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CLOSE THE DOOR ON NUCLEAR TESTING

FORMER SOVIET LEADER
Mikhail Gorbachev

TRINIDAD AND TOBAGO'S PRIME MINISTER
Kamla Persad-Bissessar

DUTCH FOREIGN MINISTER
Uri Rosenthal

PULITZER PRIZE WINNER
Richard Rhodes

AND MANY MORE

SPECIAL EDITION: **15** YEARS OF THE CTBT

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) bans all nuclear explosions.

It opened for signature on 24 September 1996 in New York.

As of 7 September 2011, 182 countries had signed the Treaty and 155 had ratified it. Of the 44 nuclear capable States which must ratify the CTBT for it to enter into force, the so-called Annex 2 countries, 35 have done so to date while nine have yet to ratify: China, the Democratic People's Republic of Korea, Egypt, India, Indonesia, Iran, Israel, Pakistan and the United States. On 3 May 2010, Indonesia stated that it had initiated the CTBT ratification process.

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) consists of the States Signatories and the Provisional Technical Secretariat. The main tasks of the CTBTO are to promote signatures and ratifications and to establish a global verification regime capable of detecting nuclear explosions underground, underwater and in the atmosphere.

The regime must be operational when the Treaty enters into force. It will consist of 337 monitoring facilities supported by an International Data Centre and on-site inspection measures. As of 3 September 2011, roughly 80 percent of the facilities at the International Monitoring System (IMS) were operational.

COVER DESIGNED BY:
Michael Balgavy, DWTC

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TIBOR TÓTH
EXECUTIVE SECRETARY

The triple disaster that struck Japan in March – earthquake, tsunami and power plant accident – tragically killed over 20,000 people and left many more injured or homeless. As if that weren't enough, the spectre of radiation sickness had returned to haunt the Japanese people 66 years after the bombings of Hiroshima and Nagasaki. While the final assessment of the consequences for the wider area of Fukushima is still pending, the situation continues to be grave.

At the height of the crisis, minuscule levels of radioactivity spread from the damaged plant first over the Pacific Ocean, then across the United States and finally around the globe. While levels of radioactivity outside Japan were fortunately below those harmful to human health, there could hardly be a better illustration of how nuclear technology – whether in its civilian or military manifestation – can create problems of a global nature.

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) helps to address such problems, as it provides a global tool to identify and analyze them. Neither nuclear tests nor emissions from a damaged nuclear power plant can escape detection.

In this issue of Spectrum, Wolfgang Weiss from the German Federal Office for Radiation Protection (BfS) describes how IMS data helped BfS to cope with one million online contacts daily at the height of the Fukushima crisis. His Austrian colleague Gerhard Wotawa gives his account of how International Monitoring System (IMS) data helped worldwide information sharing. CTBTO radionuclide data provided first-hand information on the dangerous situation unfolding at the plant, even allowing scientists to conclude when the fuel rods had been damaged.

The events in Japan helped to foster closer cooperation with other relevant organizations such as the International Atomic Energy Agency (IAEA), the World Health Organization (WHO) and the World Meteorological Organization (WMO), which will assure a strong and coherent response in future disasters. In his article, the WMO's Secretary-General, Michel Jarraud, describes how the joint response system in place between the WMO and the CTBTO performed well during the March crisis.

Had the CTBT verification regime existed in the 1950s and 1960s, it would have tracked radioactive plumes from nuclear tests – many of them more toxic than the Fukushima release – every nine days on average. The levels of radioactivity that accumulated in the atmosphere at that time dwarfed the Chernobyl accident in 1986. And, of course, the 2,000-plus nuclear tests during the Cold War also helped a growing number of nations develop doomsday devices in the megaton range.

One of the defining figures in ending the Cold War was Soviet Union President Mikhail Gorbachev. He was also the first leader to declare a moratorium on nuclear testing in 1985. In this issue, he explains why we should not be satisfied with a virtual moratorium on nuclear testing, and should continue to press for entry into force of the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

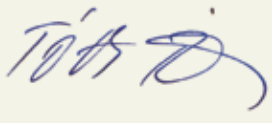
U.S. Pulitzer Prize-winning author and historian, Richard Rhodes, reflects on how 20 years after the famous 1986 Reykjavik summit, a group of U.S. statesmen – Shultz, Kissinger, Perry and Nunn – brought the importance of nuclear weapons elimination and the CTBT back into the political mainstream.
This year the CTBT, which opened for signature on 24 September 1996, celebrates its 15th anniversary. Disarmament expert Patricia Lewis remembers the day when U.S. President Bill Clinton and 70 other leaders put their signatures on the Treaty, describing it as "a great accomplishment, absolutely fantastic".

While it is admittedly frustrating that the CTBT has still not entered into force, there is no reason for gloom, as much has been accomplished over the last 15 years. Today the Treaty has 182 Signatories or Member States, representing 90 percent of the world's countries. Each signature is in itself a strong commitment to putting an end to nuclear testing, turning the Treaty into a de-facto international norm.

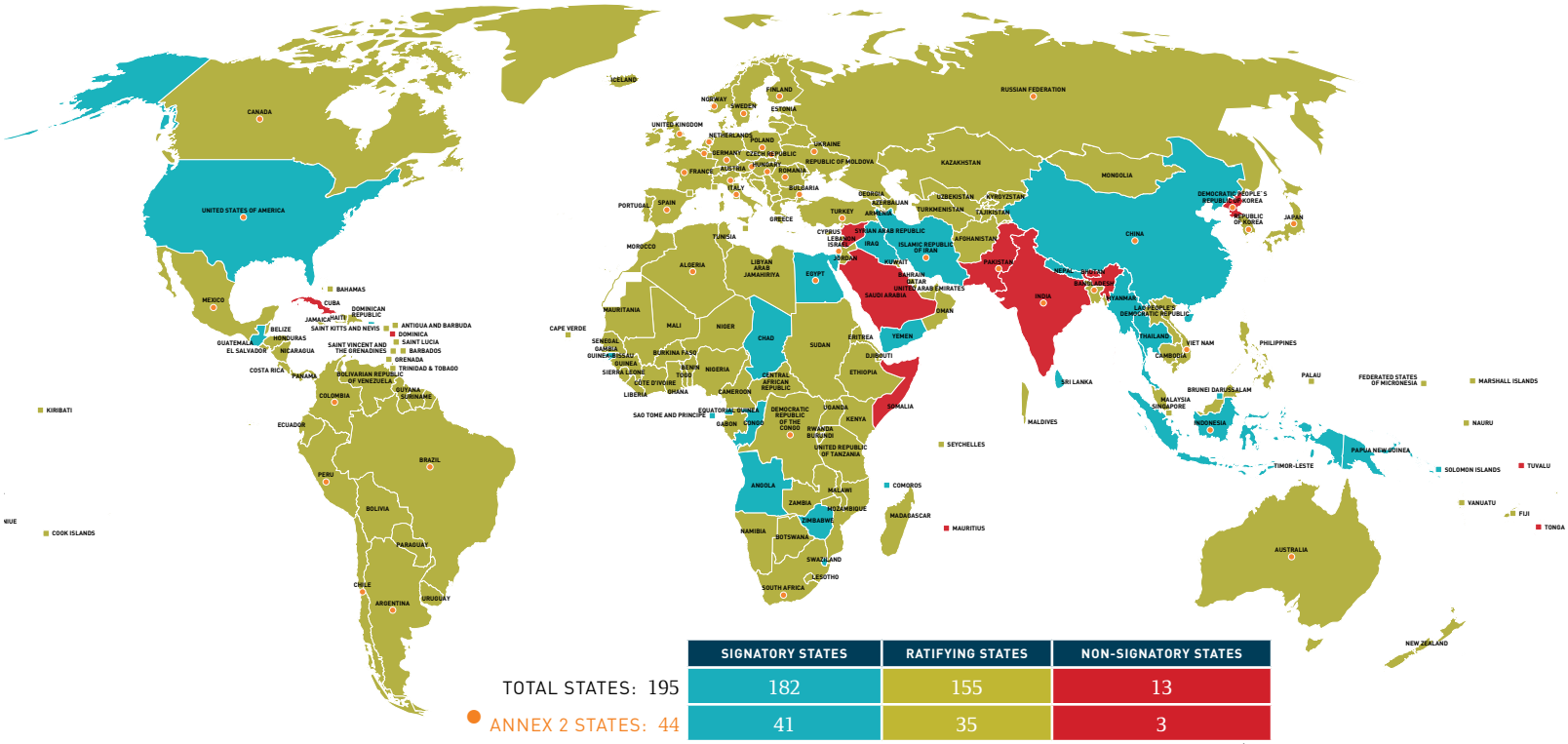
Yet it is more imperative than ever to turn this norm into a legal one, as Uri Rosenthal, the Foreign Minister of the Netherlands, explains in his contribution. We need to find ways to break free from the "debilitating, circular dynamic in which no one State will ratify unless certain other States do so first", urges arms control expert Christine Wing in her article.

It is therefore heartening to see the unwavering resolve of so many CTBTO Member States in pushing for entry into force. Around 100 foreign ministers will meet at the seventh Conference on Facilitating the Entry into Force of the CTBT on 23 September 2011 in New York to do just that. The conference's Co-Presidents, the Foreign Minister of Mexico, Patricia Espinosa Cantellano, and her Swedish counterpart, Carl Bildt, describe how they will steward this process over the coming two years.

It is the dedication of all these ardent supporters that makes the Treaty shine "as a beacon, lighting the path towards a peaceful world, free from nuclear explosions" as Kamla Persad-Bissessar, Prime Minister of the Republic of Trinidad and Tobago, so elegantly phrases it. Now more than ever it is time to close the door firmly on nuclear testing.



