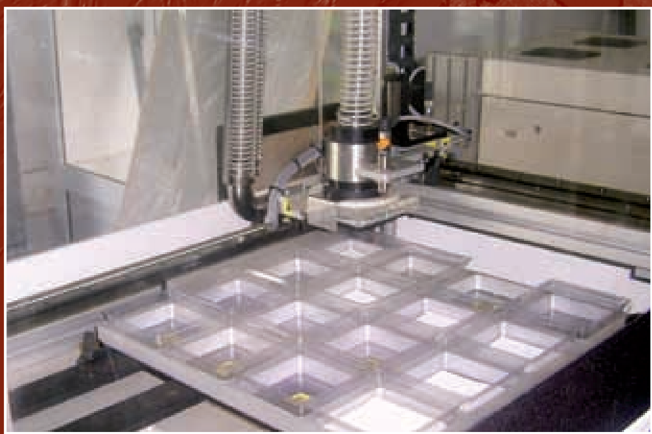
8

9

10

11

12



7. Central recording facility for primary seismic station PS37, infrasound station IS45 and radionuclide station RN58 at Ussuriysk, Russian Federation.
8. Radionuclide station RN54 at Kirov, Russian Federation.
9. Operator training in the central recording facility of infrasound station IS51, Bermuda (United Kingdom).
10. Installation vessel loaded with coiled trunk cable for carrying hydroacoustic data 100 km from the hydrophone triplet of station HA1 to the shore at Cape Leeuwin, Australia.
11. Auxiliary seismic station AS100 at Pallekele, Sri Lanka.
12. Robot arm for filter handling at radionuclide station RN53, Ponta Delgada, São Miguel, Azores (Portugal).

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

SEISMIC MONITORING

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.

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			
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. Certified facilities are indicated by background shading.

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			
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
	Kyrgyzstan			
AS60	Ala-Archa	42.6N	74.5E	3-C
	Madagascar			
AS61	Ambohidratompo	18.6S	47.2E	3-C

Auxiliary Seismic Stations

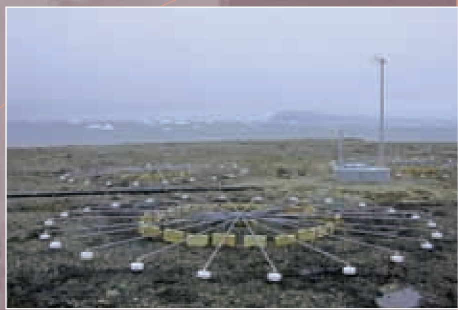
Station Number	State Responsible and Location	Latitude	Longitude	Type
	Mali			
AS62	Kowa	14.5N	4.0W	3-C
	Mexico			
AS63	Tepich, Quintana Roo	20.4N	88.5W	3-C
AS64	Colonia Cuauhtémoc, Matias Romero, Oaxaca	17.1N	94.9W	3-C
AS65	La Paz, Baja California Sur	24.1N	110.3W	3-C
	Morocco			
AS66	Midelt	32.8N	4.6W	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. Certified facilities are indicated by background shading.

INFRASOUND MONITORING

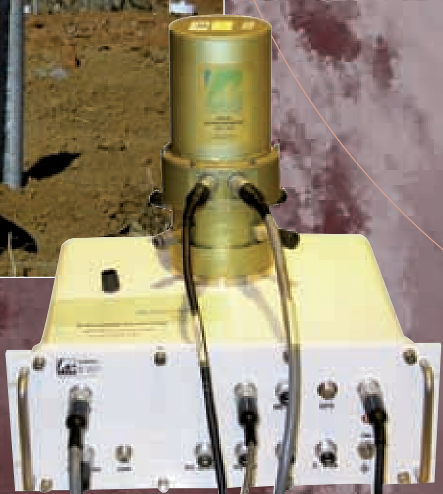
Acoustic waves with very low frequencies below the frequency band audible to the human ear are called infrasound. Infrasound is produced by a variety of natural and anthropogenic sources. Atmospheric and shallow underground nuclear explosions can generate infrasound waves that may be detected by the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



Infrasound Stations

Station Number	State Responsible and Location	Latitude	Longitude	Type
	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			
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	
	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	Karasjok	69.5N	25.5E	
	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	

Note. Certified facilities are indicated by background shading.

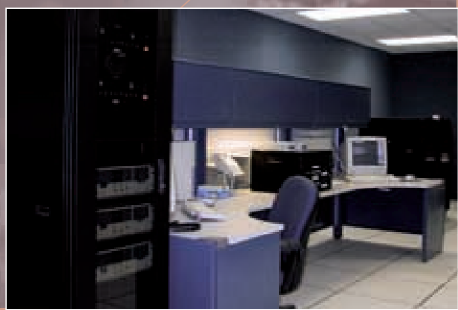
HYDROACOUSTIC MONITORING

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.

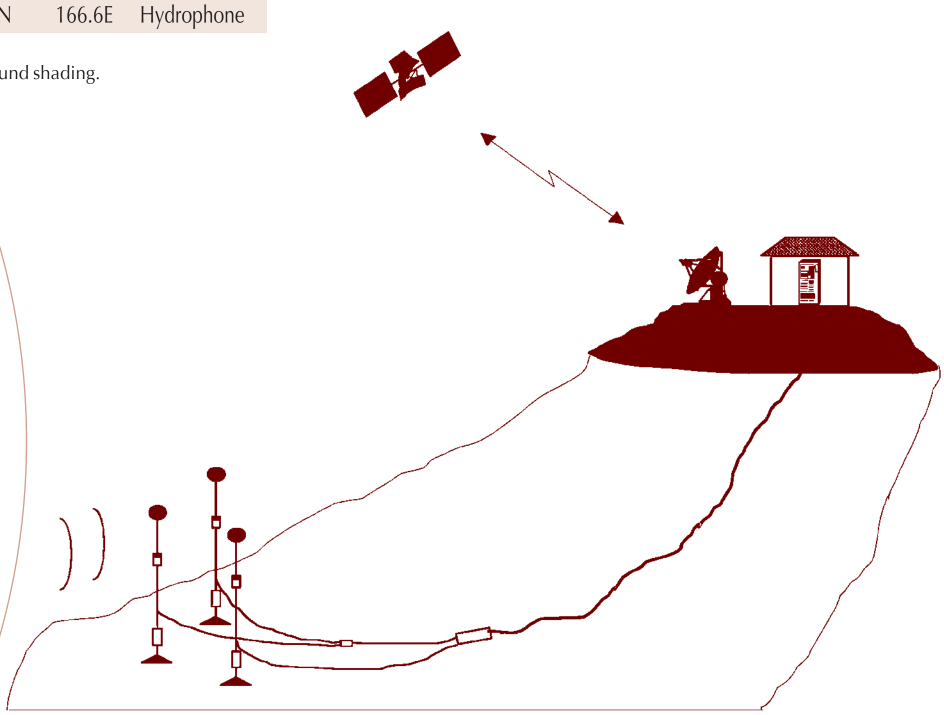
The deployment of the underwater parts of a hydrophone station, i.e. placing the hydrophones and laying the cables, is a highly complex affair. It involves the hiring of ships, extensive underwater work and the use of specially designed materials and equipment.



Hydroacoustic Stations

Station Number	State Responsible and Location	Latitude	Longitude	Type
	Australia			
HA1	Cape Leeuwin, WA	34.3S	115.2E	Hydrophone
	Canada			
HA2	Queen Charlotte Islands, B.C.	53.3N	132.5W	T phase
	Chile			
HA3	Juan Fernández Islands	33.6S	78.8W	Hydrophone
	France			
HA4	Crozet Islands	46.4S	51.9E	Hydrophone
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	Hydrophone
HA9	Tristan da Cunha	37.1S	12.3W	T phase
HA10	Ascension	8.0S	14.4W	Hydrophone
	United States of America			
HA11	Wake Island	19.3N	166.6E	Hydrophone

Note. Certified facilities are indicated by background shading.



Schematic of a typical hydrophone station showing a triplet of underwater microphone (hydrophone) sensors, fibre optic trunk cable, shore facility and satellite link to the International Data Centre.

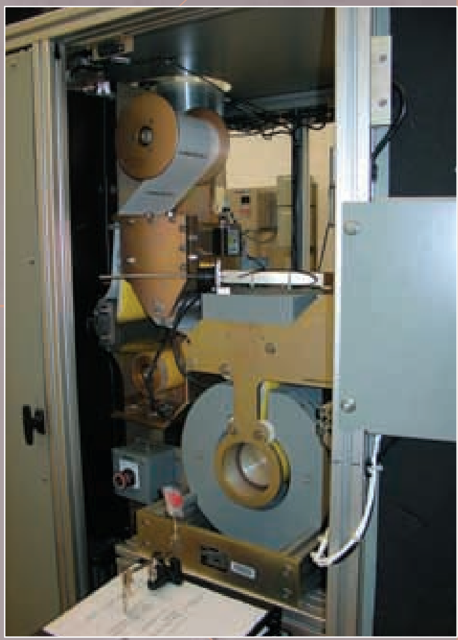
RADIONUCLIDE MONITORING

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.

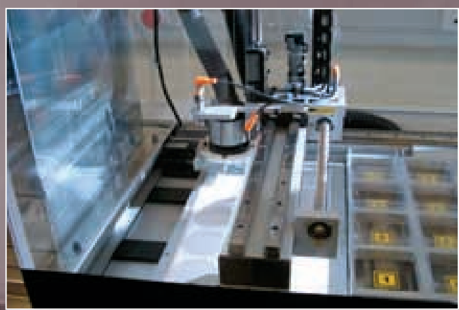
NOBLE GAS DETECTION SYSTEM



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 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
	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	
	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

Radionuclide Stations

Station Number	State Responsible and Location	Latitude	Longitude	Type
	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
	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

Station Number	State Responsible and Location	Latitude	Longitude	Type
	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	

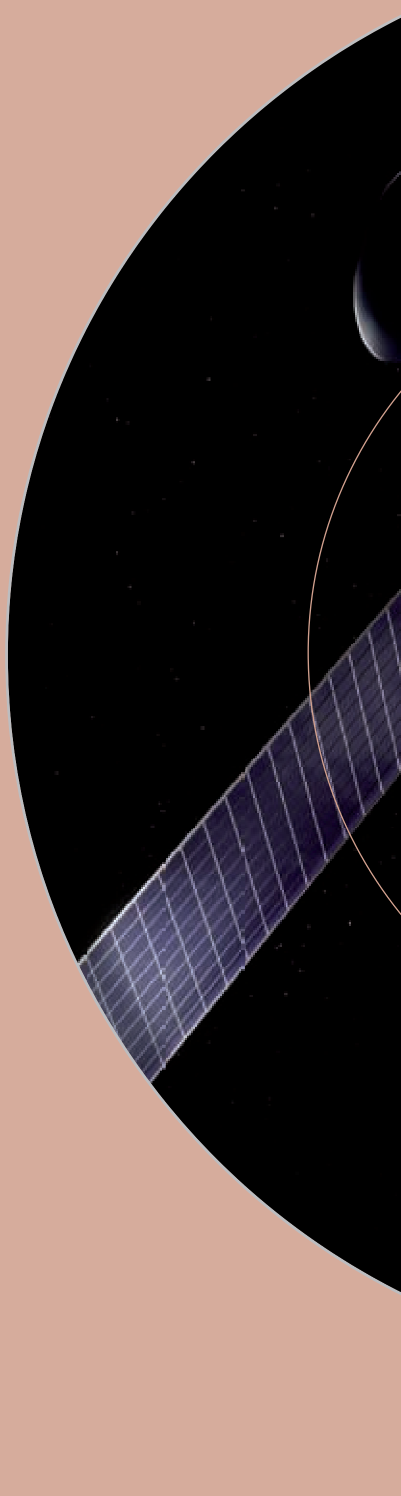
Note. Certified facilities are indicated by background shading.

Radionuclide Laboratories

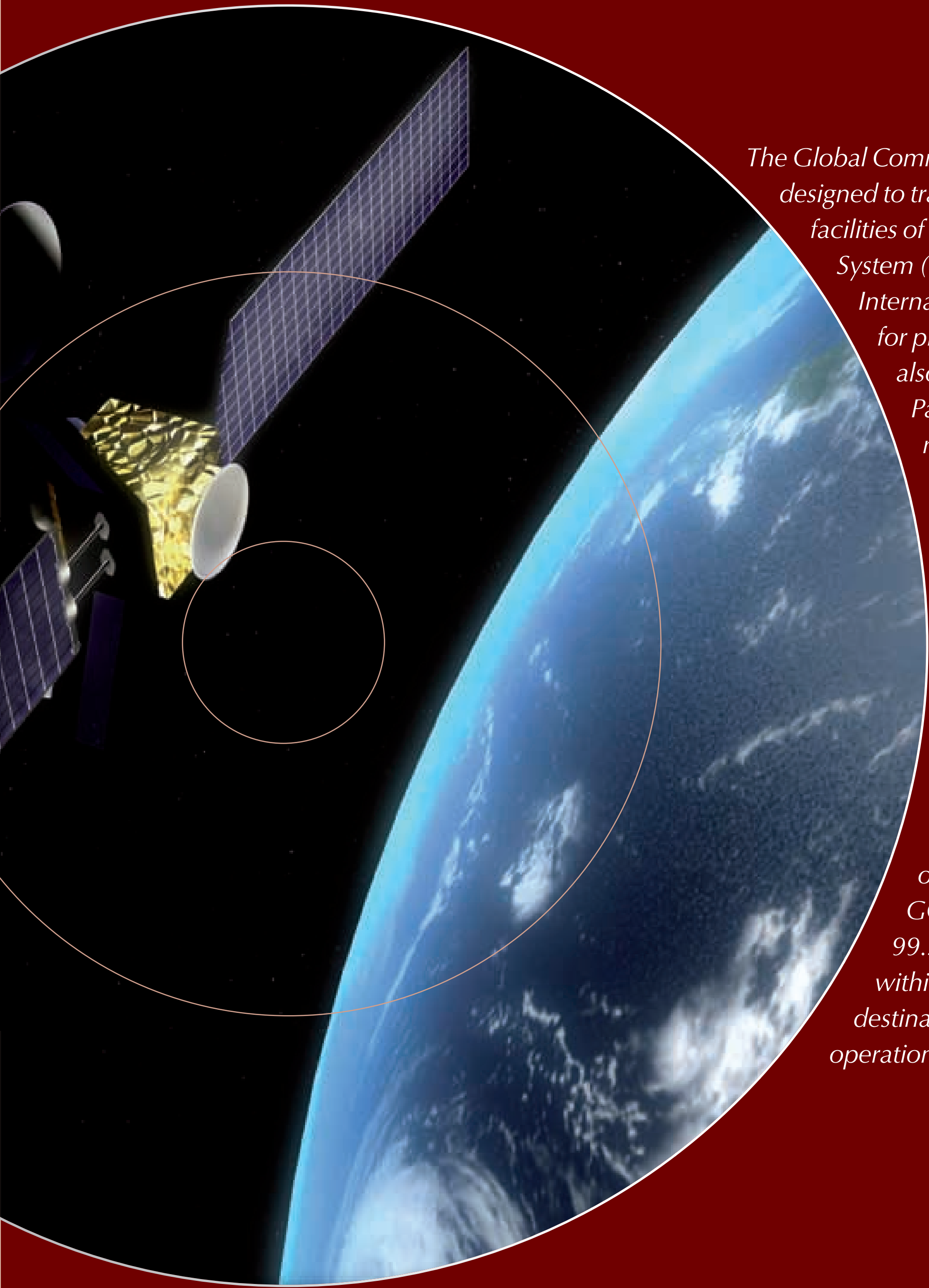
Lab Number	State Responsible	Name and Location
RL1	**Argentina**	National Board of Nuclear Regulation, Buenos Aires
RL2	**Australia**	Australian Radiation Protection and Nuclear Safety Agency, Melbourne, VIC
RL3	**Austria**	ARC Seibersdorf research GmbH (ARCS), Seibersdorf
RL4	**Brazil**	Institute of 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

Lab Number	State Responsible	Name and Location
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

Note. Certified facilities are indicated by background shading.