STATUS OF SIGNATURES AND RATIFICATIONS
AS OF 7 SEPTEMBER 2011



	SIGNATORY STATES	RATIFYING STATES	NON-SIGNATORY STATES
TOTAL STATES: 195	182	155	13
● ANNEX 2 STATES: 44	41	35	3

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PROMOTING ENTRY INTO FORCE

- Also called the Article XIV conference (AFC), this high-level conference takes place every two years.
- Because of the stringent entry-into-force requirements, the CTBT's Article XIV includes provisions for a conference to accelerate the ratification process if the Treaty has not entered into force three years after opening for signature.
- Special attention is paid to the nine outstanding nuclear holder States – the remaining Annex 2 States – that must ratify before the CTBT can enter into force; China, the Democratic People's Republic of Korea , Egypt, India, Indonesia, Iran, Israel, Pakistan and the United States.
- As the depositary of the Treaty, the UN Secretary-General Ban Ki-moon convenes the conference and invites States to participate. Ratifying States are mainly represented by their foreign ministers. Signatory and non-signatory States, intergovernmental organizations, specialized agencies and non-governmental organizations can also attend.
- A Final Declaration is adopted by each conference. The 2009 declaration urged the remaining nine States "to take individual initiatives to ratify the Treaty."
- All ratifying States are committed to the Final Declaration. Signatory States that have not yet ratified the CTBT but sign the Final Declaration also subscribe to its content. In 2009, these countries included China, Egypt, Indonesia, Israel, Iran and the United States (which are all Annex 2 States) and Ghana, Guatemala, the Marshall Islands, Myanmar, Sri Lanka, Thailand and Yemen.
- This year's conference will take place at the United Nations Headquarters in New York on 23 September.
- It will be presided over by Patricia Espinosa Cantellano, Mexico's Foreign Minister, and Carl Bildt, Sweden's Foreign Minister.

» It is urgent that the Comprehensive Nuclear-Test-Ban Treaty enters into force as early as possible. It is a major element of the international disarmament and non-proliferation regime, and it deserves the active support of all States. The Treaty's verification regime has proven to be a valuable instrument for international cooperation. On this International Day Against Nuclear Tests, I call on all States to take a bold step towards a safer and saner world for all.«

UN SECRETARY-GENERAL BAN KI-MOON,
NEW YORK, 29 AUGUST 2011

INTERVIEW WITH CARL BILDT, MINISTER FOR FOREIGN AFFAIRS OF SWEDEN

»A Treaty in force means a safer and more secure world and is a necessary step towards a future without nuclear weapons. For the CTBT to take legal effect, all of the so-called 44 Annex 2 countries must be on board.«

As Co-President of the Article XIV conference, what would you consider to be your main priorities in terms of promoting the CTBT's entry into force?

One priority would be to maintain and reinforce the political relevance of the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The CTBT is a cornerstone of, and a catalyst to, further strengthening the international disarmament and non-proliferation regime. It is also a vital contributor for reassurance and confidence-building in a wider regional and international security context. There is an urgent need to put this legal instrument firmly in place so that the door to nuclear testing can be closed once and for all.

As one of the Co-Presidents of the Article XIV conference this year, it is our objective to keep CTBT ratification high on the international agenda, and to increase the number of Treaty ratifications to promote its universalization. A comprehensive ban on nuclear testing concerns everyone.

In your opinion, what will be the most effective way over the next two years to encourage those Annex 2 States that have not yet signed or ratified the CTBT to do so?

All countries should be aware of the need to move forward on the Test Ban and the increased security for all that a CTBT in place would bring about. CTBT ratification should not be seen as a "zero sum game". The more States that ratify, the more all countries gain in terms of common security. And once the Treaty takes legal effect, there will be a qualitative leap in terms of increased security for all.

However, it is important to underline that an individual State has everything to gain from ratifying the CTBT, regardless of whether other pending States move forward with ratification or not. To sign and ratify the CTBT is a key contribution to confidence-building and a clear-cut commitment to international norms.

What message would you like to send to the nine remaining Annex 2 States?

That a Treaty in force means a safer and more secure world and is a necessary step towards a future without nuclear weapons. For the CTBT to take legal effect, all of the so-called 44 Annex 2 countries must be on board. We need to work together to make sure that the missing ratifications are added and that the CTBT enters into force.

BIOGRAPHICAL NOTE

CARL BILDT
was appointed the Swedish Minister for Foreign Affairs in 2006. Between 1991 and 1994 he served as Sweden's Prime Minister and was leader of the centre-right Moderate Party from 1986 to 1999. He has also been noted internationally as a mediator in the Balkan conflict, serving as the European Union's Special Representative for the Former Yugoslavia from 1995 to 1997, as High Representative of the international community in Bosnia and Herzegovina from 1996 to 1997, and as the UN Secretary-General's Special Envoy for the Balkans from 1999 to 2001.

INTERVIEW WITH PATRICIA ESPINOSA CANTELLANO, SECRETARY OF FOREIGN AFFAIRS OF MEXICO

»The international community must undertake a greater commitment to convince Annex 2 States that have not signed or ratified the Treaty to do so as soon as possible.«

As Co-President of the Article XIV conference, what would you consider to be your main priorities in terms of promoting the CTBT's entry into force?

Highlight the lack of justification for the existence of nuclear weapons; if most of the nuclear-weapon States have stated that they will not be the first to use those weapons, then the question to be asked is, what is the purpose of their existence? If such weapons have no logical reason to exist, further research for their development and enhancement is unnecessary.

I would also like to emphasize that the CTBT is intended to prohibit the execution of actual nuclear tests, which is the most practical step towards achieving general nuclear disarmament and non-proliferation. With a realistic approach, the Treaty can be ratified by those outstanding Annex 2 States without objection since it does not require them to eliminate their existing nuclear arsenals. Our long-term goal is their complete elimination, but the CTBT framework is one of the main and necessary steps along this road.

Mexico firmly believes that it is possible to achieve general and complete disarmament, and that weapons should be replaced by dialogue and cooperation to ensure peace and security. The existence of nuclear weapons and their use as a bargaining tool only reiterates the hypocrisy of those who possess them and their lack of willingness to assume the greatest challenge of humanity: to make the world a safe and dignified place to live.

In your opinion, what will be the most effective way over the next two years to encourage those Annex 2 States that have not yet signed or ratified the CTBT to do so?

The international community must undertake a greater commitment to convince Annex 2 States that have not signed or ratified the Treaty to do so as soon as possible. There are appropriate international fora to advance this objective and there are reasons for reaching it. The greater involvement of civil society should also be encouraged to strengthen the lobbying for the ratification and entry into force of the Treaty, mainly on the grounds of the illegitimacy of the use or threat to use nuclear weapons. It should also be made clear that the arguments put forward for not ratifying the Treaty, as well as the possession and use of nuclear weapons (based on military concerns and false dilemmas) ignore tangible actions towards a durable peace and a secure world.

Also, all Member States have to take a more active role with the Annex 2 countries to establish strategies for the early entry into force of the CTBT.

What message would you like to send to the nine remaining States?

It is necessary that they assume, with real political will, their responsibility before the international community to strengthen international peace and security. It is inconsistent that they refer to peace and security, when most of the world's population fears the use or the threat to use nuclear weapons. It is also unacceptable to know that, while an important part of the world's population lives in poverty because of lack of development opportunities and education, there are large amounts of resources allocated to develop, manufacture, maintain, deploy and improve nuclear weapons and capabilities.

BIOGRAPHICAL NOTE

PATRICIA ESPINOSA CANTELLANO is a career diplomat who was appointed Secretary of Foreign Affairs of Mexico in 2006. From 2002 to 2006 she served as Mexico's Ambassador to Austria and Permanent Representative to the International Organizations in Vienna and from 2001 to 2002 as Mexico's Ambassador to Germany. In 2005, while in Vienna, Ms. Espinosa served as Chair of the CTBTO's subsidiary body that deals with budgetary and administrative matters.

The Comprehensive Nuclear-Test-Ban Treaty: Helping to create a truly global community

BY MIKHAIL GORBACHEV
FORMER LEADER OF THE SOVIET UNION

When President Barack Obama signed the U.S. instrument of ratification for the new Strategic Arms Reduction Treaty, or START, on 2 February 2011, he cleared the way for the United States and Russia to put the landmark accord into effect. Three days later, the new START officially entered into force.

The new START reduces the size of the American and Russian nuclear stockpiles, thus representing a serious step forward for both countries. I hope this will energize efforts to take the next step to a world free of nuclear weapons: a ban on all nuclear testing.

In the final stretch, President Obama put his credibility and political capital on the line to achieve ratification. That a sufficient number of Republican senators put the interests of their nation's security, and the world's, above party politics is encouraging.

The success was not without cost. In return for the treaty's ratification, Mr. Obama has promised to allocate U.S.$ 85 billion over the next 10 years for modernizing the American nuclear weapons arsenal, which is hardly compatible with a nuclear-free world.

A TOTAL BAN ON NUCLEAR EXPLOSIONS IS OF PARAMOUNT IMPORTANCE

The priority now is to ratify the separate treaty banning nuclear testing. The stalemate on this agreement, the Comprehensive Nuclear-Test-Ban Treaty (CTBT), has lasted more than a decade. I recall how hard it was in the second half of the 1980s to start moving in this direction. At the time, the Soviet Union declared a unilateral moratorium on nuclear testing. However, when the United States continued to test, we had to respond.

Even so, we insisted on our position of principle, calling for a total ban on nuclear testing under strict international control, including the use of seismic monitoring and on-site inspections.

In 1996 the United Nations General Assembly finally opened the CTBT for signing and ratification. But this pact has a particularly stringent requirement for its entry into force: every one of the 44 "nuclear technology holder states" must sign and ratify it.

»Universal ratification of the test ban treaty would be a step toward creating a truly global community of nations, in which all share the responsibility for humankind's future.«

As of today, 35 have done so, including Russia, France and Britain. Still, the list of countries that have not ratified remains formidable: It includes the United States, China, Egypt, Indonesia, Iran, Israel, India, North Korea and Pakistan (the final three have not even signed). Each "rejectionist" country has its arguments,

The 'fireside chat' – the first meeting between U.S. President Reagan and Soviet General Secretary Gorbachev during the Geneva Summit in 1985.

but all are not equally responsible for the stalemate. The process of ratification stalled after the United States Senate voted in 1999 to reject the Treaty, claiming that it was not verifiable and citing the need for "stockpile stewardship" to assure the reliability of American weapons. The real reason was doubtless the senators' desire to keep testing.