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 Parties 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 will enable the exchange of data by IMS facilities and States in all areas of the world with the CTBTO. The GCI is required to operate with 99.5% availability and to provide data within seconds from origin to final destination. It began provisional operations in mid-1999.

HIGHLIGHTS IN 2008

COMPLETION of migration to the new GCI technology platform and launching of GCI II

ADDITION of 12 very small aperture terminals (VSATs) and four 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

The GCI is the first global satellite communications network based on very small aperture terminals (VSATs). IMS facilities and States Signatories in all but near-polar areas of the world can exchange data via their local VSAT earth stations 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 use the basic public infrastructure of the Internet together with a variety of specialized protocols to support private communications. In situations where VSATs are still not in use or not operational, VPNs, though generally slower, provide an alternative means of communication.

EXPANDING GLOBAL COMMUNICATIONS

GCI coverage continued to expand throughout 2008, with 12 new VSATs installed as well as four new VPN links used as backups to VSAT links.

At the end of the year, the GCI included 214 VSATs in operation and 25 VPNs. Five multiprotocol label switching (MPLS) circuits replaced the frame relay link of the previous GCI technology. The number of planned VSATs has been reduced owing to the conversion of some sites to reliance on independent subnetworks (ISNs) or because some were provided with a VPN connection instead.

Satellite view of GCI VSAT, ISN and VPN sites worldwide.

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.

VSAT frequency conversion units for connection to the satellite.

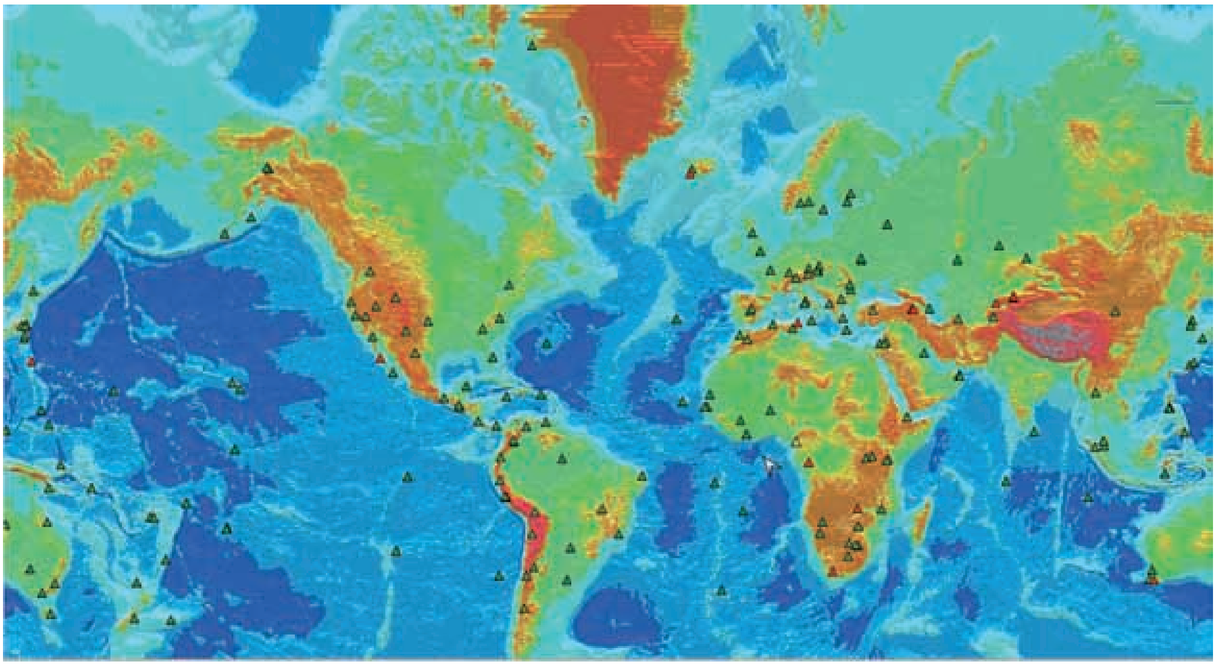
MIGRATION TO GCI II

The migration of the GCI to a new technology platform was completed by July 2008 without major disruptions to the data flow.

The PTS global VSAT network comprises more than 200 sites in nearly 100 countries. The migration was performed as part of a 10 year contract with UltiSat, Inc., which designed, implemented and commissioned a secure hybrid satellite–terrestrial network to accomplish the objectives.

With support from the PTS, the new contractor completed regulatory filings, obtained host country agreements and secured operating licences for all terminals in most countries in less than 12 months. Using leased capacity on six different satellites and an MPLS terrestrial network infrastructure, UltiSat operates and maintains this closed and secure global network in some of the world's most remote and harsh environments.

GCI II is capable of managing the performance of each link from each site, which was not possible with the previous technology. It also makes use of off the shelf rather than proprietary products for network management applications and has higher security standards than the original GCI.



Locations of GCI VSAT and ISN sites on a global relief map.

VSAT antenna at AS80, Tagaytay, Luzon, Philippines.

Currently, GCI II includes 214 VSAT stations, 25 stand-alone VPN links, four backup VPN links, four ISNs on terrestrial links, one terrestrial link for US stations located in Antarctica, four satellite hubs (one in Norway, two in the USA and one in Japan), 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.

VSAT antenna at PS40, Sonseca, Spain: a clear line of sight to a geosynchronous satellite is the first prerequisite for a VSAT to be able to function as part of the global communications network.

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 (IMS), including the results of analyses conducted at certified radionuclide laboratories. The data and products are then transmitted to States Parties for their final assessment. Data and products are received and distributed through the Global Communications Infrastructure (GCI).

The IDC is situated at the Headquarters of the 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.

HIGHLIGHTS IN 2008

RELEASE of a new 'NDC in a box' software package to National Data Centres

ENTRY of the CTBTO–WMO response system into provisional operations

CONCLUSION of tsunami warning agreements and arrangements with Australia, Indonesia, Japan, the Philippines and the USA.

SUPPORT AND BUILD-UP

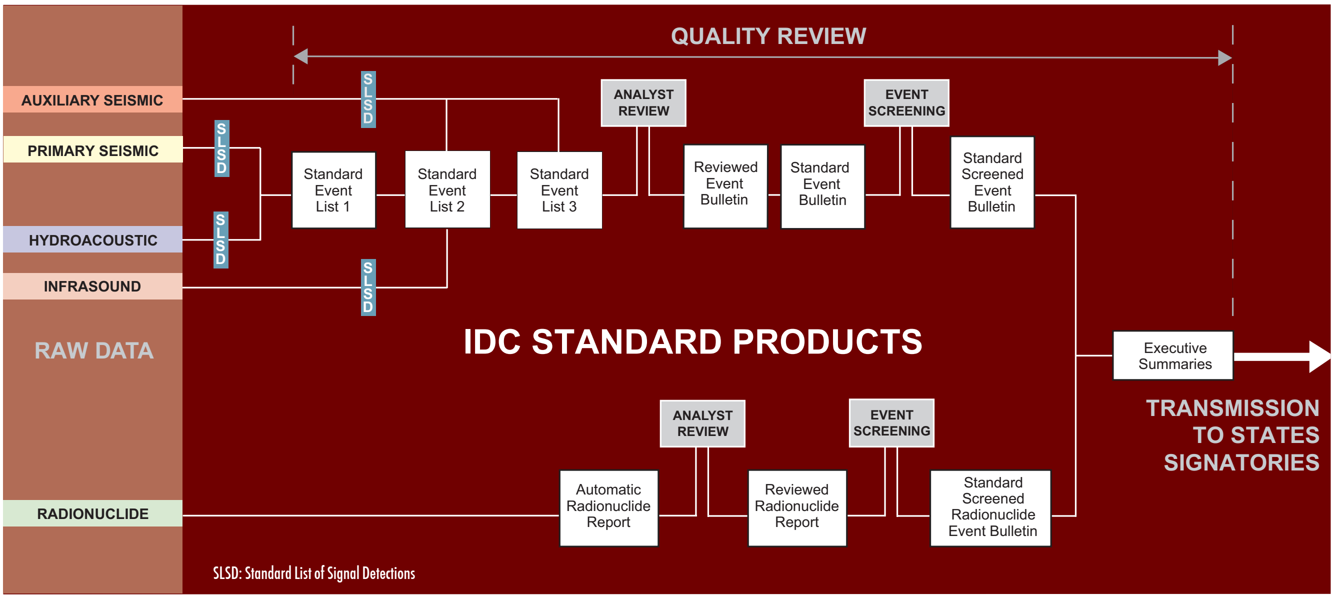
In 2008, support and build-up of the IMS continued with the testing and evaluation of data from new stations. Newly installed or upgraded stations were introduced into IDC operations. Other stations were installed in the IDC test bed.

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 two hours of the arrival of raw data. 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, six hours after the arrival of initial data. SEL2 is improved again after 12 hours have elapsed to incorporate any additional late-arriving data, to produce the final automated event list, SEL3.

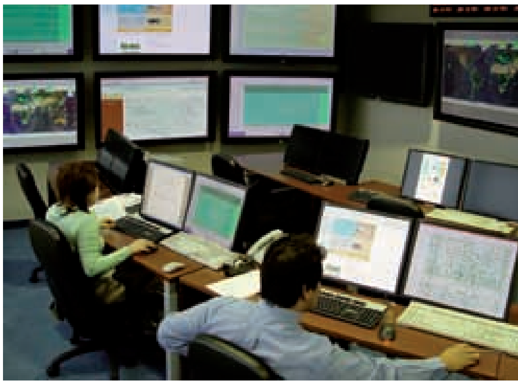
Analysts subsequently review events recorded in SEL3 to prepare the Reviewed Event Bulletin (REB). The REB for a given day contains all those events detected at IMS seismic, hydroacoustic and infrasound stations which meet specific criteria. During the current provisional operating mode of the IDC, the 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

The Operations Centre, as the focal point for operational activities, 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.

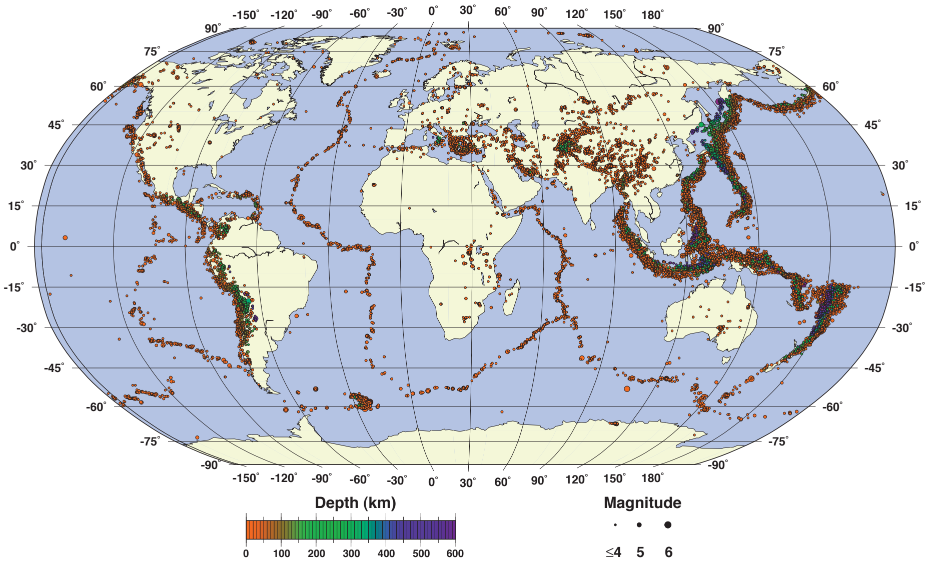


Control room of the Operations Centre.

Over 4000 incidents at facilities were registered and resolved in the centre in 2008. New key performance indicators (KPIs) based on statistics from the IMS Reporting System, GCI statistics and data availability values have been included in a performance reporting tool and have been made available to authorized users.

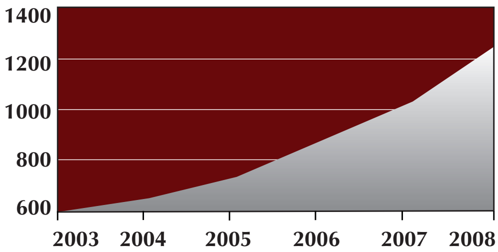
The tools employed in the Operations Centre in its day to day operations are being integrated into a system-wide incident tracking system based on open source technology, which provides a single interface for reporting and tracking

29 829 Events from the IDC 2008 Reviewed Event Bulletin



all types of incident. Another important tool is the state of health (SOH) system. A prototype SOH tool, which provides the Operations Centre staff with a consolidated view of the relevant incident troubleshooting metrics, has been developed and installed in a testing environment with real data.

NATIONAL DATA CENTRES



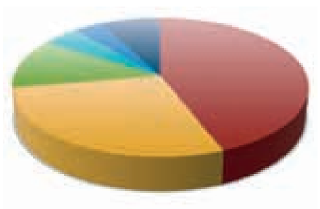
Average annual number of customer requests received by the IDC services help desk.

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.

The ‘NDC in a box’ is a software package developed by the IDC for use at NDCs, giving them the capability to receive, process and analyse IMS data. A new version of the software was released in July 2008. Along with the traditional tools for receiving, testing and analysing continuous data from the PTS, the new package includes a tool for downloading source–receptor sensitivity data from the PTS and a tool for modelling atmospheric transport that analyses the relationship between a detection in the radionuclide network and possible emission points on the surface of the globe. By the end of 2008, the new IDC in a box had been distributed to more than 50 States Signatories through the IDC secure web site.

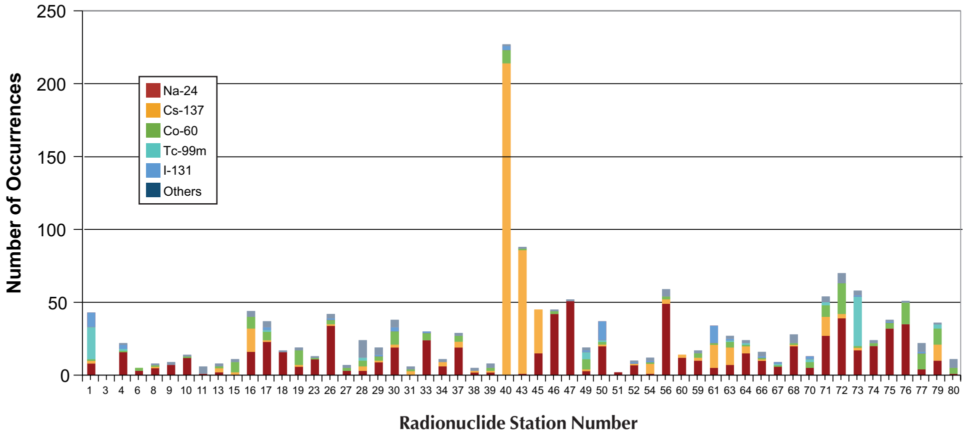
A total of 110 secure signatory accounts (one for each requesting State Signatory) had been established by the end of the year and 1098 users from these States Signatories had been authorized to access IMS data and IDC products and receive technical support. These are increases of 13 secure accounts (13%)

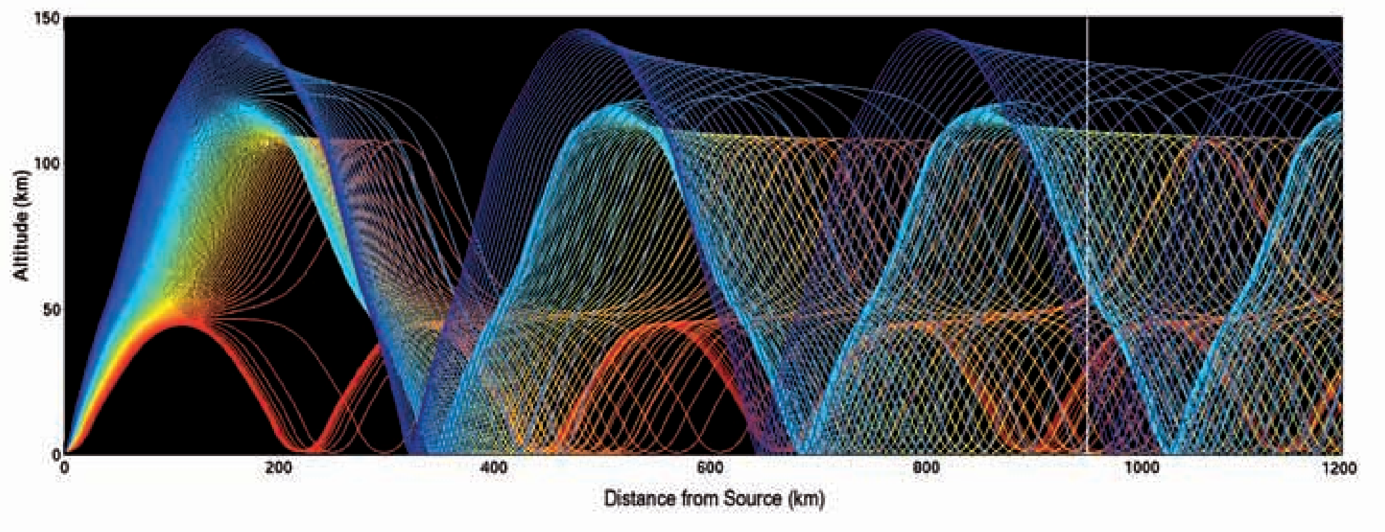
Overall Distribution of Treaty-Relevant Radionuclide Occurrences in 2008



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

Occurrence of Anthropogenic Nuclides by Station in 2008





Example of a ray tracing simulation of infrasound propagation in the atmosphere (stratospheric and thermospheric returns) using new software acquired by the PTS. The simulation was made for an explosion that occurred at a munitions depot near Gerdec, Albania, on 15 March 2008. The event was detected by several infrasound monitoring stations, including IS26 at Freyung, Germany (shown by the white vertical line), 950 km away.

and 239 users (22%) over 2007. More than 1200 requests from authorized users regarding technical information were received and resolved, continuing the steady increase in requests, which have more than doubled since 2003.

SIMULATING SOUND PROPAGATION IN THE ATMOSPHERE

In 2008, the PTS acquired software for simulating sound wave propagation in the atmosphere. This software takes into account the heterogeneity of the atmosphere to predict the different types of infrasound phase passing between a source and a receiver, and calculates the travel times and other parameters for these arrivals.

In parallel, the PTS received the most recent version of an empirical global atmospheric model called HWM2007. This model replaces the 1993 version and more accurately describes the atmosphere on the basis of millions of integrated satellite data and surface meteorological data. Work has begun to combine HWM2007 with real time models available from the European Centre for Medium-Range Weather Forecasts, in order to construct a highly realistic atmospheric model of the earth from the surface up to an altitude of 180 km.

The new models should help to better understand signal waveforms detected at IMS infrasound stations and refine the location of events built with infrasound data. Testing and validation will be needed before any real time dynamic atmospheric models can be used in IDC operations.

INTERNATIONAL NOBLE GAS EXPERIMENT

Radionuclide station RN40, located on the premises of the Kuwait Institute for Scientific Research in Kuwait City, on the southern shore of Kuwait Bay, where the second noble gas measurement campaign took place in September–November 2008.

SAUNA-II equipment provided by the Pacific Northwest National Laboratory, Richland, Washington, USA, at the North-West University in Mafikeng, South Africa, during its deployment in the third noble gas measurement campaign in November–December 2008.

The PTS has developed a plan for a smooth and steady transfer of the 20 noble gas systems in the IMS into IDC operations during 2009. The plan includes the definition of the acceptance criteria and SOH parameters of the systems to be monitored as well as outlining the necessary training for relevant staff.

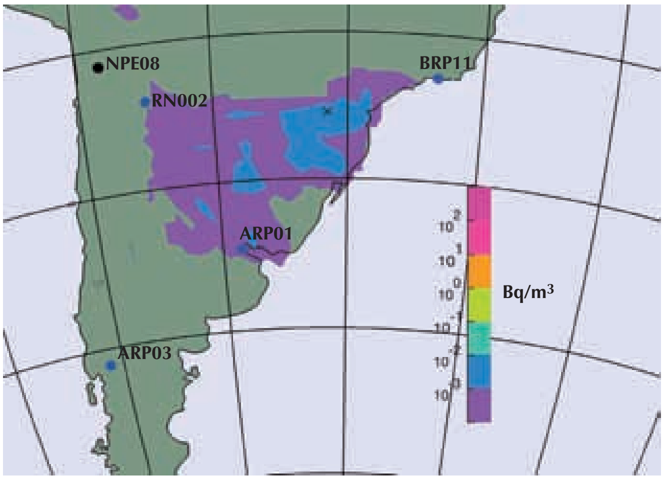
Distinguishing the civil anthropogenic background level of airborne radionuclides from radiation emissions due to Treaty-relevant events is a challenging task that involves nuclear physicists, statisticians and meteorologists. The PTS is currently putting emphasis on obtaining a comprehensive understanding of possible sources, atmospheric transport and variability of the noble gas radioxenon over time. This is possible through cooperation with scientists from more than twenty institutions worldwide in the International Noble Gas Experiment (INGE).

In June 2007, the European Union (EU) approved a joint action to support PTS research activities to explore the anthropogenic xenon background and to fund a PTS field campaign for studying and measuring the xenon background in several parts of the world. The results gained during the last nine years from INGE have clearly shown that the radioxenon background is much more complex than was first thought. Indeed, initially unforeseen anthropogenic sources have been identified, such as radioisotope production facilities for medical applications. Measurements with a transportable detector unit are being carried out at various locations worldwide where radioxenon background data are currently absent.

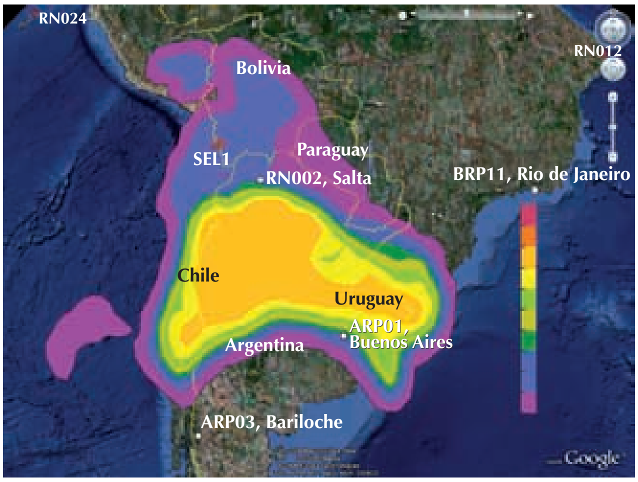
The EU joint action project successfully collected data at three different sites in 2008 and will continue at another four sites in 2009. Valuable information has been acquired on radiopharmaceutical production, which has recently been identified to be the principal civil source of radioactive xenon isotopes. The data are complemented with measurements directly in the stacks of the radiopharmaceutical facilities. In this way, the PTS can obtain a unique insight into source characteristics and therefore a much better understanding of the extent to which these facilities can influence the sensitivity of the CTBT verification system.

Mobile radioxenon measurements were performed during the first noble gas measurement campaign in June–July 2008 with a SAUNA sampler near the old Cistercian abbey of Villers-la-Ville in southern Belgium, close to the radiopharmaceutical facility in Fleurus.

The charcoal column of the mobile SAUNA system installed in a truck. Concentrated radioxenon was collected in the column during the field measurement campaign in Belgium, which was jointly sponsored by the Swedish Defence Research Agency.



PTS atmospheric modelling for NPE08 and the 2008 CTBTO–WMO exercise: evolution of the simulated surface level activity concentration of nuclear debris during the period from the SEL1 event (27 October) until the collection stop (4 November) for the first radionuclide sample at an operational IMS station (ARP01) that was predicted to cause detection (i.e. to rise above the minimum detectable concentration).



Backtracking of simulated radionuclide concentrations that would have been detected with a complete network of 80 radionuclide monitoring stations. The calculated possible source region (shown in colour) covers the location of the initiating SEL1 event.

TRACKING RADIONUCLIDES THROUGH THE ATMOSPHERE

Since 1 September 2008, the CTBTO–WMO response system has been in provisional operation. This system strengthens the atmospheric backtracking capabilities of the verification regime by enabling 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 – in Beijing, China; Exeter, United Kingdom; Melbourne, Australia; Montreal, Canada; Obninsk, Russian Federation; Offenbach, Germany; Tokyo, Japan; Toulouse, France; and Vienna, Austria – respond to these requests by submitting their computations to the Commission as fast as is technically feasible, with a deadline of 24 hours.

This system is intended to corroborate the backtracking calculations of the Commission, and both organizations will benefit in terms of 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 every quarter and an announced full scale exercise would be conducted annually.

In the first full scale exercise, the Commission used the radionuclide scenario that it had generated in support of the October 2008 NDC Preparedness Exercise (NPE08). The scenario was based on a seismic event of 27 October recorded in SEL1, which was chosen by the NDCs but not disclosed to the data fusion staff of the IDC or to the WMO centres. The PTS then applied atmospheric transport modelling to predict which IMS stations would, in theory, detect potentially relevant radionuclides in their air samples if the event had been a nuclear test.

Signing of a tsunami warning arrangement between the CTBTO Preparatory Commission and Japan on 11 August 2008 in Vienna. From left to right: Mr Takeshi Koizumi, First Secretary of the Permanent Mission of Japan, Ambassador Yukiya Amano, Permanent Representative of Japan to the International Organizations in Vienna, and Mr Tibor Tóth, Executive Secretary of the CTBTO Preparatory Commission.

For the first six days of predicted detections, hypothetical sampling times and the locations of the relevant stations were used to trigger request messages to the WMO centres. Immediate venting of nuclear debris from a nuclear test equivalent in yield to a chemical explosion of 1 kilotonne of TNT and having a radiation source strength of 10^{15} becquerels (where 1 becquerel is 1 radioactive disintegration per second) was assumed as the basis for modelling.

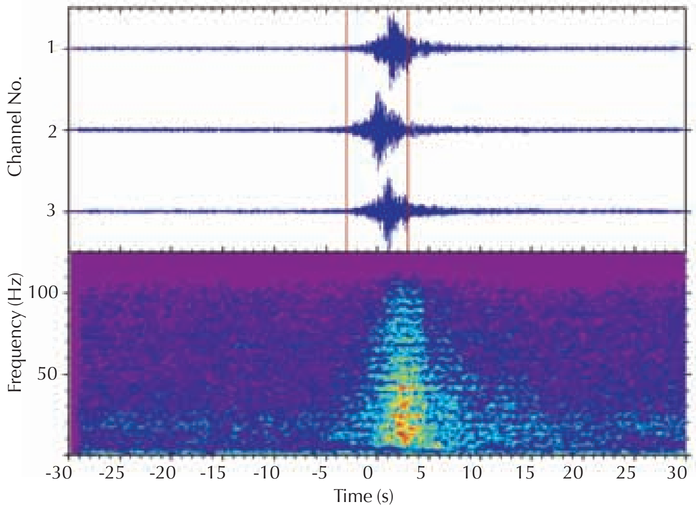
The results from all WMO centres and the PTS for each of the six days were analysed and a daily Data Fusion Bulletin combining waveform and radionuclide data was produced with the aid of WEB-GRAPE, an analysis tool used in atmospheric transport modelling. The interactive analysis process revealed that the possible source region was sufficiently well confined for the SEL1 event to be identified as the only plausible source. This meant that the issuance of further request messages to WMO centres could be suspended and the data fusion mission had been a success.