Nevertheless, in the 21st century only one country, North Korea, has ventured to conduct nuclear explosions. There is, in effect, a multilateral moratorium on testing. It is increasingly obvious that for the international community nuclear explosions are unacceptable.

CTBT VERIFICATION REGIME CAN ALSO HELP WITH DISASTER MITIGATION

In the meantime the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) has built up a strong verification regime. Over 260 monitoring stations — around 80 percent of the number needed to complete the system — are now fully operational. The system proved its effectiveness by detecting the relatively low-yield nuclear explosions conducted by North Korea in 2006 and 2009. And in March 2011, the system once again demonstrated its capability after the 9.0 magnitude earthquake off the coast of Japan triggered a massive tsunami. Data from the CTBTO's monitoring stations helped tsunami warning centres in Japan and the wider Pacific region to issue rapid tsunami alerts. Following the accident at the Fukushima Daiichi nuclear power plant, the CTBTO became an authoritative source of information on radiation dispersal around the globe for both its Member States and international organizations involved in nuclear safety and disaster mitigation.

So with North Korea being the only country to have conducted any tests over the last decade, should we, perhaps, be content with this virtual moratorium on nuclear testing?

No, because commitments that are not legally binding can easily be violated. This would render futile any attempts to influence the behaviour of countries that have been causing so many headaches for the United States and other nations.

U.S. SENATE WOULD BE WRONG TO REJECT CTBT AGAIN

The American senators should give this serious thought. As George Shultz, Secretary of State under President Ronald Reagan, has said, Republicans may have been right when they rejected the Treaty in 1999, but they would be wrong to do so again.

It is fairly certain that once the Senate has agreed to ratification, most of the countries still waiting will follow. No country wants to be a "rogue nation" forever, and we have seen that dialogue with even the most recalcitrant governments is possible. Yet dialogue can work only if the United States refrains from telling others what they must not do while keeping its own options open.

On 23 September, foreign ministers from the CTBTO's 182 Member States will gather in New York for the Conference on Facilitating the Entry into Force of the CTBT. They will jointly call upon those States that need to adhere to the Treaty so that it can enter into force. They will commit their countries to act at the highest political level to make this happen. Let's hope that this will lead to further ratifications, especially by the 'rejectionist' countries mentioned above.

Universal ratification of the test ban treaty would be a step toward creating a truly global community of nations, in which all share the responsibility for humankind's future.

A version of this op-ed appeared in print on 29 December 2010 on page A23 of the New York Times.

BIOGRAPHICAL NOTE

MIKHAIL GORBACHEV was the last head of state of the Soviet Union. From 1985, he embarked on a programme of political, economic, and social liberalization under the slogans of *glasnost* (openness) and *perestroika* (restructuring). He declared a moratorium on nuclear testing from 1985-87 and then again from 1991. While in power, agreement was reached with the United States on the Intermediate-Range Nuclear Forces Treaty in 1987 and START in 1991. In recognition of his outstanding services as a reformer and world political leader, Gorbachev was awarded the Nobel Peace Prize in 1990.

Trinidad and Tobago's long standing support

for an international non-proliferation regime

BY KAMLA PERSAD-BISSESSAR
PRIME MINISTER OF THE REPUBLIC
OF TRINIDAD AND TOBAGO

Today, the international community stands at what is essentially a nuclear power crossroads. Indeed, the moment is upon us to make critical decisions about the place of nuclear power in our world – decisions which will indelibly shape our future for generations to come. Given the life-changing nature of nuclear power, its divisive nature is only to be expected.

It is crucial that the line between prohibited and permitted nuclear activities is drawn clearly and irrevocably. The Comprehensive Nuclear-Test-Ban Treaty (CTBT) provides the last and most visible barrier against nuclear weapons development.

In this regard, Trinidad and Tobago believes that the CTBT stands as a beacon, lighting the path towards a peaceful world, free from nuclear explosions, whether for military or for peaceful purposes. For this reason, Trinidad and Tobago signed the CTBT on 8 October 2009 and ratified it on 26 May 2010.

A LONGSTANDING COMMITMENT TO GLOBAL PEACE AND SECURITY

Trinidad and Tobago is also a State Party, since 1963, to the Treaty banning Nuclear Weapon Tests in the Atmosphere, In Outer Space And Under Water (Partial Test Ban Treaty); to the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Treaty of Tlatelolco) which was signed in 1967 and ratified in 1970; and the Nuclear Non-Proliferation Treaty (NPT) which was signed in 1968 and ratified in 1986. Becoming a State Party to these international instruments bears testimony to our long held commitment to global peace and security.

It should be noted that during the Commonwealth Heads of Government Meeting which was held in Trinidad and Tobago in November 2009, the threats posed by weapons of mass destruction, especially nuclear weapons, were acknowledged, resulting in the reaffirmation by States of their commitment to eliminate the world of these weapons. As Chair-in-Office of the Commonwealth until October 2011, Trinidad and Tobago has continued to promote this aspect of the Final Communiqué.

The country has also consistently voted in favour of the General Assembly resolution calling for the entry into force of the CTBT, the most recent being A/RES/65/91, which welcomed the ratification by Trinidad and Tobago as a significant step towards the early entry into force of the Treaty.

ADDRESSING THE VITAL LINKS BETWEEN WOMEN AND DISARMAMENT

Affirming that the CTBT constitutes the cornerstone of the nuclear non-proliferation regime, during my

contribution to the General Debate of the 65th Session of the United Nations General Assembly, in September 2010, Trinidad and Tobago announced that it would introduce in the First Committee, which is devoted to disarmament, internal peace and security, a resolution on women, disarmament, arms control and non-proliferation.

As the first female Prime Minister of Trinidad and Tobago, it was encouraging to see that on 8 December 2010 the said resolution, A/RES/65/69, was adopted by consensus "recognizing that the participation of both men and women is essential for the attainment of sustainable peace and security", and also "the valuable contribution of women to practical disarmament measures carried out at the local, national, regional and subregional levels in the prevention and reduction of armed violence and armed conflict, and in promoting disarmament, non-proliferation and arms control…"

The adoption of resolution 65/69 marked the first time that the General Assembly formally addressed the vital links between women and disarmament, and was welcomed by many disarmament, peace and security activists as a means of enhancing the United Nations Security Council Resolution 1325 of 2000, which, it was believed, did not sufficiently address disarmament issues.

In sponsoring resolution 65/69, Trinidad and Tobago clearly demonstrated not only its ongoing support for a nuclear-weapon free, demilitarized global world; but more so reiterated its belief that all discussions on disarmament, conflict resolution and peace-building must include women to ensure an expansion of their role. This is absolutely crucial since women increasingly suffer the greatest harm as a result of armed conflict, despite being in the minority among the combatants and perpetrators. The Executive Secretary of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Tibor Tóth, perhaps said it best with the phrase: "Security is too important to be left just to men". Trinidad and Tobago firmly agrees with his view that a secure world must be based on gender equality, and that efforts to achieve such a world must include women at all levels and in all processes in order to obtain the best results.

Also during the 65th Session of the General Assembly, Trinidad and Tobago's contribution by Dr Surujrattan Rambachan, Minister of Foreign Affairs, to the High-Level Meeting on Revitalizing the Work of the Conference on Disarmament and Taking Forward Multilateral Disarmament Negotiations, underscored the view that disarmament is a major factor in the promotion of peaceful relations among States. For this reason, Trinidad and Tobago became party to certain Conventions including the CTBT.

CIVIL AND SCIENTIFIC USES

Trinidad and Tobago has noted, with interest, that the data collected by the CTBTO, which are being employed to monitor the planet for nuclear explosions, also offer a wide range of civil and scientific uses. These comprise real-time notification of the location and size of potentially damaging earthquakes and natural disasters, early detection of volcanic eruptions, and scientific studies of the earth, including the oceans and atmosphere. Of particular interest to Trinidad and Tobago are the seismic and hydroacoustic technology and data, with the capacity for rapidly acquiring and disseminating data on potentially tsunami-generating earthquakes and generating research on climate change, respectively.

ESTABLISHING A TSUNAMI EARLY WARNING SYSTEM FOR THE CARIBBEAN

At present, efforts are underway to establish a tsunami early warning system in the Caribbean through the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS). Established in 2005, the ICG/CARIBE EWS is a subsidiary body of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

As part of this effort, the Government of Trinidad and Tobago has partnered with the United States Agency for International Development (USAID) and the Australian Agency for International Development (AusAID) to strengthen the capacity to detect, monitor and provide early warning of tsunamis and related geologic hazards; and facilitate the development of information sharing policies between earthquake monitoring agencies in the Caribbean, Central America and the northern countries on the South American continent. In this vein, Trinidad and Tobago remains committed to strengthening the capacity of the Seismic Research Centre located at the University of the West Indies, St. Augustine Campus, in Trinidad and Tobago, to detect, monitor and warn persons at risk from tsunami and other related geological hazards.

CTBTO DATA CAN HELP PROVIDE FASTER TSUNAMI WARNINGS

In the interim, the Pacific Tsunami Warning Center (PTWC) would send a warning to specific government agencies

Article continues on page 32

BIOGRAPHICAL NOTE

KAMLA PERSAD-BISSESSAR is the Prime Minister of Trinidad and Tobago and Commonwealth Chair-in-Office and has made history by being the first woman to hold either position. She has been a legislator in the Trinidad and Tobago Parliament for the past 24 years, serving in such capacities as Attorney General, Minister of Education, Minister of Legal Affairs and Opposition Leader. Mrs. Kamla Persad-Bissessar has pledged her continued commitment to advance women's empowerment, reduce poverty and promote global peace building.

Getting to Grips with the Nuclear Paradox

The Netherlands, a leading CTBT advocate, says now is the time for entry into force.

BY URI ROSENTHAL, MINISTER OF FOREIGN AFFAIRS OF THE KINGDOM OF THE NETHERLANDS

The proliferation of nuclear weapons is one of the major threats to international peace and stability. Although most nations have ratified or acceded to the Nuclear Non-Proliferation Treaty (NPT) and the ban on nuclear testing is gaining ground, we are facing a threat paradox. As President Obama said, 'In a strange turn of history, the threat of global nuclear war has gone down, but the risk of a nuclear attack has gone up.'[1]

Disarmament and nuclear non-proliferation are therefore cornerstones of Dutch foreign security policy and we have consistently worked to strengthen the international system of legally binding treaties and law in this field, with the NPT at its core.

PUSHING FOR THE CTBT'S ENTRY INTO FORCE

In this context, the recent establishment of the Non-Proliferation and Disarmament Initiative (NPDI), of which the Netherlands is a founding partner, is an important development. At our last ministerial NPDI meeting in Berlin in April, we decided to aim for greater transparency in the way nuclear weapon States report their disarmament efforts. This can also help create the conditions for new steps towards further nuclear arms reductions between the existing nuclear weapon States. As NPDI partners, we will also intensify our efforts to universalize the International Atomic Energy Agency's Additional Protocol, which is vital to ensure that nuclear activities remain peaceful, and work for the entry into force of the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

The CTBT is an essential part of the non-proliferation and disarmament system. The Netherlands has always been one of its strongest advocates. It was among the first Annex 2 States[2] to sign it and did so on 24 September 1996 – the very day that the Treaty was opened for signature. Former Ambassador Jaap Ramaker, who had played a key role in the Treaty's drafting and adoption, became the Special Representative to Promote the Treaty's Ratification Process.

However, nine remaining Annex 2 States still need to ratify the Treaty before it can enter into force. The Dutch government will continue its diplomatic efforts to reach that target. Some argue that nuclear tests are still necessary for safety, to verify the reliability of existing arsenals. But technological progress has made nuclear tests redundant. Today's sophisticated, computerized simulations can effectively guarantee the reliability of nuclear stockpiles.

A BAN ON NUCLEAR TESTS IS MORE NECESSARY THAN EVER

Why ban nuclear tests then, one could argue, when there's no more need to conduct them anyway? The reason is that by banning the tests, we can

[1] Barack Obama, Prague, 5 April 2009.
[2] The Annex 2 States include 44 countries, which possessed nuclear power or research reactors in 1996. Thirty-five have already ratified the CTBT.

restrain new countries from developing new nuclear weapons programmes and halt the development of advanced new types of nuclear weapons.

Such restraint is more necessary today than ever before. The recently discovered enrichment facility in North Korea augments our concerns about its nuclear programme. The full extent of the Iranian nuclear programme – especially its possible military dimensions – remains unclear. The international relations expert Parag Khanna noted that 'States seek nuclear weapons to deter the United States and nearby enemies, to compel neighbours to accept their dominance, and to gain status in the world's nuclear club.'[3]

In addition to concerns about certain States, we also have to confront the danger of nuclear arms falling into the hands of non-State actors like international terrorist groups. The political commentator Moisés Naím pointed to an increase in illegal arms smuggling and its links with international, organized crime[3]. Unconventional, hybrid threats caused by a combination of such forces may seem remote, but the danger of nuclear terrorism is real. NATO referred in its new Strategic Concept to nuclear terrorism as one of the primary international threats.

A POWERFUL DETERRENT TO WOULD-BE VIOLATORS

This brings me to another issue: the CTBT's verifiability. Some argue that despite the Treaty, clandestine tests can still go unnoticed by the international community. This is not true: the CTBT's International Monitoring System is up and running. From its earliest stages, the Netherlands has been closely involved by contributing expertise to its further development. Moreover, the monitoring system has proven its effectiveness already. Its seismic monitoring network successfully detected both nuclear tests by North Korea in 2006 and 2009. However, we would have been able to conduct intensive on-site inspections had the Treaty been in effect. Once the Treaty is in force, the combination of the monitoring system's technologies and the possibility of on-site inspections should deter countries considering future clandestine tests.

»Fifteen years after the Treaty's adoption by the UN General Assembly on 10 September 1996, we should make a strong push towards its entry into force. Now is the time.«

MONITORING DATA ALSO HAVE CIVILIAN USES

The monitoring system's relevance to early warning for natural disasters has grown as well, for example by contributing seismic and hydroacoustic monitoring data to tsunami warning centres. If it had not been for the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization sharing these data with the Japanese authorities on 11 March, the number of casualties from the 9.0 magnitude earthquake and tsunami that hit Japan would have been even more tragic. From the very next day, the monitoring system's radionuclide stations around the globe could trace the dispersion of radioactivity from the Fukushima nuclear power plant to Russia, the United States, Europe and eventually to the southern hemisphere. In this regard, we should explore the possibilities of expanding the civilian use of the monitoring system in other areas of emergency awareness.

Finally, although the Comprehensive Nuclear-Test-Ban Treaty has not yet entered into force, it has already contributed to the international norm against nuclear weapons testing. Since the early 1990s, the five NPT nuclear weapon States have maintained their moratoria on tests. Pakistan and India have maintained their moratoria since 1998. Ratification by remaining Annex 2 countries will further strengthen the norm. The Treaty's entry into force will bolster the verification system. I therefore welcome Ghana's recent ratification and Indonesia's efforts to complete its ratification process in the course of this year. I hope that more announcements will follow at this month's Article XIV conference in New York. Fifteen years after the Treaty's adoption by the UN General Assembly on 10 September 1996, we should make a strong push towards its entry into force. Now is the time.

BIOGRAPHICAL NOTE

URI ROSENTHAL
was appointed Minister of Foreign Affairs of the Netherlands in October 2010. From 1999, he represented the People's Party for Freedom and Democracy (VVD) in the Dutch Senate, becoming its leader in the Senate in 2005. Prior to this, he was appointed professor of political science at Erasmus University in 1980 and professor of government at Leiden University in 1987. Besides his academic career, he was chairman of the Institute for Safety, Security and Crisis Management.

[3] Parag Khanna, *How to Run the World: Charting a Course to the Next Renaissance* (New York, 2011).
[4] Moises Naim, *Illicit: How Smugglers, Traffickers and Copycats Are Hijacking the Global Economy* (New York, 2005).

Face to Face with Patricia Lewis:

Reflections on Gender, the CTBTO and the Nuclear "Danse Macabre"

ANNIKA THUNBORG, CHIEF OF PUBLIC INFORMATION AT THE CTBTO, TALKS TO PATRICIA LEWIS, DEPUTY DIRECTOR OF THE JAMES MARTIN CENTER FOR NONPROLIFERATION STUDIES AT THE MONTEREY INSTITUTE OF INTERNATIONAL STUDIES

What kind of challenges have you encountered as a nuclear physicist and arms control expert in a field that tends to be predominantly male?

As a physicist, I worked almost exclusively with men from a very young age. That has remained true in my work in disarmament – less so, but I still work primarily with men. I think essentially we're the same but we use language in a different way, which can lead to misunderstandings but it can also be very enriching. I think of myself as bilingual in my profession so that I can understand what both men and women are saying.

What do you think will change if you have more women involved in non-proliferation and disarmament and the nuclear sciences?

It's an issue of gender but I also think it's an issue of diversity. It's about not having a particular culture, be it a masculine culture or a white Western culture. It's about what we call cognitive diversity, i.e. the different ways in which brains think and approach problems. People bring not only their problem-solving approaches but also their experience to any discussion. If you have a lot of people from a similar culture in the discussion, you'll get a number of different approaches but you won't get as full a range as when you're in a situation with people from different backgrounds and a gender blend of roughly 50:50. If you have a really difficult problem to solve as we do [the issue of nuclear disarmament], the best way to go about solving it is by bringing in many different viewpoints, experiences, creativity etc. which you won't have in a monocultural approach.

Do you think the increased diversity in this field both in terms of gender and culture has led to progress?

Yes. I've also worked at the United Nations where you can see the impact of having many different cultures. You have a wide range of personalities as well and it's an organization that's striving for gender equality. I've lived around the world and every time I've been exposed to new ways of thinking and cultures, it's opened up my mind and allowed me to think about new approaches to various issues.

As well as the importance of gender balance, if everybody feels that they have the right to speak or be listened to, you get so much more out of people. The frustration is that it can take a lot longer. But as every engineer will tell you,

everything's in the preparatory work. If you don't put the time into the design or discussions, you end up with a product that won't stand up. So it's actually worth putting time into the preparatory work.

What would be your message to the leaders who are participating in the Conference on Facilitating the Entry into Force of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) – or the Article XIV conference – in New York on 23 September?

The emphasis has to remain on getting full ratification. I've proposed several times that we should consider provisional entry into force if it appears that we're not going to see ratifications by all of the nine outstanding States[1]. Certainly if the United States ratifies and then a few others do but then we get stuck again with other countries that don't ratify, I would definitely push that. But given that everybody is hoping the United States will ratify, we're not there yet. The focus on U.S. ratification is very good. I think the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) does as much as it possibly can to make sure that outstanding States ratify the Treaty.

I also think it's important to stress the connection with earthquake monitoring, tsunami warning, volcanic eruption monitoring – or using CTBTO data for a range of other civil or scientific applications. The International Monitoring System (IMS) is such an important resource for Earth scientists. It's not just about monitoring the test ban. I think that developing countries, in particular, need to have that communicated more and more. Obviously with Fukushima and tsunami warnings, the CTBTO has demonstrated its worth. I think Fukushima also showed the CTBTO's global reach and the ability of the IMS to detect radionuclides. Of course, one never wanted nuclear tests by North Korea or a nuclear accident in Japan. But being able to help populations with this technology has been an amazing demonstration of what the CTBTO can do.

[1] The nine States are: China, the DPRK, Egypt, India, Indonesia, Iran, Israel, Pakistan and the United States.

»The CTBTO has done an amazing job in developing new technologies and approaches and placing emphasis on science and creativity«

With regard to the nuclear accident in Fukushima, I don't think that our profession should exaggerate the risks but we shouldn't downplay them either. We need to talk about the radiation levels in a realistic and credible way because there is sometimes a tendency, I believe, in the international community and the scientific community to dismiss the public fears and to say that there's no danger. We need to be much more honest about the risks without fear mongering.