TSUNAMI EARLY WARNING SYSTEMS

Following the tragedy caused by the tsunami in the Indian Ocean in December 2004, the Commission tasked the PTS to test the provision of data for the purpose of tsunami warning.

A number of tsunami warning institutions began receiving IMS data in near real time on a test basis. During this test phase, which lasted over a year, tsunami warning centres confirmed the usefulness of IMS data. In comparison with data from other existing monitoring networks, IMS data were found to arrive at these tsunami warning centres with less delay and higher reliability. This provides potentially vital additional warning time in which to activate alerts in the event of a possible tsunami threat. Consequently, in November 2006, the Commission endorsed a recommendation to provide continuous data in real time to relevant tsunami warning organizations.

Detection of Signals from Explosions in Water at Distances up to 16 000 km



The plots show recordings by the north hydrophone triplets of hydroacoustic station HA3 in the Juan Fernández Islands (Chile) for one of a series of signals recorded in September 2008. The colour-shaded image shows the spectrogram of the signal recorded on hydrophone number 1. The large amount of high frequency energy associated with the signal suggested that the source might have been an underwater explosion. This hypothesis was further supported by the presence of horizontal bands of alternating high and low energy in the spectrogram. These bands are due to interference between the signal transmitted at the time of the explosion and subsequent signals arising from oscillations of the gas bubble produced by the explosion.

Signals recorded at both hydrophone triplets of station HA11 on Wake Island (USA) in the middle of the Pacific Ocean showed a very similar band structure, indicating that they were associated with the same explosive event. Arrival time and azimuth information from the three recording triplets allowed the source of the signals to be located off the east coast of Japan, a distance of some 16 000 km from the Juan Fernández hydrophones.

The signals have been identified as originating from a marine seismic survey. In total, more than thirty explosions from the survey were detected and located by the IDC and reported in the Reviewed Event Bulletin.

In 2008, agreements or arrangements were made between the PTS and tsunami warning centres in Australia, Indonesia, Japan, the Philippines and the USA (Alaska). Additional agreements or arrangements were being developed with Malaysia, Myanmar, Sri Lanka and Thailand. About 2.1 gigabytes of data were being sent in near real time each day to the warning centres.

While the purpose of the global verification regime is to verify compliance with the CTBT, the use of IMS data to mitigate the catastrophic consequences of tsunamis is an example of the wide range of potential civil and scientific applications for which these data could be used.

INTERNATIONAL SCIENTIFIC STUDIES

As an organization responsible for establishing and operating a verification system that relies on the latest advances in science and technology, it is of strategic importance for the Commission to stay attuned to defining events in the scientific community, to benefit from new developments and to attract competent scientists to work for it. In this way, it can also ascertain whether its activities and products meet international standards. 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. It is a follow-up to the "Synergies with Science" symposium held in August–September 2006.

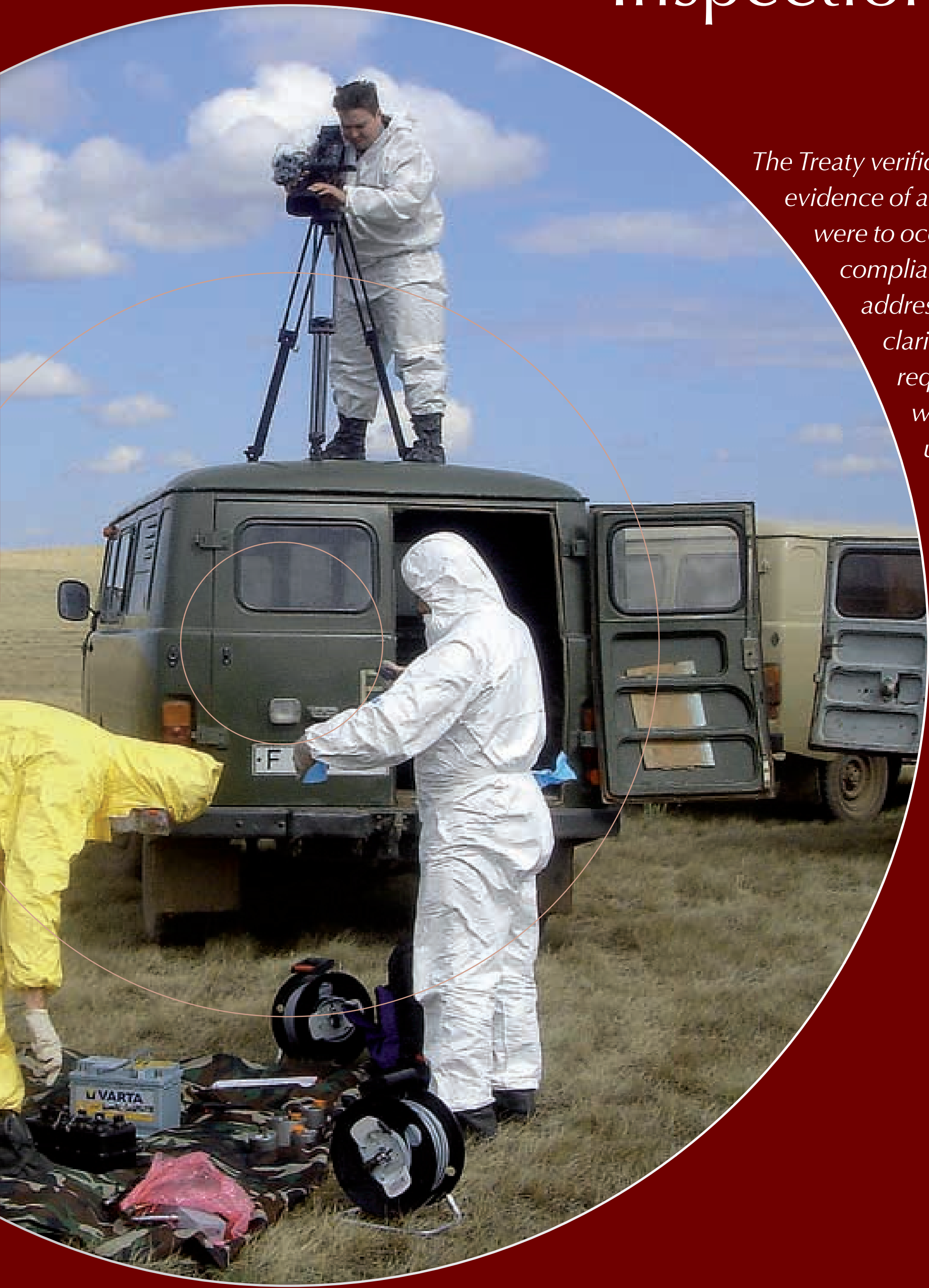
The decentralized work method of the ISS project involves many different scientific groups. The project has engaged some twenty senior scientists who coordinate contacts and activities with the scientific community in eight fields of key importance to the Commission: system performance, seismology, hydroacoustics, infrasound, radionuclide monitoring, atmospheric transport modelling, on-site inspection and data mining.

The project includes active participation in scientific conferences and joint studies with scientific institutions on how to apply modern analytical methods to improve the efficiency of data analysis by the PTS and the quality of its data products. A specific ISS activity begun in 2008 was to evaluate the capability and readiness of the IMS and OSI elements of the CTBT verification regime. The results of this evaluation will be presented at a conference in Vienna on 10–12 June 2009.

A workshop on data mining was held at the Headquarters of the Commission on 15–16 September. It addressed how methods and procedures developed within this new area of science can be used to improve the analysis of verification data. The workshop was attended by some forty experts and proved important in boosting dialogue and cooperation between the data mining community and those engaged in developing tools for analysis of verification data. As a direct result of the workshop, an expert meeting was held at the Lawrence Livermore National Laboratory near San Francisco, California, on 18 December to discuss how data mining methods might create a new paradigm for the analysis of seismic data. To develop the issue further, it was planned to convene the next expert meeting in Vienna on 23–27 March 2009.

The Center for Strategic and International Studies and the American Association for the Advancement of Science invited members of the ISS project to brief scientists at a meeting in Washington, D.C., on 12 December. The meeting was well attended, not only by scientists but also by representatives of the US administration.

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.

PREPARING FOR ON-SITE INSPECTIONS

HIGHLIGHTS IN 2008

SUCCESSFUL completion of the first Integrated Field Exercise (IFE)

IFE debriefing workshop in Baden, Austria

ACQUISITION of state of the art equipment for visual observation.

INTEGRATED FIELD EXERCISE

Following three years of planning and preparation, an Integrated Field Exercise (IFE), the first of its kind according to the Treaty concept of inspection, was successfully conducted from 25 August to 25 September 2008. The IFE began with activities at the Headquarters of the Commission in Vienna and these were followed by in-field inspections in Kazakhstan, which had agreed to assume the role of inspected State Party (ISP). Eleven task force groups comprising over 50 experts were involved in the planning and preparation, and almost 200 individuals took part in the IFE itself, including support staff from the host country. The entire exercise was conducted according to the time line stipulated in the Treaty and its Protocol.

Final preparations included the collection of inspection equipment from PTS custody in Vienna as well as equipment that had been provided as contributions in kind by States Signatories. All equipment was stored near Vienna International Airport. This equipment (amounting to 50 tonnes) was transported by chartered aircraft to Almaty, Kazakhstan, on 18 August.

INSPECTION TEAM

The inspection team assembled in Vienna on 25 August to receive a briefing, make health and safety preparations and draw up the initial inspection plan. With most inspection equipment and logistical supplies already dispatched, the first 40 members of the inspection team set out on 30 August for the point of entry in Almaty.

The individuals selected to act as surrogate inspectors in this exercise had been nominated by their States Signatories and had successfully completed the OSI training cycle. They also had to pass the same rigorous medical examination, which included a psychological assessment. The selected nominees all possessed expertise in the main technical fields of relevance to OSI, such as magnet-

ic field mapping, resistivity measurement, ground penetrating radar, seismology, radionuclide measurement or logistics, or in leadership or diplomacy.

OPERATIONS SUPPORT CENTRE

At Headquarters, the Operations Support Centre (OSC) was activated on 26 August, marking the formal beginning of the exercise activities. The first OSC activities included preparation of the inspection mandate and establishment of contacts with the ISP authorities. The OSC provided support throughout the exercise period to the inspection team and the control team in the field, as well as coordinating communications between the Commission and the base of operations. Standard operating procedures were used during operation of the OSC and requests from the field were followed up in a timely manner.

ACTIVITIES IN THE FIELD

Activities at the point of entry were conducted on 1 September in Almaty. The inspection team handed over the inspection mandate to representatives of the ISP and discussed the initial inspection plan, after which the two parties entered into intensive negotiations. These were conducted to ensure timely arrival of the inspection team at the base of operations, access to the inspection area, and ISP technical support for overland transportation, in-field activities, setting up of the base of operations and advance arrival of some team members to make health and safety and logistical preparations, as well as necessary arrangements for communications and consultations between the team and the ISP. Stringent access limits were imposed by the ISP for overflights, ground access to certain restricted zones and such inspection activities as sampling. Negotiations with the ISP on preliminary agreement for start-up inspection activities continued on the train journey to the inspection area. The ISP was otherwise cooperative with respect to the transfer of the inspection team and its equipment to the base of operations.

All participants travelled by train and land vehicles to the inspection area in the former Soviet nuclear test site of Semipalatinsk on 2 September. This involved a 22 hour train journey, followed by a 7 hour drive over rough roads and terrain. The equipment, which was cleared through customs at the point of entry, was transported to the inspection area with the inspection team.

The inspection team reached the base of operations at Murzik on 3 September and immediately set about establishing the base facilities. This included setting up communication links via satellite with the OSC in Vienna, preparing inspection equipment for checking, holding a health and safety briefing with the ISP to gain access to the Semipalalink Test Site and finalizing the start-up inspection strategy.

IT gathers in Vienna

Receipt of OSI request

Inspection team (IT) preparations

Briefing

Travel from Vienna to point of entry (POE)

Briefing

POE procedures

Travel to base of operations

Initial period of inspection

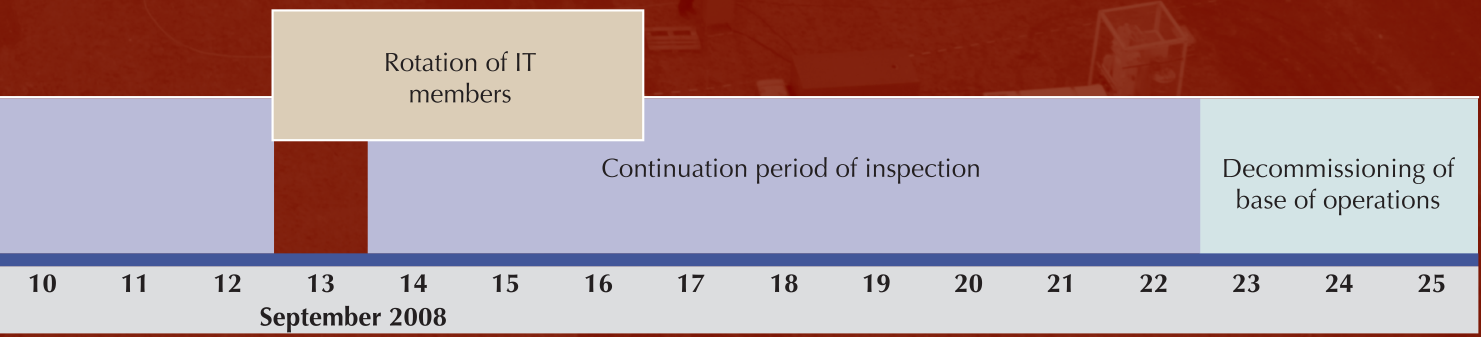
25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9

August 2008








Rotation of IT members
Continuation period of inspection
Decommissioning of base of operations
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
September 2008

Following the briefing and some time consuming equipment checks, the inspection team finally gained entry to the inspection area (40 km by 25 km) on 4 September and started its deployment of a passive seismic monitoring network and other initial inspection activities. During its initial period of inspection from 4 to 12 September, the team conducted overflights, ground based visual observations, a ground radioactivity survey, passive seismic monitoring and environmental sampling and analysis. By 12 September, the team was able to localize several areas of OSI interest and so prepared for a continuation of its activities. The team simulated the filing of its progress inspection report to this effect via the Director-General to the Executive Council.