I completely agree with you. I was very much engaged in the scientific discussions on Fukushima. I've been shocked by the readiness of scientists to accept what was told to them by the people who we now know were withholding information, and their readiness to dismiss any concerns over the levels of radiation. Here I think we saw the wisdom of civil society. They don't believe all this nonsense! We need a much more open discussion. I always compare it to the airline industry. Every time there's a crash, they can't pretend it didn't happen. So they investigate and produce a report. I feel the same way with the nuclear industry. They need to be open and honest about the risks and address them and stop denying them. If we look at the chemical weapons negotiations, the industry made it very clear that they were distancing themselves from the past when they'd supplied chemicals for chemical weapons or for even worse things like gas chambers. And they were the biggest supporters of the Chemical Weapons Convention. If the nuclear industry could do that for nuclear disarmament, it would really help. They could make a difference to their own industry and to the debate as well as being seen to promote something good.

How do you see the role of civil society, the media and parliamentarians during the Article XIV conference in terms of promoting ratifications?

Civil society's role is not something that should be the final paragraph in a conference report. It's actually one of the most central aspects of our work. In democracies or even in countries that aren't democracies, the views of the population are paramount. But it's more than that. It's about the way in which government is structured, the whole meaning of what we now understand as human security, where we put the people right at the centre of our security decision-making. So if we're putting people at the centre in terms of their protection, we need to do the same in terms of their views. And our representatives need to take heed of the range of views of the population in the decision-making processes.

I think it's positively connected as well with problem-solving approaches and new ideas, which can really take things forward. So civil society and the representatives of civil society – the voices of ordinary people – are essential to how we might progress.

One of the things I think we've seen over the last few years is the importance of partnerships between governments and civil society organizations. The Mine Ban Convention, the Convention on Cluster Munitions and the Biological Weapons Convention processes have all involved such partnerships. The one forum where the role of civil society has been almost completely excluded is the Conference on Disarmament (CD) and, in stark contrast to other processes, there's absolutely no movement in the CD. I'm not saying that it's the only reason but it's certainly an important factor.

The nuclear issue is often seen as more complex than the land mine or cluster munitions issue. Do you think that the complexity of the nuclear issue both politically and technically makes it more difficult for civil society to influence the process?

I don't actually think it's a more complex issue. Nuclear weapons are very big, dirty, nasty weapons that go bang and make a lot of mess. Then they've also got this sort of magic associated with them in that they're supposed to prevent conflict, although there's not much evidence of that. My feeling is that the discussion is connected with power, the type of power that we think of as belonging only to the elite, so it's a kind of magical power. It's fraught with emotions such as obtaining power, wanting to have a dominant power over others and so on. So it's got all of these different layers and in that way, it's complex.

But if you look at other weapons systems such as landmines and cluster munitions, these are weapons that are actually used every day. In some ways it's much harder than getting rid of weapons that are not used and will not, we're told, be used. So there's something else going on. We've got ourselves stuck in a dance where the governments and civil society know the steps of the dance very well and they're not changing the rhythm and it keeps going on. A *danse macabre* if you like.

One of the things I think we could do is look at successful processes. It's especially inspirational to see how these processes put the people at the centre of decision-making. In the case of land mines and cluster munitions, it's very important to show the direct daily impact of these weapons on people to those who are making decisions about them. In the case of nuclear weapons, we can show them what happened in the past because we've had some experience of nuclear testing and the impact of it. We can also imagine what will happen in the future. What we need is the preventive principle, similar to what we have for climate change, to prevent complete and utter disaster in the future. We need to start focusing on the humanitarian or human rights principles in which human beings and civil society are at the centre of decision-making.

The CTBT turns fifteen on 24 September. Briefly, what has been accomplished in the last 15 years and what remains to be done?

It's such an important date – one of so much hope and such a sense of accomplishment. The CTBT had been the prize of so many for so long.

India had blocked it in the Conference on Disarmament and that was certainly a bad omen. But we had just been through the indefinite extension of the Nuclear Non-Proliferation Treaty, the Cold War was over, and the Chemical Weapons Convention had been signed. And there we were signing off the Comprehensive Nuclear-Test-Ban Treaty. And it was a truly comprehensive treaty. Not a treaty with limits, not a treaty that allowed some amount of testing to still go on etc. etc. It was a great accomplishment, absolutely fantastic.

The fact that the CTBT hasn't entered into force is very frustrating. Even if the United States does ratify, others still have to do so to fulfill the Treaty's Annex 2 requirements (see page 4). But it will be harder for them to explain their failure to ratify if a country like the United States does so. That is the great prize and we need to make it happen. It will take enormous leadership and quite a lot of determination to get the CTBT ratified but we must have it.

In the meantime, the CTBTO has done an amazing job in developing new technologies and approaches and placing emphasis on science and creativity. It's also made great headway in setting up the IMS, which is now 80 percent operational. Although we've had the tragedy of two nuclear tests by North Korea, at least the CTBTO has shown itself at the forefront of being able to detect these tests. That should put to rest any concerns that countries have about verification. And as I mentioned earlier, it's important to raise awareness about the use of monitoring data for disaster mitigation purposes. This potential that the CTBTO can provide in terms of disaster mitigation for earthquakes, tsunamis and volcanic eruptions for ordinary people is fundamental for people living in all corners of the world.

An aerial view of damage caused by the March 2011 earthquake in the Tōhoku region, Japan. CTBTO data can also be used for disaster mitigation.

BIOGRAPHICAL NOTE

PATRICIA LEWIS
is the Deputy Director and Scientist-in-Residence of the James Martin Center for Nonproliferation Studies at the Monterey Institute of International Studies in the United States. Previously, she was the Director of the United Nations Institute for Disarmament Research and of the Verification Technology and Information Centre. In 2009, Dr Lewis received the Joseph A. Burton Forum Award for "outstanding contributions to the public understanding or resolution of issues involving the interface of physics and society."

VOICES

Why Wait?

States will cede power by waiting for others to ratify the CTBT first

BY CHRISTINE WING,
CENTER ON INTERNATIONAL
COOPERATION, NEW YORK UNIVERSITY

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is awaiting ratification by nine nuclear holder countries before it can enter into force: China, the Democratic People's Republic of Korea (DPRK), Egypt, India, Indonesia, Iran, Israel, Pakistan, and the United States[1]. Governments in each country have their own specific reasons for not yet ratifying the Treaty. But one reason is shared by many, and deserves particular attention: the argument that a government does not want to ratify the CTBT until x or y State does so.

Often, that blank is filled by naming the United States, such that U.S. ratification becomes the pivot on which decisions by other States turn. There are good reasons for attention to the United States: clearly the CTBT will not enter into force *without* U.S. ratification, and the Treaty's fate in the United States is therefore important. Yet the same could be said of China, India, Israel, Pakistan, or any other so-called Annex 2 State[2] that has not yet ratified the Treaty but is required to do so for entry into force. Moreover, for a government to make its decision contingent on U.S. (or Chinese, or Indian, or Israeli, or Pakistani…) action is to give enormous power to that State—and to the opponents of the CTBT within that State. At the regional level, governments may also assert that their own decision is contingent on ratification by their neighbour. This is likely especially in regions of ongoing political and potential military conflict.

NO NEED FOR FURTHER NUCLEAR EXPLOSIONS

The implication is that governments are cautious because their security interests are threatened if certain States do not ratify. However, the only actual loss that a government sustains through ratification is that it foregoes the option to conduct tests legally. But is this a real loss? Five of the non-ratifying Annex 2 States have nuclear arsenals that are more than adequate for deterrence, and their governments are confident in that deterrent. Indeed, there is no apparent need for further testing—a position that is acknowledged in numerous of these countries, at least in private. Furthermore, three of the non-ratifying Annex 2 States are non-nuclear weapon States Parties to the Nuclear Non-Proliferation Treaty (NPT), and legally obligated not to develop nuclear weapons programmes. Only one State – the DPRK – with a still-small nuclear weapons programme in development, has tested recently. It may do so again. But this does not mean that the other Annex 2 countries are threatened to a degree that the Treaty should not come into force.

[1] Six of these States have signed the CTBT but not yet ratified: China, Egypt, Iran, Indonesia, Israel, and the United States. The DPRK, India, and Pakistan have not signed the Treaty. Indonesia has stated its intention to ratify the CTBT in the near future.

[2] The Annex 2 States include 44 countries, which possessed nuclear power or research reactors in 1996. Thirty-five have already ratified the CTBT.

The last Conference on Facilitating the Entry into Force of the CTBT held at the United Nations Headquarters in New York in September 2009 resulted in several ratifications.

If the rationale for testing is not compelling, then how do we account for these governments' reluctance to ratify the CTBT? One factor is that the status quo works well for many of the remaining Annex 2 States: other than the DPRK, no State has tested for over a decade, and governments can reap the benefit of a testing moratorium without taking on Treaty obligations. In this context, governments may be reluctant to disturb the seemingly tacit agreement among major nuclear-armed States to refrain from testing. Alternatively, some governments may be willing to ratify, but hold out ratification as a bargaining chip in other international transactions.

Equally, if not more important, are the domestic politics of the CTBT. Although a government may decide that acceding to the CTBT does not represent a security risk, it may still face divisive domestic opposition. Given the potential cost of ratification, especially in the context of a workable status quo, the price of ratification may well seem higher than the benefits conferred.

WORRYING ABOUT LOSSES, NOT PLANNING FOR GAINS

Which brings us to the crux of the issue. As with most things in public life, the real question that governments face is whether there is more to gain or to lose through positive action. To date, for the governments of these non–ratifying Annex 2 States, the scale has tipped toward worrying about losses, rather than planning for gains. Inaction has seemed better than action. But this is under-ambitious and shortsighted—for there are significant gains to be had if States choose not to wait for others to adopt the CTBT.

Firstly, if any of the non-ratifying nuclear-armed States were to adopt the Treaty before the United States does, the international political context for entry into force would change instantly. Partly this is because the widely held view that everything depends on the United States would need re-thinking. But also, a decision made independently of U.S. action would affirm that the CTBT is valuable in its own right and that its implementation is trustworthy, regardless of any one State's failure to ratify. Moreover, such a decision could reassure domestic opponents in other non-ratifying States, i.e. those who argue against ratification because they fear that powerful States will still remain outside the Treaty.

Finally, if the U.S. were no longer seen as the primary obstacle to further CTBT progress, then other non-ratifying States would confront the ratification question head-on: do they want to join the large number of States – three quarters of the world's countries – that have already completely renounced the testing of nuclear weapons, or continue to side-step the issue?

RATIFICATION BRINGS SEVERAL BENEFITS

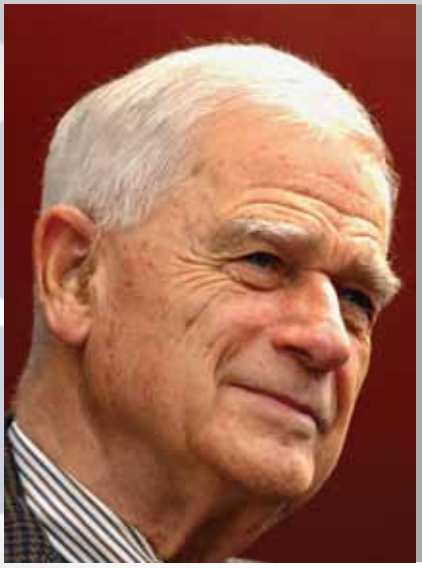
These consequences would constitute a gain for the ratifying State in two ways. Firstly, the decision to ratify would promote progress toward entry into force by breaking the logjam that has beset the Treaty ratification process. It would take States out of the debilitating, circular dynamic in which no one State will ratify unless certain other States do so first, and bring additional pressure to bear on the remaining Annex 2 States. Secondly, deciding to ratify the Treaty—especially for those Annex 2 States that have nuclear weapons but have not yet ratified—would represent significant and constructive global leadership.

Indeed, that leadership is there for the taking. It only requires that a State value its long-term security—as obtained through entry into force of this important international agreement – more than it values any short-term political considerations. There is no reason to wait.

BIOGRAPHICAL NOTES

CHRISTINE WING
is Senior Fellow (non-resident) at the Center on International Cooperation at New York University. She also consults with non-governmental organizations, foundations, and international institutions on policy questions related to nuclear weapons and nuclear power. Dr Wing serves on the Board of Directors of the Arms Control Association, as well as the Monterey Nonproliferation Strategy Group.

In Memoriam

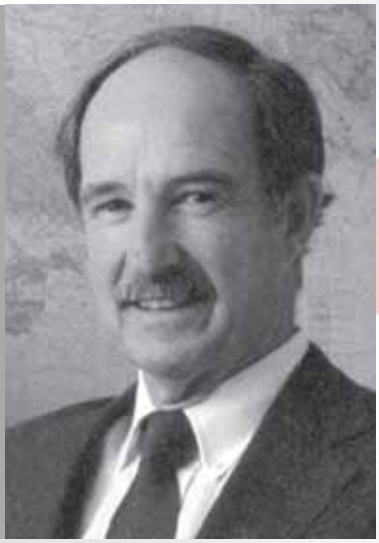


MARK HATFIELD (SENATOR)

Mark Hatfield was the longest serving U.S. Senator in Oregon history, serving five terms as Republican Senator from 1967 to 1997. Hatfield successfully introduced and campaigned for the adoption of the "Nuclear Test Moratorium Act" by the U.S. Senate in 1992. Throughout the 1990s, he consistently and vocally opposed any plans to resume nuclear testing.
(Died on 7 August 2011 aged 89).

EUGENE HERRIN (SEISMOLOGIST/PROFESSOR)

Eugene Herrin played a significant scientific role in the development of infrasound detection of atmospheric tests and the design and implementation of the International Monitoring System's global seismic network for test ban verification and earthquake detection. Herrin also made contributions to national security through successful and enforceable nuclear non-proliferation negotiations.
(Died on 20 November 2010 aged 81).



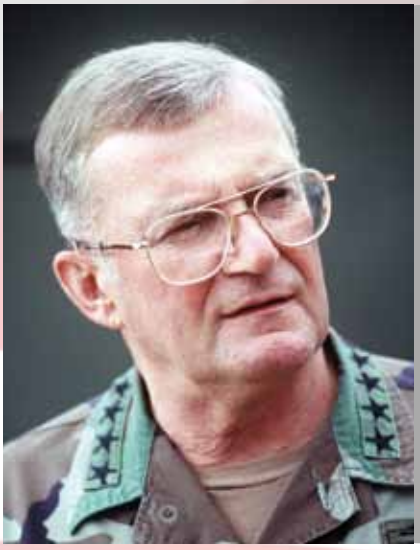
ROSEMARY LYNCH (FRANCISCAN NUN)

Rosemary Lynch was a lifelong peace activist. She organized a series of vigils and peaceful gatherings in the desert around the Nevada Nuclear Test Site, USA, in the 1980s and 1990s calling for an end to nuclear testing. Lynch was also the co-founder of Pace e Bene, an international network focusing on education in justice, social change and nonviolence.
(Died on 9 January 2011 at the age of 93).

A Tribute to Americans who campaigned for an end to nuclear testing

LOUISE REISS (DOCTOR)

Louise Reiss conducted studies in the 1960s on the presence of strontium-90 from nuclear testing in the baby teeth of young Americans. Her alarming findings raised awareness and spurred a civil movement against nuclear testing. The research played a key role in persuading the world's leading powers to sign and ratify the Partial Test Ban Treaty in 1963, which banned nuclear testing in the atmosphere, underwater and outer space but not underground. (Died on 1 January 2011 aged 90).



JOHN SHALIKASHVILI (GENERAL)

John Shalikashvili was a United States Army General who served as Chairman of the Joint Chiefs of Staff from 1993 to 1997. He was the author of the authoritative January 2001 report *Findings and Recommendations Concerning the Comprehensive Nuclear Test Ban Treaty,* described as one of the best explanations of why the Treaty makes sense for U.S. and international security.
(Died on 23 July 2011 aged 75).

DAGMAR WILSON (ACTIVIST)

Dagmar Wilson was the founder of the Women Strike for Peace event that mobilized 50,000 women in the early 1960s to demand an end to nuclear testing. Wilson also helped organize marches and other actions such as sending letters to the First Ladies of the USA and the USSR, Jacqueline Kennedy and Nina Khrushcheva, calling for an end to the arms race and to nuclear testing.
(Died on 30 January 2011 aged 94).

Revisiting Reykjavik Revisited

The 25th Anniversary of a Remarkable Meeting

BY RICHARD RHODES
PULIZTER-PRIZE WINNER

This year, 2011, marks the 25th anniversary of the astonishing meeting in Reykjavik, Iceland, in October 1986 between Soviet General Secretary Mikhail Gorbachev and U.S. President Ronald Reagan. That meeting very nearly led to an agreement to begin the process of eliminating nuclear weapons from the world. Ultimately the two leaders were unable to agree, but both understood their negotiations to have been uniquely fruitful, as indeed they were. "Seen by many as a failure," Gorbachev wrote later, the Reykjavik Summit "actually gave an impetus to reduction by reaffirming the vision of a world without nuclear weapons and by paving the way toward concrete agreements on intermediate-range nuclear forces and strategic nuclear weapons." The two-day meeting signalled as well the beginning of the end of the Cold War.

Two decades later in 2006, with little movement toward nuclear elimination in the intervening years, a core group of American statesmen determined to renew and advance the Reykjavik vision. Former Reagan Secretary of State George Shultz, U.S. Ambassador and arms negotiator Max Kampelman and Stanford University physicist and longstanding government adviser Sidney Drell, discovered a common and urgent concern with renewed nuclear peril. In particular, terrorist attacks by a sub-national group, al Qaeda, had raised the spectre of nuclear terrorism undeterred by the threat of nuclear retaliation. There was uncertainty as well about how long the grand bargain of the Nuclear Non-Proliferation Treaty would hold when the nuclear powers continued to shirk their commitment to the non-nuclear powers to move expeditiously toward nuclear disarmament. Shultz, Drell and Kampelman invited other former U.S. government officials to participate in their new initiative, and many responded.

CALLING FOR A NUCLEAR-WEAPON-FREE WORLD

Out of that effort came a conference, held at the Hoover Institution in Stanford, California, on the 20th anniversary of the Reykjavik Summit. The findings of that conference were summarized in an editorial in the *Wall Street Journal* on 4 January 2007, signed by former Secretaries of State George Shultz and Henry Kissinger, former Secretary of Defense William Perry and former U.S. Senator Sam Nunn.

"Nuclear weapons today present tremendous dangers, but also an historic opportunity," the editorial began. "U.S. leadership will be required to take the world to the next stage—to a solid consensus for reversing reliance on nuclear weapons globally as a vital contribution to preventing their proliferation into potentially dangerous hands, and ultimately ending them as a threat to the world."

In a list of steps that would lay the groundwork for a world free of the nuclear threat, the statesmen also highlighted the importance of U.S. ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) by: "Initiating a bipartisan process with the Senate, including understandings to increase confidence and provide for periodic review, to achieve ratification of the Comprehensive Test Ban Treaty, taking advantage of recent technical advances, and working to secure ratification by other key states."

President Reagan and Soviet General Secretary Gorbachev at the Reykjavik Summit, October 1986.

Other editorials followed, along with concerted efforts by the four signatories to carry the message of urgency to presidents and prime ministers throughout the world. In a joint op-ed published in *The Wall Street Journal* on 15 January 2008, the statesmen renewed their call for a nuclear-weapon-free world by supporting, among other measures, the adoption of a process for bringing the CTBT into effect "… which would strengthen the Nuclear Non-Proliferation Treaty (NPT) and aid international monitoring of nuclear activities." Their friends dubbed them "the Four Horsemen," though they rode to oppose the apocalypse, not to deliver it. Their work continues today, with committed support from many national leaders including American President Barack Obama.