The continuation period of inspection activities was approved and was conducted from 14 to 22 September. During this period, the team conducted additional overflights for air radioactivity measurement and magnetic field mapping, especially covering a former no-flight zone and restricted access area, and other continuation period activities such as a ground penetrating radar survey and electrical conductivity survey, while continuing to use techniques applied in the initial period. Noble gas sampling and analysis (argon-37 only) were conducted for the first time. During these inspection activities, the team applied a range of planned inspection techniques as specified in the Protocol to the Treaty, except for an active seismic survey, gravity measurements and drilling.

The team duly filed its preliminary findings document at the conclusion of the inspection exercise and went through the prescribed procedures with the ISP. Throughout its activities, the team was guided by the OSI Test Manual.

The team spent 353 hours in inspection activities. Its ground based activities covered a total land distance of 4723.6 km. It also conducted several overflights, when permitted by the weather and the ISP. Of the total distance of 2574 km flown, 764.43 km were covered during the initial overflight, 1185 km during the additional overflights for gamma surveillance and 624.5 km for the aerial field mapping.

The inspection team worked in adverse weather conditions and essentially lived in a camp, faced with a highly compressed time frame and an inspection area of 1000 km^2, a difficult exercise scenario and the tough role played by the ISP. Nevertheless, it finally accomplished all of its planned tasks on schedule.

Towards the end of the initial inspection period, the size of the camp was reduced as various groups accomplished their tasks and departed according to schedule from the site. This eased the burden on the logistics of the camp.

In parallel with the inspection, other auxiliary activities took place. A 14 member team of observers was present at the base of operations from 4 to 8 September, following the daily routines and inspection activities. One science writer was also present, and two others arrived with Kazakh journalists on 11 September. This day was dedicated to the media, in close coordination with the inspection team leader and the leading representative of the ISP, so as not to disrupt the inspection activities.

The control team provided support to the inspection team in the field and took care of the other groups of participants, including the evaluation team, representatives of the ISP and the media, and observers.

The decommissioning of the base of operations began on 23 September and was completed by 26 September. The first group of participants departed from the inspection area on 24 September.

The exercise was successfully completed on 28 September. By the end of the exercise, all participants and all core and auxiliary equipment were safely and completely repatriated, on schedule and according to plan. The IFE posed a great challenge to the Commission and proved a major step towards OSI readiness.

FOLLOW-UP

As part of the follow-up process, in November the IFE task force groups were reinstated and a communication system was launched for all IFE stakeholders to share views on activities undertaken during the preparation, conduct and completion of the exercise. A 'lessons learned log' was designed to facilitate the recording of IFE findings. It will be incorporated into the OSI Lessons Learned Database during the second phase of the review and follow-up process in the first half of 2009.

A debriefing workshop was held in Baden, Austria, from 1 to 5 December to present the main outcomes, to obtain feedback from IFE participants and to identify areas for improvement. The 79 workshop participants included representatives of the inspection team, the inspected State Party, the control team and the evaluation team, together with observers of the IFE and representatives from Permanent Missions and non-governmental organizations (NGOs). The results of the workshop will be taken into account in the elaboration of the draft OSI Operational Manual and will help identify significant issues to be addressed in the future OSI programme.

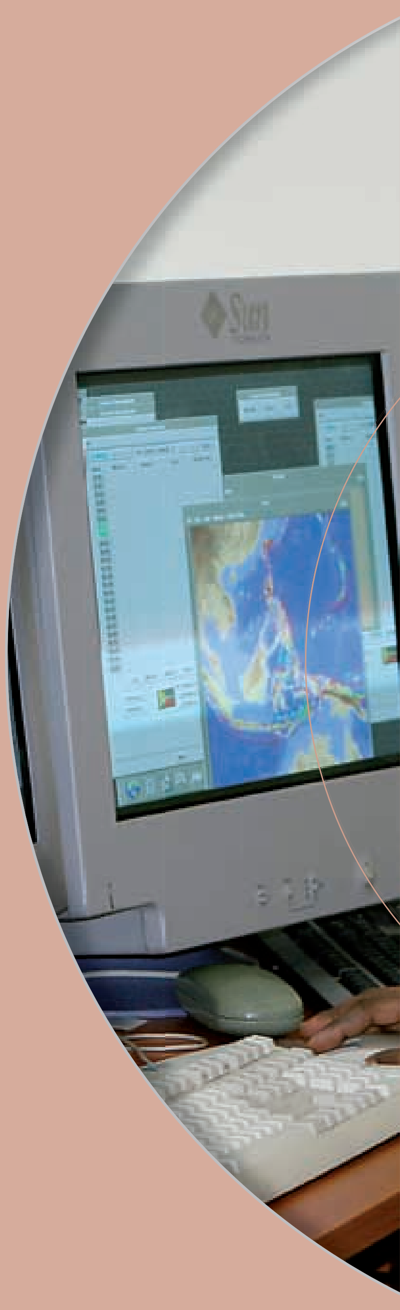
TRAINING INSPECTORS FOR THE EXERCISE

The OSI training cycle that started in 2007 to prepare a roster of potential participants for the IFE continued in 2008. A series of specialized training sessions was held for groups of trainees who had already received introductory and advanced training. A leadership course and a tabletop exercise were held in Baden from 13 to 19 April. These were the last activities in the abridged training cycle designed to enhance the capabilities of potential IFE participants.

Four additional equipment testing and training sessions were conducted for inspection sub-teams that would apply seismic and continuation period (geophysics) techniques. Three were held in Vienna during April–July and one was hosted by the Italian National Institute of Geophysics and Vulcanology. These activities allowed inspection team members to acquaint themselves with newly obtained equipment that would be used in the field, namely a seismic field laboratory and equipment for deep conductivity measurements. E-learning modules were developed and used before and during the training on issues such as overflight, seismic methodology and use of the Test Manual, a version of the draft OSI Operational Manual that was prepared especially for the IFE.

EQUIPMENT POOL

Certain inspection techniques may be introduced in the continuation period of an inspection, which follows the initial period subject to appropriate approval. In 2008, the PTS procured additional equipment for the continuation period, including a system to measure deep resistivity, a professional surveying kit and a Seismic Aftershock Monitoring System, which included 10 miniature seismometer arrays. All of this equipment was employed in the continuation period of the simulated inspection conducted in the IFE. In addition, the PTS acquired state of the art equipment for the visual observation sub-team, including a digital camera with special software for picture analysis and some advanced binoculars. Basic research continued with the aim of integrating a mobile system for detecting radioactive argon into the OSI regime.



Capacity Building

The Preparatory Commission offers States Signatories training courses and workshops in technologies associated with the International Monitoring System, the International Data Centre and on-site inspection, thereby assisting in the strengthening of national scientific capabilities in related areas. Such capacity building serves to enhance the real and potential 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.

CAPACITY BUILDING

HIGHLIGHTS IN 2008

THIRD workshop on IMS operation and maintenance in Vienna

NDC development workshops in Jakarta and Tunis

INSTALLATION of the e-learning management system.

A participant at the 10th IDC training course for analysts, Vienna, April–July 2008.

Mr Federico Guendel (left), Director of the IMS Division of the CTBTO Preparatory Commission, and Mr Lassina Zerbo, Director of the IDC Division, at the Third Workshop on Operation and Maintenance of the International Monitoring System, Vienna, November 2008.

TRAINING STATION OPERATORS AND NDC TECHNICAL STAFF

A diverse range of training events for station operators and NDC technical staff was provided in 2008. Station operators benefited from four equipment courses and three regional events, including one in Russian that reached 49 participants. A total of 80 NDC technical staff were trained in two regional training events and a two week advanced course. In addition, two participants from one State Signatory attended a visitors' programme at the Headquarters of the Commission in Vienna.

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 three months and requires a huge commitment from the participants. From the numerous applicants, only a handful are chosen to come to Vienna for the demanding course of instruction. In 2008, eight trainees were chosen to attend the training. Most of the course offers hands-on training with the analytical tools, preceded by a short theoretical introduction. By the end of the three months, the trainees leave in a much stronger position to apply for analyst posts in the organization.

ON-SITE INSPECTION OUTREACH ACTIVITIES

In parallel with activities that were part of the training cycle for the IFE (see *Preparing for On-Site Inspections*), the Commission continued with its regular outreach activities. The 15th OSI Introductory Course for members of Permanent Missions in Vienna was conducted from 14 to 17 October for a total of 22 trainees. A Regional OSI Introductory Course for States in South-East Asia, the Pacific and the Far East was conducted in Daejeon, Republic of Korea, from 9 to 15 November. The Commission enjoyed support and cooperation from three Governmental institutions in implementing the regional course: the Korea Arms Verification Agency, the Korea Institute of Nuclear Nonproliferation and Control and the Korea Institute of Geoscience and Mineral Resources. In total, 25 trainees participated in the course, which started with a theoretical introduction to the OSI regime and ended in a small scale field exercise, an exceptionally useful training tool for participants.

OPERATION AND MAINTENANCE WORKSHOP

The Commission convened the Third Workshop on Operation and Maintenance of the International Monitoring System in Vienna between 10 and 14 November.

A total of 69 participants from 34 States Signatories as well as staff of the Commission attended the formal presentations and working group discussions over the five days. The main topics covered by the workshop included the roles and responsibilities of the Commission, host country, station operators, contractors and other agencies with respect to operation and support of the IMS facilities; improving the performance and sustainment of the IMS network; IMS configuration management; and data quality control parameters and procedures.

Participants at the advanced training course for NDC technical staff, Vienna, November–December 2008.

NDC DEVELOPMENT WORKSHOPS

Two NDC development workshops were conducted in 2008, one in Jakarta and the other in Tunis. 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.

NOBLE GAS, INFRASOUND AND LABORATORY WORKSHOPS

St Petersburg

A noble gas workshop, organized by the Khlopin Radium Institute with the support of the Commission, took place in October in St Petersburg, Russian Federation. The latest advances in research and development in noble gas technology were presented together with topics such as event categorization, quality control, atmospheric transport and progress in testing of noble gas systems at IMS sites. The workshop recognized that noble gas systems have reached a high degree of maturity and recommended the commencement of certification of noble gas stations while maintaining development efforts, with emphasis on the analysis of noble gas spectra.

Bermuda

An infrasound technology workshop was held in Bermuda (UK) in November. The workshop was organized by the University of Mississippi, USA, in collaboration with the Commission and provided a major insight into the current state of infrasound research and development. Among the topics covered were the status of the IMS network, processing at the IDC, sensors and calibration, infrasound waves generated by anthropogenic and geophysical sources, wind noise reducing systems, and modelling of infrasound propagation and network performance.

Participants of the NDC development workshop, Tunis, December 2008.

Aldermaston

A radionuclide laboratory workshop took place in December in Aldermaston, UK, organized by the Atomic Weapons Establishment in technical cooperation with the Commission. During the workshop, issues such as laboratory operation and analytical techniques were discussed. The workshop recommended that, in order to remain certified and to continue to receive Level 5 samples, laboratories should participate in the annual Proficiency Test Exercise and meet a specific set of requirements. Failure in two out of three consecutive exercises would trigger a revalidation process for the relevant laboratory, during which the sending of Level 5 samples to the laboratory in question would be discontinued.

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 was introduced 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 the Policy Making Organs (PMOs).

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 facilities of the PTS were established in 2008 with the installation of a learning management system. The new system has all of the necessary features such as computer platform independence and compatibility with the official languages of the United Nations. In addition, it meets the requirements of the existing hardware, software, networking and security systems of the PTS. Courses can be updated quickly and easily. The system is secure and allows tracking of security violations as well as robust password checking. The user interface is clear and easy to follow, which is essential in view of its diverse population of users.

System testing was conducted in 2008 by representatives from 13 countries and the results have been positive. In addition, staff of the Commission were trained in the administration of the courses as well as in creating content so that updates to the course modules can be accomplished in-house. A large scale content development effort funded by the EU has begun with the aim of providing training courses from 2009. Several pilot course modules were also developed for testing and use as introductory information.

Improving Performance and Efficiency

Throughout the process of establishing the verification system, the Provisional Technical Secretariat of the 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.

IMPROVING PERFORMANCE AND EFFICIENCY

HIGHLIGHTS IN 2008

RELEASE for testing of a prototype Web based performance reporting tool that displays key performance indicators (KPIs) for data, products and PTS processes

NDC Evaluation Workshop in Baden, Austria

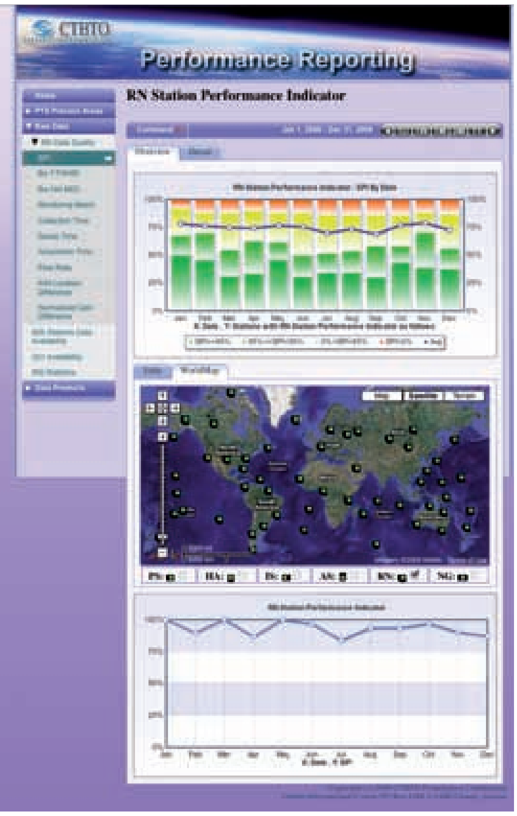
COMMENCEMENT of the evaluation of the IFE.

DEVELOPING THE QUALITY MANAGEMENT SYSTEM

The function of the Quality Management System (QMS) is to identify and put into effect key performance indicators (KPIs) for evaluating PTS processes and products, thus facilitating management review and continual improvement. KPIs are 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 2008, the PTS devised a structured plan for developing a fully fledged QMS by 2011. This will conform to internationally recognized standards as an instrument for accomplishing the objectives set out by the CTBT and for providing the States Signatories and the Commission with the necessary confidence in the functioning of the PTS and its products and services.