MOVING BEYOND THE COLD WAR

As an historian affiliated with Stanford University who has written at length about the development and international politics of nuclear weapons, I had the privilege of attending both the October 2006 conference and a second conference held at Stanford University the following year. It was encouraging to watch and hear a small crowd of statesmen, scientists and specialists debate the deep problem of the continued existence of nuclear weapons in the world—men and women such as former chairman of the U.S. Joint Chiefs of Staff Admiral William Crowe, former U.S. Ambassador and arms negotiator Thomas Graham, Jr., historian Don Oberdorfer, physicist Roald Sagdeev, U.S. National Security Council non-proliferation expert Rose Gottemoeller and many others.

I was surprised to hear Henry Kissinger acknowledge, at the end of the second conference, in a tone that seemed more than pro forma, that he had learned a great deal across its two days: so had I. I was not surprised to see that former U.S. Assistant Secretary of Defense Richard Perle, a prominent neoconservative who had consistently worked to oppose nuclear disarmament, attended the first conference but not the second.

Many of the participants in the two conferences had opposed moving toward eliminating nuclear weapons during their active careers in government. Partly that was because their government service fell within the Cold War years, when both the United States and the Soviet Union believed that their vast nuclear arsenals protected them from nuclear attack. Partly the participants had served at the convenience of presidents who had been committed to maintaining large nuclear arsenals and had properly represented their superiors' views. Partly as well they had understood the darker truth that nuclear weapons had served to embody national prestige and to communicate unmistakable national strength.

BUILDING A SAFER WORLD FOR OUR CHILDREN

I wondered if there were other reasons besides the threat of undeterrable nuclear terrorism that had changed their minds. As the opportunity arose during and after the conferences, I asked some of them. The most common reason, I learned, was that the end of the Cold War and the dissolution of the Soviet Union had removed the threat of conflict with what had been a hostile nuclear power. (Many Americans today believe that the United States has already eliminated its nuclear arsenal. That belief is perhaps ill-informed, but it accurately reflects an intuitive sense that the U.S. nuclear arsenal's primary purpose was to deter the U.S.S.R. from nuclear use, and vice versa. Russia clearly does not stand in the same relationship to the United States as the former Soviet Union did.)

Some of those I spoke with mentioned the great expense of maintaining a nuclear arsenal, although the American military has argued that meeting the same objectives with conventional forces will cost more in annual appropriations than the nuclear arsenal does. The argument is questionable, since it's difficult to imagine any military objective for which the United States—or any other major nuclear power—would violate the taboo that has held fast against nuclear use since 1945.

The former French Consulate, the Höfði House, site of the Reykjavik Summit.

President Reagan and Soviet General Secretary Gorbachev in front of the Höfði House, Reykjavik, Iceland, October 1986

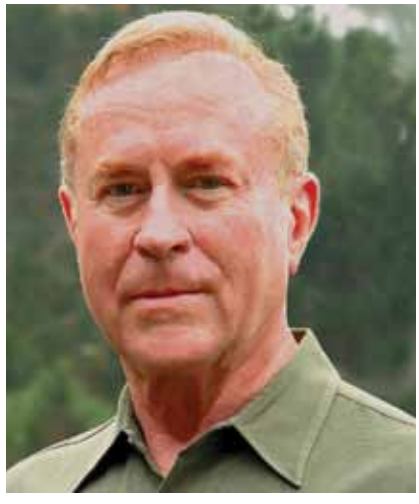
Former U.S. Ambassador and arms negotiator Max Kampelman best articulated the reason I heard most frequently. Born in 1920, Kampelman was 86 at the time of the Reykjavik 20th anniversary. He had been a pacifist during World War II, one of those who volunteered to be experimentally starved at the University of Minnesota in 1945 to assist in research on hunger relief in immediate postwar Europe and to demonstrate his patriotism. In the different context of the Cold War, he had abandoned pacifism to serve as ambassador and head of the United States delegation to the negotiations with the Soviet Union on nuclear and space arms in Geneva from 1985 to 1989, coincident with the Reykjavik Summit. Kampelman told me he helped initiate the Reykjavik Revisited project in 2006 because he was worried about the security of the world that his children and grandchildren would inherit. He told me that with tears in his eyes. I took him at his word.

THE 'OUGHT' OF STABILITY AND PEACE

It's one thing to represent a government. It's another to contemplate personally your responsibility for the world you have helped make. Kampelman understood that nuclear disarmament was a difficult challenge, perhaps the most difficult challenge the international community has ever faced. As he said at the opening of the conference at Stanford in 2007, he found inspiration to pursue meeting that challenge in a surprising place. He had taught political science before he entered government. A basic text he had used in his teaching was *An American Dilemma,* the Swedish economist and sociologist Gunnar Myrdal's monumental 1944 report on the state of race relations in the United States. In a word, they were ugly, with apartheid throughout the American South and a continuing plague of lynchings.

Echoing Myrdal, Kampelman spoke of "the power of the 'ought,'" meaning the power of moral values embodied in the goals nations and communities of nations set for themselves. "Indeed," he said, "we in the U.S. understood the power of the 'ought' at a time when our very existence as a nation was at stake. Our founders established the Declaration of Independence and our Constitution as clear goals for our nation—goals we have continually been working to achieve. And they established these 'oughts' of independence, freedom, and liberty in an atmosphere of slavery, second-class citizenship for women, and property qualifications for voting. . . .The power of the 'ought' is great, warrants respect, and should not be minimized. Today, a central theme of American foreign policy must be to move the 'is' of our present global nuclear peril to a more hopeful 'ought' of stability and peace. We must not minimize the pursuit of the 'ought.' Our role must be to establish a civilized 'ought' for the human race. The abolition of weapons of mass destruction now must be central to that objective."

Idealism is often dismissed as impractical, even weak, as a motive force in international affairs. I found it hopeful that men and women with long experience of government service gave concrete expression to the idealism of "ought." They saw, and see, the elimination of nuclear weapons as a goal worth working toward, to unshackle our descendants from the dangerous follies of the past. Bringing the CTBT into force would be a powerful advance toward that end.



BIOGRAPHICAL NOTE

RICHARD RHODES was awarded a Pulitzer Prize for *The Making of the Atomic Bomb*, the first of his four volumes of nuclear history. He is the author or editor of 28 works of fiction, history and letters, an associate of the Stanford University Center for International Security and Cooperation and, most recently, the author of a play, Reykjavik, that recreates the debate between Mikhail Gorbachev and Ronald Reagan in Iceland in October 1986.

STATUS OF CERTIFIED IMS FACILITIES
AS OF 3 SEPTEMBER 2011

CERTIFIED	TESTING	UNDER CONSTRUCTION	PLANNED	TOTAL
265	20	23	29	337

- Primary Seismic
- Auxiliary Seismic
- Infrasound
- Hydroacoustic
- Radionuclide
- Radionuclide with Noble Gas *
- Radionuclide Laboratories

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A successful partnership in Atmospheric Transport Modelling

BY MICHEL JARRAUD
SECRETARY-GENERAL OF THE WORLD METEOROLOGICAL ORGANIZATION

»A joint response system between WMO and the CTBTO has been in provisional operation since 2008 and it successfully underwent a major test in March 2011 in the context of the dramatic events in Japan.«

On behalf of the World Meteorological Organization (WMO), I wish to thank the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) for the kind invitation to contribute to *Spectrum*. This also provides WMO with a welcome opportunity to acknowledge the outstanding collaboration which, over a remarkably short time, has evolved into a solid operational partnership.

A joint response system between WMO and the CTBTO has been in provisional operation since 2008 and it successfully underwent a major test in March 2011 in the context of the dramatic events in Japan. From the WMO perspective it was, in fact, a quadruple disaster, consisting of a major earthquake, a devastating tsunami, the atmospheric – and oceanic – release of radioactive substances and the impact of very cold weather on the rescue operations, which further augmented the distress of the affected population. Indeed, only the fact that Japan has a very well prepared and resilient society in the face of natural hazards prevented the magnitude of the tragedy from mounting higher still.

WMO AND CTBTO OBSERVING SYSTEMS HAVE A CROSS-BOUNDARY SCOPE

Over 2,000 nuclear tests were conducted from 1945 to 1996, which clearly justifies the need for an International Monitoring System (IMS) like the one the CTBTO is currently developing. Notably, the cross-boundary scope of our respective observing systems is another feature which our two organizations have in common.

In WMO's case, however, although by the mid-17th century some scientific societies were already collecting data more or less systematically in search of weather patterns, the concept of internationally coordinated observations took considerably longer to develop, in particular due to early technological constraints.

A SERIES OF METEOROLOGICAL MILESTONES SINCE 1654

The first international meteorological network was established in 1654 by Ferdinand II of Tuscany. Seven stations were established in northern Italy and four more in Warsaw, Paris, Innsbruck and Osnabrück. The next major milestone came in 1780, in the form of a network of 39 stations, including two in North America, managed by the Societas Meteorologica Palatina, which was another name for the Meteorological Society of Mannheim. Although this network lasted only 12 years, it was a key step forward since all weather observations were performed according to standardized practices and using calibrated instruments.

Eruption of Eyjafjallajokull volcano, Iceland, April 2010.

However, it would still take several decades for the first International Meteorological Conference (Brussels, 1853) and the First International Meteorological Congress (Vienna, 1873) to provide the executive structure needed to successfully re-launch the concept, through the foundation of the International Meteorological Organization (IMO), our predecessor, which became WMO in 1950 and only one year later was already part of the UN System. Today, with 189 Members and a mandate in weather, climate and water, WMO focuses its scientific and technical programmes on providing optimal services to all WMO Members, especially in support of their safety and well-being, through their respective National Meteorological and Hydrological Services (NMHSs).

In the late 1950s, artificial satellites began to orbit our planet and soon became our eyes in the sky, providing us with vital additional information of a truly global nature. Independently but almost simultaneously, super-computers reached a sufficient degree of power to render feasible the numerical weather prediction methods proposed several decades earlier.