During the 2007 Quality Management Workshop in Vienna, a preliminary draft PTS Process Metrics Manual was presented, together with a catalogue of KPIs for radionuclide data and products and the prototype of a Web based performance reporting tool to display the status and trends of such KPIs. The workshop recommended that priority be given to developing the manual, which should include a complete top-down hierarchical organization of all processes and associated metrics. As further input to the manual, in 2008 a catalogue of KPIs for waveform technologies was compiled.



Example of KPIs displayed using the prototype performance reporting tool. The upper chart shows the station performance indicator for the IMS radionuclide monitoring technology during 2008. The lower graph shows the performance indicator for one of the stations shown on the map.

A number of candidate KPIs have been computed for review, testing and validation. These include: (a) IMS installation and certification progress; (b) data availability for all technologies, by technology, by station and by group of stations; (c) data quality for radionuclide particulate technologies; (d) product timeliness (for the REB and RRR); and (e) global GCI availability. The KPIs have been computed from data in the IDC database, the Database of the Technical Secretariat and the IMS Reporting System.

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 2008, a framework for evidence based evaluation of the IFE was completed and is being used for the evaluation. The IFE Evaluation Framework provides evaluation criteria, methods and tools. The framework was finalized during a meeting in Turin, Italy, from 26 to 30 May in partnership with the United Nations

System Staff College and the United Nations Evaluation Group (UNEG). This event combined the delivery of an introductory course on evaluation in the United Nations system with a workshop dealing specifically with IFE evaluation and aimed at providing the external evaluation team and the exercise managers and planners with an overview of the main concepts and tools.

Evaluation of the IFE is based on a combination of qualitative and quantitative methods to increase overall reliability, validity and confidence in conclusions. The selected approach to data analysis consists of examining whether the information collected by different methods and sources can be corroborated between data sets. This 'triangulation method' should reduce the impact of potential biases that can arise from using a single method or source.

The IFE evaluation makes use of observations provided by an external evaluation team, composed of experts in the various techniques tested in the exercise, and of surveys and interviews of IFE stakeholders, such as members of the inspection team, representatives of the inspected State Party, members of the control team and exercise planners.

Inspectors conducting visual observations during an overflight in the IFE.

The team coordinating evaluation activities with the IFE stakeholders.

FEEDBACK FROM NATIONAL DATA CENTRES

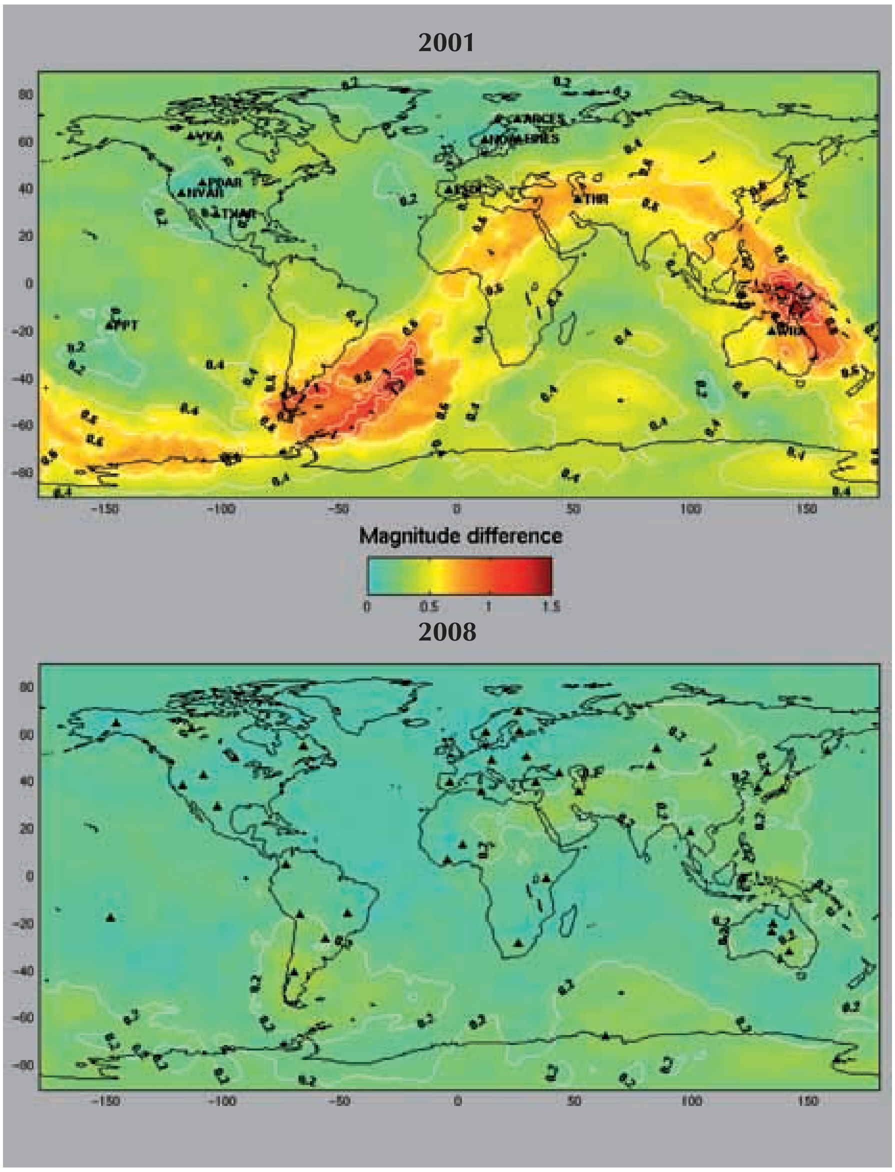
In its Quality Policy, the PTS underlines its focus on customers. NDCs, as the main users of PTS products and services, meet in annual NDC evaluation workshops in order to provide their feedback to the PTS.

The 2008 NDC Evaluation Workshop, hosted by the Austrian NDC, was held in Baden, Austria, from 5 to 9 May 2008 with over 80 participants representing 34 States Signatories, NDCs and the PTS. The main objective of the workshop was to further improve the performance of the verification system and consolidate a set of KPIs which would best represent and measure such performance.

IFE evaluation team members at a briefing.

A representative of the inspected State Party and a member of the IFE evaluation team observing work in the radionuclide laboratory.

Improvement in Seismic Detection Capability



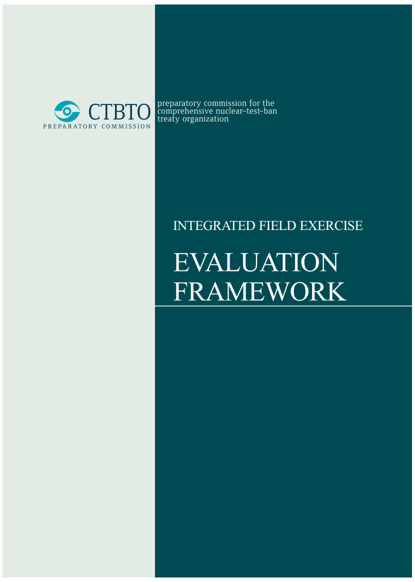
The two maps show simulations of the estimated detection capability of certified primary seismic monitoring stations at the end of 2001 and 2008 relative to that of the complete IMS primary seismic network under ideal conditions (full station availability and low background noise).

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.

At the end of 2001, when only 11 primary seismic stations had been certified, there were large areas with magnitude differences above 0.4 (represented by yellow to brown shading), and some local differences were as high as 1.4 (represented by red to dark brown shading).

At the end of 2008, with 40 stations certified, the same areas showed differences in magnitude of only 0.2 on average. Overall, at the end of 2008 magnitude differences in several parts of the world fell 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.

The results of the first NDC Preparedness Exercise (NPE), held in 2007, were presented at the workshop by participating NDCs. The purpose of the NPE was to test the status of the verification capabilities of the NDCs, which depend critically on the number of available waveform data and on the quality and usefulness of IDC data products. The workshop recognized the importance of NPEs and recommended that the 2008 NPE take the form of a data fusion test involving the waveform technologies and the radionuclide technology together with atmospheric transport modelling (see *International Data Centre:* "Tracking Radionuclides Through the Atmosphere"). The workshop also recommended improvement of procedures for surface wave magnitude determination at the IDC and prioritization of the completion of the IMS network.



The workshop discussed the need to support emerging and developing NDCs and recommended that analysts from such NDCs be trained at established or more advanced NDCs.

In reviewing the status of implementation of recommendations from past workshops, participants recommended that the quality assurance and quality control activities at the PTS be consolidated into a systematic programme to increase the confidence of the users of the verification system in PTS products. It was also recommended that the PTS create a comprehensive dictionary of terms to be used within the CTBT community.

EVALUATION PRACTICES AND THE UNITED NATIONS

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 PTS continued to support the activities of UNEG in 2008 and contributed its experience in integrating quality management and evaluation with the practices of results based management.

Policy Making

Policy making is effected through the Policy Making Organs (PMOs). These are the vehicles by which the CTBTO Preparatory Commission makes and implements decisions concerning the work of the organization.

The plenary body of the Commission, which is composed of all States Signatories, provides political guidance and oversight to the Provisional Technical Secretariat. The plenary is the primary PMO and is assisted by two other PMOs called Working Group A and Working Group B.

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 2008

EXPANSION of the pilot project to facilitate participation of experts from developing countries in official technical meetings of the Commission

REAPPOINTMENT of the Chairperson of Working Group A for a further two years and the Chairperson of Working Group B for a further three years

ADVANCES in establishing the Information System with Hyperlinks on Tasks Assigned by the Resolution Establishing the Preparatory Commission.

MEETINGS IN 2008

In 2008, the Preparatory Commission was chaired by Ambassador Hans Lundborg, Permanent Representative of Sweden. The Commission met in plenary twice, from 23 to 24 June at its Thirtieth Session and from 17 to 18 November at its Thirty-First Session.

Working Group A was chaired by Ambassador Abdulkadir Bin Rimdap (Nigeria) and held its Thirty-Third Session from 2 to 3 June and its Thirty-Fourth Session from 20 to 21 October. Working Group B was chaired by Mr Hein Haak (Netherlands) and also held two sessions: its Thirtieth Session from 12 to 29 February and its Thirty-First Session from 25 August to 12 September. The Advisory Group, chaired by Mr André Gué (France), held the first and second parts of its Thirtieth Session from 21 to 25 April and from 13 to 16 May, and its Thirty-First Session from 15 to 19 September.

At a special session held on 12 February, the Commission decided to reappoint Ambassador Rimdap as Chairperson of Working Group A for a term of two years. At its Thirty-First Session, the Commission reappointed Mr Haak as Chairperson of Working Group B for a further three year term. At the same session, the Commission also extended the current term of office of the Chairperson of the Advisory Group, Mr Gué, by one month until 15 June 2009.

EXPANDING THE PARTICIPATION OF EXPERTS FROM DEVELOPING COUNTRIES

In 2008, the PTS continued the implementation of a pilot 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 pilot 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 pilot project in 2008. These included the organization of meetings between the experts, representatives of donor countries and the PTS during each session of Working Group B to facilitate an exchange of views on technical issues and on progress in project implementation.

The project was expanded in 2008 to support an additional three experts, bringing the total number supported to six (one each from Ethiopia, Kenya, Mexico, Mongolia, Peru and Thailand). For the first time, an expert from a least developed country was supported under the pilot project.

The pilot project was financed in 2008 by voluntary contributions from Austria, China, Finland, Hungary, Indonesia, Malaysia, Morocco, the Netherlands, New Zealand, Norway, Oman, Qatar, the Republic of Korea, Slovenia, South Africa, Turkey and the United Kingdom.

The six experts took part in sessions of Working Group B and other technical meetings, including the NDC Evaluation Workshop in May. In addition, the experts benefited from a series of technical briefings and discussions with the PTS on key verification related issues. They also participated in one of the acceptance tests of the new PTS e-learning system. The expert from Kenya led discussions as Task Leader for Issues Related to NDCs at both sessions of Working Group B.

On the basis of an implementation report prepared by the PTS, at its November session the Commission welcomed the successful continuation of the pilot project.

Meeting between representatives of donor countries and experts from developing countries who have received support through the pilot project to attend technical meetings of the Commission.

SUPPORTING THE POLICY MAKING ORGANS

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 PMOs 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 PMOs.

The PTS continued its preparation for the holding of a 2009 Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty in New York, and in this regard has established a regular line of communication with the United Nations Secretariat. In addition, the PTS provided substantive and organizational support to the coordinators of the Article XIV process in holding informal consultations of States ratifiers.

Improving Official Documentation

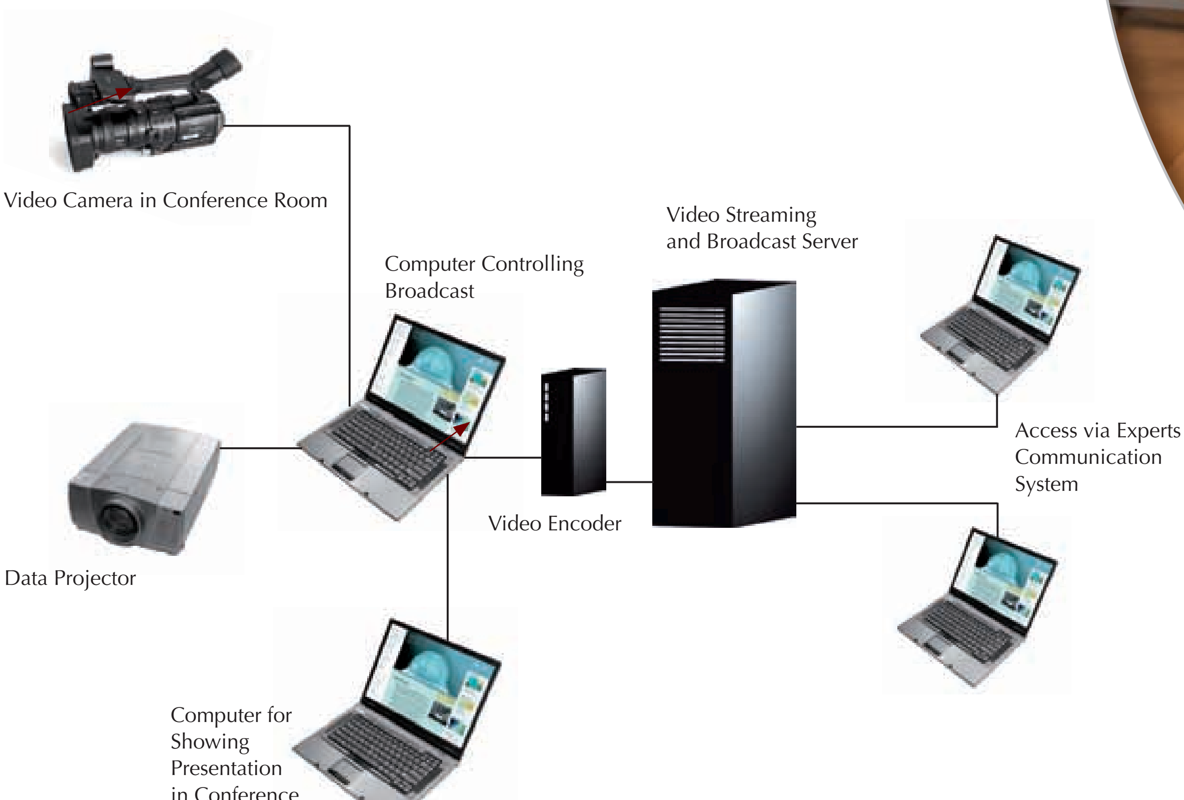
In issuing the Medium Term Plan for 2009–2013 and the 2009 Programme and Budget on a secure web site known as the Experts Communication System (ECS), the PTS established a new standard of transparency and accountability by including in the electronic files of these planning documents KPIs that were hyperlinked to sources of real time performance data. These changes were made as part of an overall effort to move towards results based management.

Information System on Progress in Fulfilling the Mandate of the Treaty

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 PMOs. 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 prides itself on its ability to provide a virtual working environment for those unable to attend regular meetings of the PMOs. State of the art technologies are employed to transmit the proceedings of each official plenary meeting around the globe in real time. Meetings are recorded and transmitted live via the ECS before being archived for reference purposes. In addition, supporting documents related to each particular session are distributed to States Signatories through the ECS, and participants are notified of new documents by email alerts. In 2008, the video streaming equipment used for the live transmissions was upgraded to improve its reliability and versatility and raise the image quality.



Video Streaming System

Outreach

A key duty 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, NGOs, the media and the general public. The outreach activities involve educating people about the activities of the Commission, promoting signature and ratification of the Treaty by States and fostering international cooperation in the exchange of verification related technologies.

HIGHLIGHTS IN 2008

RATIFICATION of the Treaty by Barbados, Burundi, Colombia, Lebanon, Malawi, Malaysia and Mozambique, and signature of the Treaty by Iraq and Timor-Leste

MINISTERIAL Meeting in New York in support of the Treaty

LAUNCH of the new public web site.

TOWARDS UNIVERSALITY OF THE TREATY

The Treaty moved closer to universalization in 2008 with ratification by the following seven countries: Barbados, Burundi, Colombia, Lebanon, Malawi, Malaysia and Mozambique. Two countries signed the Treaty: Iraq and Timor-Leste.

As of 31 December 2008, the CTBT had been signed by 180 States and ratified by 148 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

The PTS continued its efforts in 2008 to raise awareness and enhance understanding of the Treaty, to facilitate the implementation of the decisions of the Commission on the establishment of the verification regime and, in particular, the installation of IMS facilities, and to promote signature and ratification and participation in the work of the Commission.

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 to the Treaty). 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 Australia, Brunei Darussalam, Costa Rica, France, Indonesia, Italy, Kazakhstan, the Republic of Korea, Samoa, South Africa, Sweden, Turkey and the USA with a view to strengthening their interaction with the Commission and highlighting the significance of the entry into force of the Treaty.

Latin America and the Caribbean

There were several outreach opportunities in Latin America and the Caribbean in 2008. The PTS provided administrative assistance in the preparation of a Regional Ministerial Meeting, which was organized by the Governments of Costa Rica and Austria and designed as a follow-up meeting to the 2007 Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty (‘Article XIV conference’). The meeting was held on 30 September in San José, Costa Rica, and was funded by a voluntary contribution from the Government of Austria. Preceding this event, a meeting of high level officials was held on 29 September. The high level meeting dealt primarily with the legal and technical requirements for the entry into force of the Treaty.

From 4 to 8 August, a mission jointly organized by the PTS and the United Nations Regional Centre for Peace, Disarmament and Development in Latin America and the Caribbean (UNLiREC) was conducted to the three English-speaking Caribbean countries which have yet to sign and ratify the CTBT: Dominica, Saint Vincent and the Grenadines, and Trinidad and Tobago. Detailed presentations were made in the three capital cities on political and technical aspects of the Treaty. In addition, a joint PTS–UNLiREC mission took place on 1 October in Guatemala City. The missions were supported by voluntary contributions from the Government of Austria.

Inter-Parliamentary Union

The Executive Secretary attended the 118th and the 119th Assembly of the Inter-Parliamentary Union (IPU), held from 13 to 18 April in Cape Town and from 13 to 15 October in Geneva. At the 119th IPU Assembly, he participated in a panel discussion on "Advancing nuclear non-proliferation and disarmament, and securing the entry into force of the Comprehensive Nuclear-Test-Ban Treaty: The role of Parliaments". The topic is to be discussed by the First Standing Committee of the IPU during the 120th Assembly in April 2009.

Organisation Internationale de la Francophonie

The Executive Secretary was invited once again by the Organisation internationale de la Francophonie to attend the 12th Francophonie Summit, which took place in Quebec City, Canada, from 17 to 19 October. On the margins of the summit, the Executive Secretary held meetings with several delegations.

Liaising with the United Nations

The Executive Secretary visited Geneva on 6 March and met with the Secretary-General of the WMO and the Director of the Geneva Branch of the United Nations Office for Disarmament Affairs. The meetings provided an opportunity to exchange views on current work and priorities of the respective organizations, as well as to explore further possible avenues of cooperation.

On 12 and 13 June, the Executive Secretary met with the Executive Secretary of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO/IOC). During the meeting, they took stock of the current co-operation between the two organizations and explored future possibilities. Apart from cooperation in the areas of tsunami warning and capacity building, other potential fields of cooperation, e.g. climate change within the framework of the Intergovernmental Panel on Climate Change, were identified.

PTS representatives participated in several conferences sponsored by the United Nations. These included the 20th United Nations Conference on Disarmament Issues in Saitama (Saitama City, Japan, 27–29 August), the Seventh United Nations–Republic of Korea Joint Conference on Disarmament and Non-Proliferation Issues (Jeju Island, Republic of Korea, 23–26 November) and the United Nations Climate Change Conference (Poznań, Poland, 1–12 December).

United Nations General Assembly

The Executive Secretary took part in the sixty-third session of the United Nations General Assembly from 22 to 26 September. On the margins of the session, he met with a number of senior officials and government representatives.

On 15 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 role of the respective organizations", together with the High Representative for Disarmament Affairs, the Director-General of the Organisation for the Prohibition of Chemical Weapons (OPCW), the Secretary-General of the Conference on Disarmament and the Representative of the Director General of the International Atomic Energy Agency (IAEA). On the margins of the panel exchange, he held bilateral talks with the panel members.

Finally, on 3 November, the Executive Secretary addressed the United Nations General Assembly under the agenda item on "Cooperation between the United Nations and regional and other organizations". The resolution on cooperation between the United Nations and the Preparatory Commission was adopted under the same agenda item (with 64 votes in favour, 1 vote against and no abstentions).

International Atomic Energy Agency

On 3 October, the Executive Secretary gave an address to the fifty-second regular session of the IAEA General Conference. In speaking about the IAEA forecast of annual growth rates of nuclear energy in the course of the next 20 years, to address challenges of energy security and climate change, the Executive Secretary emphasized that this must go in tandem with strengthening the non-proliferation and disarmament regime, including the CTBT, the most visible legal and technical barrier to the development of nuclear weapons.

Further Activities

In December 2008, a PTS representative participated in a conference entitled "Peace and Disarmament: A World without Nuclear Weapons?", organized in Brussels by the Socialist Group in the European Parliament. Several high level speakers emphasized the importance of the CTBT and its entry into force at the earliest date possible.

Other cooperation and coordination with international organizations and institutions included PTS participation in the Security Policy Conference on Armament and Disarmament (Budapest) and the International Conference on Nuclear Disarmament (Oslo) in February; the Second Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention (The Hague) and the second session of the Preparatory Committee for the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (Geneva) in April; a project in Nepal in the framework of an EU joint action to support the activities of the Preparatory Commission at the end of June; the 15th Ministerial Conference of the Non-Aligned Movement (Tehran) in July; the 40th Session of the International Seminars on Planetary Emergencies (Erice, Italy) in August; the 11th PIIC Beijing Seminar on International Security (Beijing) in October; the North Atlantic Alliance Seminar on Proliferation Issues (Berlin) in November; and the Global Zero Conference (Paris), the Brainstorming Conference on "Nuclear Non-Proliferation and the Rise in Demand of Nuclear Civil Power" (Washington, D.C.) and the 13th Session of the Conference of the States Parties of the OPCW (The Hague) in December.

In Vienna, the Executive Secretary continued dialogue with States through the Permanent Missions and received a number of high level visitors, including the Director General of the Israel Atomic Energy Commission, Shaul Chorev; the Director General of the International Security Bureau of the Canadian Foreign Ministry, Donald C. Sinclair; the President of Turkmenistan, Gurbanguly Berdymukhamedov; and the Deputy Foreign Minister for Legal and International Affairs of the Islamic Republic of Iran, Seyyed Mohammad Ali Hosseini. This provided further opportunities for bilateral discussions on common issues related to recent developments in the work of the Commission.

With a voluntary contribution from Austria, the Commission organized information visits for representatives from Dominica, Ghana and Liberia in order to familiarize key stakeholders in those countries with the Treaty and the work of the Commission. The Commission also arranged an information visit for a representative from Angola.

MINISTERIAL MEETING

A Ministerial Meeting was held in New York on 24 September to promote the Treaty. The meeting, at which around 40 Foreign Ministers were in attendance, was addressed by prominent personalities such as the United Nations Secretary-General, Ban Ki-moon, the former US Defense Secretary, William Perry, and the Academy Award winning actor and producer, Michael Douglas, who is also a United Nations Messenger for Peace. The Joint Ministerial Statement issued at the meeting (see p. 64) was subsequently endorsed by a total of 96 countries. A statement by Barack Obama, while still a presidential candidate, in support of the CTBT was issued on the day of the meeting.

Appreciation was expressed to Austria and Costa Rica, as joint coordinators of the Article XIV process, as well as to the Special Representative of States ratifiers to promote the CTBT ratification process, Ambassador Jaap Ramaker of the Netherlands. Prospects for a new momentum on ratification and entry into force of the Treaty were noted and the importance of capitalizing on the potential of any such prospects was stressed. Support was expressed for the convening of an Article XIV conference in New York in 2009.

All statements delivered to the meeting, United Nations webcasts and related press reports were placed on the public web site. An issue of *CTBTO Spectrum* was produced especially for distribution at the meeting, featuring interviews and articles by, among others, the President of Costa Rica, Oscar Arias, the Director General of the IAEA, Mohamed ElBaradei, and former US Senator Sam Nunn. In addition, press releases and highlight articles were issued before and after the meeting.

INTERNATIONAL COOPERATION

In 2008, the PTS held two regional workshops. The workshops had several objectives: to review CTBT related achievements in support of the nuclear non-proliferation regime; to promote the entry into force and universality of the CTBT; to enhance understanding of the CTBT; to facilitate capacity building for the purpose of implementing the CTBT; and to discuss the verifiability of the Treaty monitoring system.

Participants of the international cooperation workshop, Apia, Samoa, May 2008.

In May, the PTS organized a Workshop on CTBTO International Cooperation for States in the Pacific, which was held in Samoa with the close cooperation of the host Government and funded by a voluntary contribution from the Government of Austria. The workshop resulted in a list of recommendations for future action in order to maintain a nuclear-free Pacific.

Participants of the international cooperation workshop. Istanbul, July 2008.

In July, a Cross-Regional Workshop for CTBTO International Cooperation, for selected States from all six geographical regions as defined in the Treaty, was held in Istanbul. Its overall theme was “Twelve Years of the CTBT: Achievements and Perspectives”. The workshop was attended by representatives from 32 countries as well as from UNESCO and the Organization of the Islamic Conference, and by the Special Representative to promote the CTBT ratification process and speakers from the Russian Federation, Turkey and the Arms Control Association.

Ambassador Ünal Çeviköz (left), Deputy Under-Secretary from the Ministry of Foreign Affairs of Turkey, in discussion with Mr Tibor Tóth, Executive Secretary of the CTBTO Preparatory Commission, at the Istanbul workshop.

The workshop provided a forum for the exchange of information between the PTS and the States as well as among States themselves. It also served as a platform to enhance the understanding of the Treaty and to further cooperation among States Signatories. Participants discussed the significance of the CTBT in the wider context of the nuclear non-proliferation regime and as a confidence and security building measure. Attention was given additionally to the verifiability and worldwide coverage of the Treaty monitoring system, regional and national implementation of the CTBT and capacity building, as well as civil and scientific benefits of the IMS, in particular the new developments concerning tsunami early warning systems and the Istanbul earthquake early warning and rapid response system.

The opening session was chaired by the Executive Secretary of the Commission and the Deputy Under-Secretary from the Ministry of Foreign Affairs of Turkey. On the margins of the workshop, the Executive Secretary held bilateral meetings with the Minister of Foreign Affairs of Turkey and visited the nuclear test monitoring centre at the Belbasi Seismic Research Station.

PROMOTING THE TREATY AND THE COMMISSION

The year 2008 saw an intensification of PTS public information activities focusing on targeted audiences, including the media, States, NGOs, scientific and academic institutions, think tanks and public policy institutes, to promote the Treaty and the work of the Commission. Special emphasis was placed on the remaining States that have yet to sign or ratify for the CTBT to enter into force.

The PTS continued with briefings and presentations, the use of the CTBTO exhibition and film as well as printed material, and participation in important disarmament and non-proliferation seminars and conferences to enhance public awareness.

Proactive Media Relations

Press conferences were held on the occasion of the ratification by Colombia (January); for the launch of the new web site (June); during the plenary sessions of the Commission (June and November); during the visit of the Executive Secretary to Kazakhstan (July); within the context of the IFE in Kazakhstan (August, September and October); and on the occasion of the signing of a tsunami warning arrangement with Indonesia (November).

There was a notable increase in the number of published articles in which the CTBT was mentioned, reflecting a rising public interest. Links to the most relevant articles were placed on the public web site on a daily basis. In addition, a large number of press briefings and interviews were given to representatives of the print and broadcast media. The PTS also assisted in the filming of documentaries on the CTBT and its verification regime by two US film companies and a German television network.

Information Products

In addition to the public web site, other electronic dissemination techniques continued to be developed. The number of press releases increased by 32% with respect to 2007 and, as a new element, electronic newsletters were issued to specific audiences on a biweekly basis.

Several major printed products were produced in 2008. These included: (a) an issue of *CTBTO Spectrum* focusing on the role of the CTBT in the general nuclear non-proliferation and disarmament context; (b) a brochure entitled *The nuclear test-ban verification regime: An untapped source for climate change monitoring;* (c) a brochure on the IFE called *CTBTO tests its on-site inspection regime in Kazakhstan;* and (d) a brochure on the ISS project.

Covering the Integrated Field Exercise

A special focus of public information activities in 2008 was on the IFE in Kazakhstan as the largest single project in the history of the Commission. A dedicated area on the web site, briefings for media representatives and diplomatic missions in Vienna and in Kazakhstan, a media day in the field, press releases, highlight articles and video clips ensured extensive coverage before, during and after the exercise. In addition, the groundwork was done for a new PTS promotional film. Media coverage of the IFE was considerable.

Launch of New Public Web Site

In June, the new CTBTO public web site was officially launched by the Executive Secretary at a ceremony in the rotunda of the Vienna International Centre.

With the launch of the new web site, the central tool for information dissemination about the CTBTO was enhanced signifi cantly Its features range from greatly expanded written and visual content, supported by state of the art technology, to a more comprehensive search engine and a number of multimedia applications. The multimedia items include animations of the functioning of the IMS and the transmission of data, videos covering important events such as the IFE, the detection of the nuclear test carried out by the Democratic People's Republic of Korea in 2006, tsunami warning applications of the IMS, and interactive maps to display the status of the Treaty, IMS build-up and former nuclear test sites.

The new web site aspires to provide a complete overview of the CTBT and its verification regime, the history of nuclear tests and the arms control efforts undertaken to contain them, including the long phase preceding the adoption of the Treaty. It is intended to be the most comprehensive online resource on the history of the ban on nuclear weapon testing.

Home page of the new public web site.

Detail of the interactive map of IMS facilities.

Section of the web site on the history of nuclear testing.

Video clip of a nuclear test.

JOINT MINISTERIAL STATEMENT ON THE CTBT

24 September 2008
New York

1. We, the Foreign Ministers who have issued this statement, reaffirm our strong support for the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which would rid the world of nuclear weapons test explosions and would contribute to nuclear disarmament and non-proliferation.

2. In this year marking the 12th anniversary of the Treaty's opening for signature, we emphasize that the CTBT is a major instrument in the field of nuclear disarmament and non-proliferation. The Treaty was an integral part of the 1995 agreements by the States parties to the Nuclear Non-Proliferation Treaty (NPT) allowing the indefinite extension of the Treaty. The early entry into force of the CTBT was recognized at the 2000 Review Conference of the NPT as a practical step to achieving NPT nuclear disarmament and non-proliferation objectives, and has also been reaffirmed as being of central importance by the UN General Assembly.

3. We recall the Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty, that adopted in September 2007 a declaration by consensus outlining measures consistent with international law to encourage further signature and ratification of the Treaty.

4. We affirm that the CTBT will make an important contribution by constraining the development and qualitative improvement of nuclear weapons and ending the development of advanced new types of nuclear weapons, as well as preventing the proliferation of nuclear weapons in all its aspects. The entry into force of the Treaty is vital to the broader framework of multilateral disarmament and non-proliferation efforts. Progress on this issue would also contribute to a positive outcome of the 2010 Review Conference of the NPT.

5. We welcome that the CTBT has achieved near universal adherence with signature by 179 States and ratification by 144 States as of today. Of the 44 States whose ratification is necessary for the entry into force of the Treaty, nine have yet to do so. We welcome the four ratifications that have occurred since the entry into force conference last year, in particular that of Colombia, one of the States whose ratification is necessary for the entry into force of the Treaty. We call upon all States that have not yet done so to sign and ratify the Treaty without delay, in particular those whose ratification is needed for its entry into force. We recognize the extensive range of bilateral and joint outreach efforts by signatories and ratifiers to encourage and assist States which have not yet signed and ratified the Treaty. We commit ourselves individually and together to make the Treaty a focus of attention at the highest political levels and to take measures to facilitate the signature and ratification process. We support the efforts by the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization to facilitate such process by providing legal and technical information and advice.

6. We call upon all States to continue a moratorium on nuclear weapon test explosions or any other nuclear explosions. Voluntary adherence to such a moratorium is a welcome step, but does not have the same permanent and legally binding effect as the entry into force of the Treaty. We reaffirm our commitment to the Treaty's basic obligations and call on all States to refrain from acts which would defeat the object and purpose of the Treaty pending its entry into force. With respect to the nuclear test announced by the Democratic People's Republic of Korea on 9 October 2006, bearing in mind UNGA Res 61/104, we underline the need for a peaceful solution of the nuclear issues through successful implementation of the Six Party Talks Joint Statement of September 2005 and we urge the DPRK to fulfil its commitments therein and to fully comply with Security Council resolutions 1695 and 1718. We note that the verification regime successfully detected the aforementioned event and believe that it highlighted the urgent need for the early entry into force of the Treaty.

7. We welcome the progress made in building up all elements of the verification regime, which shall be capable of verifying compliance with the Treaty at its entry into force. We will provide the support required to complete and operate the verification regime in the most efficient and cost-effective way. We will also promote technical cooperation to enhance verification capabilities under the CTBT.

8. In addition to its primary function, the CTBT International Monitoring System as part of the verification regime is bringing scientific and civil benefits, including for tsunami warning systems and possibly other disaster alert systems, through civil and scientific applications of waveform and radionuclide technologies and use of the data. We will continue to seek ways to ensure that these benefits will be broadly shared by the international community in conformity with the Treaty.

9. We appeal to all States to make maximum efforts towards achieving the early entry into force of the CTBT. On our part we dedicate ourselves to realizing this goal.

"The Treaty's entry into force would be a major step in our effort to build a safer, more peaceful world. It would outlaw all nuclear tests and move us towards the larger goals of ridding the world of nuclear weapons and preventing their proliferation."

Ban Ki-moon, United Nations Secretary-General

"Testing nuclear devices is a clear threat. Twenty years after the end of the Cold War the language of threat is no longer the language we want to speak."

Ursula Plassnik, Austrian Foreign Minister

The entire world community needs to rally behind the CTBT. CTBT is an absolute necessity when it comes to stopping nuclear technology proliferation."

Bruno Stagno Ugarte, Costa Rican Foreign Minister

"In 1996 already I was part of the US comprehensive study on whether the CTBT could be effectively verified. We were convinced already at that time that this could be done. Today, the verification system is much superior to what it was then."

William Perry, former US Defense Secretary

"There is no need to test nuclear weapons. It is imperative that the CTBT can come into force, including in my own country, the United States. It is a crucial, crucial time for the Treaty to get ratified."

Michael Douglas, United Nations Messenger for Peace

"We need a complete ban on nuclear testing. We need a complete ban on nuclear weapons, and we need complete disarmament. Australia is committed to work hard to persuade countries to make the Treaty come into effect."

Stephen Smith, Australian Foreign Minister

Management

Effective and efficient management of the activities of the Provisional Technical Secretariat of the CTBTO Preparatory Commission, including support of the Policy Making Organs, 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-passers 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 2008

COMPLETION of the restructuring process

ZERO real growth Programme and Budget

COLLECTION rates of annual assessed contributions for 2008 greater than in previous year.

RESTRUCTURING THE PROVISIONAL TECHNICAL SECRETARIAT

As the CTBT verification system has grown, the PTS has had to adapt to manage that growth. In 2004, a report reviewing the organizational structure of the PTS was issued to States Signatories. This report contained a number of recommendations on restructuring the organization and led to the formulation of a 'road map' to guide implementation of the recommendations.

Restructuring involved redefining the functions of the technical Divisions responsible for the IMS and the IDC. The operational elements of the IMS and IDC Divisions were merged to create a Division responsible for provisional operation, testing and evaluation of the verification system. The technical functions that support the IMS and IDC operations were then combined into a Division responsible for engineering, development and logistical support.

With the completion of this process in 2008, the organization is reaping the benefits. In addition to promoting efficiency, the new structure is more cost effective. In line with the trend of previous years, the PTS continued and will continue to achieve more with the same level of resources.

FINANCE

2008 Programme and Budget

The 2008 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 2008 amounted to US$56 587 200 and €43 574 800. At the budget exchange rate of 0.7960 euro to 1 US dollar, the total US dollar equivalent of the 2008 Budget was $111 327 100, representing a nominal growth of 1.86% but almost constant in real terms (a decrease of $2800 or 0.0026%).

On the basis of the actual average exchange rate in 2008 of 0.6868 euro to 1 US dollar, the final total US dollar equivalent of the 2008 Budget was $120 033 327 (Table 4). Of the total Budget, 79.02% originally was allocated to verification related activities, including an allocation of $13 522 394 to the Capital Investment Fund (CIF), established for the build-up of the IMS. This increased to $14 962 394 after a $1 440 000 transfer from the General Fund.

Table 4. Distribution of 2008 Budget

Area of Activity	U$ (millions)[a]
International Monitoring System	38.2
International Data Centre	45.9
On-Site Inspection	8.5
Evaluation	2.2
Policy Making Organs	2.9
Administration, Coordination and Support	22.3
Total	**120.0**

[a] An average exchange rate of 0.6868 euro to 1 US dollar was used to convert the euro component of the 2008 Budget.

Assessed Contributions

As of 31 December 2008, the collection rates of the assessed contributions for 2008 amounted to 77.72% of the US dollar portion and 77.64% of the euro portion. These are higher than the 2007 collection rates as of 31 December 2007, which were 74.51% and 74.44% respectively.

The number of States that had paid their 2008 assessed contributions in full as of 31 December 2008 was 99, the same as in 2007. Regarding 2007 assessed contributions, the collection rate as of 31 December 2008 amounted to 96.61%.

Expenditure

Owing to the low collection rate of 78%, the unused budget for the General Fund amounted to $20 692 480. The expenditure against the 2008 Budget amounted to $102 891 400, of which $18 512 946 was from the CIF. For the CIF, approximately 56.5% of the allotted funds were spent by the end of 2008.

PROCUREMENT

The PTS completed 495 procurement processes in 2008, compared with 463 in 2007. Procurement contracts for testing and evaluation and PCAs concluded by the end of the year covered 11 IMS stations, 6 stations at which noble gas equipment was tested and 1 radionuclide laboratory.

HUMAN RESOURCES

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

As of 31 December 2008, the PTS had 265 staff members from 75 countries, compared with 253 staff members from 71 countries at the end of 2007. Table 5 provides information on the distribution of staff members in the Professional category by geographical region. Table 6 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 2008, there were 53 women in Professional positions, corresponding to 31.36% of the staff in the Professional category. In comparison with 2007, the number of female staff members at the P3 and P2 levels remained the same, while at the P4 level there was an increase of 10.00%. On the other hand, there was a decrease of 16.67% at the P5 level.

In 2008, the PTS appointed 43 new staff members. In addition, the PTS processed contracts for 106 consultants, 19 interns and 6 linguists; 121 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 courses on ethics and accountability, project management, and results based management and budgeting.

Table 5. Professional Staff Members by Geographical Region (2005–2008)

Geographical Region	2005	2006	2007	2008
Africa	19	21	22	25
Eastern Europe	24	21	23	22
Latin America and the Caribbean	12	10	12	13
Middle East and South Asia	8	7	7	8
North America and Western Europe	82	73	70	74
South-East Asia, the Pacific and the Far East	30	29	24	27

Table 6. Regular Staff Members by Field of Work (31 December 2008)

Field of Work	Professional	General Service	Total
Evaluation Section	4	1	5
International Monitoring System Division	35	24	59
International Data Centre Division	71	16	87
On-Site Inspection Division	17	6	23
Subtotal, verification related	*127 (75.15%)*	*47 (48.96%)*	*174 (65.66%)*
Office of the Executive Secretary	4	3	7
Internal Audit	1	1	2
Division of Administration	19	28	47
Legal and External Relations Division	18	17	35
Subtotal, non-verification-related	*42 (24.85%)*	*49 (51.04%)*	*91 (34.34%)*
Total	**169**	**96**	**265**

Signature and Ratification

STATES WHOSE RATIFICATION IS REQUIRED FOR THE TREATY TO ENTER INTO FORCE (31 DECEMBER 2008)

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

STATUS OF SIGNATURE AND RATIFICATION OF THE TREATY BY GEOGRAPHICAL REGION (31 DECEMBER 2008)

Africa
(53 States)

51 Signatories
36 Ratifiers

Eastern Europe
(23 States)

23 Signatories
23 Ratifiers

Latin America and the Caribbean (33 States)

29 Signatories
28 Ratifiers

Middle East and South Asia
(26 States)

21 Signatories
15 Ratifiers

North America and Western Europe
(28 States)

28 Signatories
27 Ratifiers

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

28 Signatories
19 Ratifiers

STATUS OF SIGNATURE AND RATIFICATION OF THE TREATY (31 DECEMBER 2008)

180 Signed **148** Ratified **15** Not signed **47** Not ratified

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	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	
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
Cote 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
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	
Libyan Arab Jamahiriya	13 Nov. 2001	6 Jan. 2004

State	Date of Signature	Date of Ratification
Liechtenstein	27 Sep. 1996	21 Sep. 2004
Lithuania	7 Oct. 1996	7 Feb. 2000
Luxembourg	24 Sep. 1996	26 May 1999
Madagascar	9 Oct. 1996	15 Sep. 2005
Malawi	9 Oct. 1996	21 Nov. 2008
Malaysia	23 Jul. 1998	17 Jan. 2008
Maldives	1 Oct. 1997	7 Sep. 2000
Mali	18 Feb. 1997	4 Aug. 1999
Malta	24 Sep. 1996	23 Jul. 2001
Marshall Islands	24 Sep. 1996	
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
Moldova	24 Sep. 1997	16 Jan. 2007
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
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
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		
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
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		
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	