The importance of these two autonomous developments was readily recognized by the international community through the 1961 UN General Assembly Resolution 1721/XVI on the Peaceful Uses of Outer Space, requesting WMO to meet the challenge of harnessing the new opportunities. Established in 1963, the World Weather Watch (WWW) – the core of WMO Programmes – combines observing systems, telecommunication facilities and data-processing and forecasting centres – operated by WMO Members – to make available the meteorological and related environmental information needed to provide efficient services in all countries. In particular, the modern WWW encompasses the WMO Emergency Response Activities (ERA) Programme, supporting the application of specialized atmospheric dispersion-modelling techniques to track and to forecast the global spread of various airborne particulates during environmental emergencies, based on the operational infrastructure of numerical weather prediction systems operated by various WMO Regional Specialized Meteorological Centres (RSMCs) throughout the world.

Spectrum readers may be professionally inclined to think of these particulates as radioactive substances, but the potential of such methods is broader since, with appropriate adjustments, similar models can also be applied to volcanic ash, biohazards, chemical substances from industrial accidents, sand and dust storms, smoke from large fires, locusts and other insect infestations, among other issues.

Of course, the respective concentration measuring sensors differ considerably from one application to another, as do the initial conditions. For example, the 1986 Chernobyl disaster injected a very large number of particles high into the atmosphere, where they remained for a rather long time. By contrast, the Fukushima Daiichi accident was markedly different, as was the prevailing meteorological situation.

TRACKING RADIOACTIVITY DISPERSION IS ESSENTIAL AFTER A NUCLEAR ACCIDENT

Since the Chernobyl accident, WMO has continuously upgraded its operational planning and support for nuclear facility accidents, as in the aftermath of such situations it is critically important to track radioactive material dispersion effectively. Of relevance as well from the CTBTO perspective, is the fact that the system can also be applied to reverse-track emitting sources.

Today, WMO RSMCs are operational 24 hours a day, seven days a week, covering the entire planet, and providing authorities and decision-makers with the best possible information on winds and trajectories, as well as on any likely precipitation which might contribute to wash down nuclear contamination over cities, cultivated fields, fishing zones and other critical areas.

The system includes a telecommunication gateway at the German National Meteorological Service (DWD) in Offenbach to provide real-time information, in particular, to the Incident and Emergency Centre of the International Atomic Energy Agency (IAEA) in Vienna. Accordingly, specialized products can begin to be made available to the IAEA within less than three hours of their initial request. WMO also coordinates very closely with the International Civil Aviation Organization (ICAO) by helping to prevent commercial airlines from flying into any potentially dangerous areas, and with the International Maritime Organization (IMO) by supporting navigational warnings, establishing

Aerial photo taken by a small unmanned drone of the crippled Fukushima Daiichi nuclear power plant, northern Japan. From left: Unit 1, partially seen; Unit 2, Unit 3 and Unit 4. (Air Photo Service Co. Ltd., Japan)

danger zones and providing meteorological alerts which can be disseminated via the established automated systems.

On 11 March 2011, at the IAEA's request, WMO activated its Environmental Emergency Response mechanism for Asia, consisting of three Regional Specialized Meteorological Centres situated at the Japan Meteorological Agency (Tokyo), in Beijing (China) and Obninsk (Russian Federation). For other regions, the relevant centres are located in Exeter (United Kingdom), Melbourne (Australia), Montreal (Canada), Toulouse (France) and Washington (USA).

The three concerned RSMCs continued to issue forecast charts of the Fukushima Daiichi power plant nuclear material dispersion until these products were no longer required, while the other five centres regularly provided dispersion charts for comparison and validation.

WMO AND CTBTO WORKED CLOSELY THROUGHOUT THE FUKUSHIMA CRISIS

Throughout the emergency, WMO collaborated closely with the CTBTO and simultaneously provided special support to the World Health Organization (WHO) in Geneva. Indeed, since nuclear safety is a global public good serving the interests of all, the Fukushima Daiichi emergency helped to illustrate the importance of cooperation among all the competent UN System organizations, including in the area of public information.

In concluding I would like to stress that, much as we collectively regret the individual suffering and the massive damage caused by the connected disasters which impacted upon Japan last March, including the Fukushima Daiichi nuclear power plant episode, the potential was there for higher magnitude destruction. Throughout the crisis, the Japan Meteorological Agency provided tsunami and weather warnings efficiently.

I would also like to draw attention to the critical importance of strengthening different kinds of observational programmes at key installations. The CTBTO is currently developing its global verification system to monitor compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT), including a network of seismic, hydroacoustic, infrasound and radionuclide stations. This system is primarily being designed to detect nuclear explosions and it could benefit from the installation of co-located automated weather stations (AWSs). Similarly, radionuclide monitoring stations at or close to nuclear installations already equipped with AWSs could also be fitted to measure the composition of the local atmosphere. In the event of a nuclear accident, a very precise knowledge of the local weather parameters would contribute to the better and quicker monitoring and evaluation of any potential nuclide dispersion.

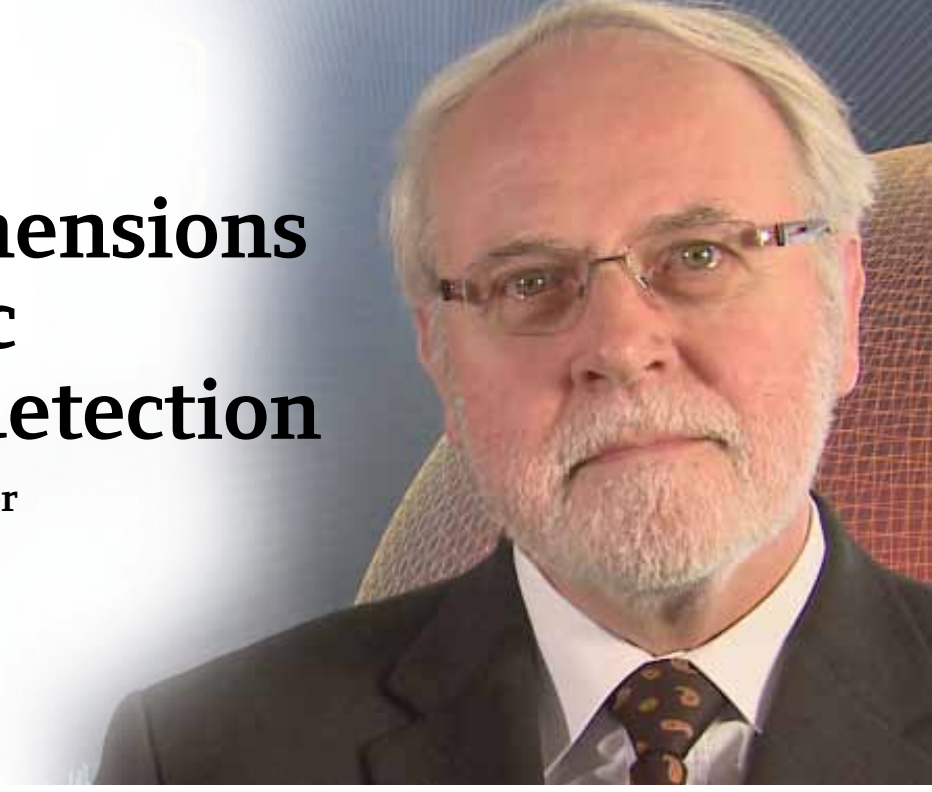
On behalf of WMO, I look forward to further collaboration with the CTBTO, in this and other key areas, in particular for the protection of life, livelihoods and property; health and well-being; safety on land, at sea and in the air; sustainable economic growth; the protection of natural resources and environmental quality; and especially for natural disaster risk reduction activities and climate change adaptation.

BIOGRAPHICAL NOTE

MICHEL JARRAUD
has been Secretary-General of the World Meteorological Organization (WMO) since 1 January 2004. Before joining WMO as Deputy Secretary-General in January 1995, he held a number of senior positions within the European Centre for Medium-Range Weather Forecasts (ECMWF), including Deputy Director of the Centre from 1991. From 1986 to 1989, he was Director of the Weather Forecasting Department at the French National Meteorological Service..

The global dimensions of atmospheric radioactivity detection

Experience and conclusions after the Fukushima Daiichi nuclear power plant accident



BY WOLFGANG WEISS
FEDERAL OFFICE FOR RADIATION PROTECTION, GERMANY

There are good reasons why data from the International Monitoring System (IMS) network could significantly improve the basic understanding of the global transportation and mixing of radionuclides in the atmosphere and contribute to the mitigation of the radiological consequences during a large-scale nuclear accident. This is one important result of many analyses of the accident at the Fukushima Daiichi nuclear power plant published six months after the release of radionuclides from the plant in March 2011. An understanding of the time and spatial variations of airborne concentration levels can provide the basic data for further assessments of deposition mapping of those radionuclides onto soil or plants, their transfer to foodstuffs and finally, dose estimates to humans. Additionally, the detailed knowledge of activity levels offers a unique opportunity to test and enhance modelling of all sorts, thus providing worthwhile information for scientists in various fields.

The IMS monitoring data and International Data Centre (IDC) analyses were shared continuously with 120 Member States and close to 1,200 authorized users through the IDC's secure website. Bearing in mind the objectives and purpose of the Treaty's verification system – i.e. monitoring the globe for signs of nuclear explosions – as well as the need to assist in a severe humanitarian disaster situation, the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) responded positively to requests from Member States and to Yukiya Amano, Director-General of the International Atomic Energy Agency (IAEA) by providing the IAEA with access to the data and data products relevant to the Fukushima accident. The CTBTO also cooperated with other pertinent international organizations such as the World Meteorological Organization (WMO), the World Health Organization (WHO) and the United Nations Office for Disarmament Affairs (UNODA), to help mitigate the consequences of this nuclear disaster.

The request to share this important data from the CTBTO directly with a number of relevant international organizations was formulated early on during the accident and the CTBTO reacted swiftly and in a timely manner to this request. There is great hope now that – similar to the contribution of IMS seismic and hydroacoustic data to tsunami warning efforts – IMS radionuclide data as well as atmospheric transport modelling (ATM) predictions can be shared in the future not only with governments and their institutions around the world but also with scientific committees like the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), and the wider research community as well as with the general public. This is good news – not only for science. In the medium to longer term, such an agreement will raise the professional profile of the CTBTO, enhance public confidence in the developments of the organization, and provide new opportunities for the CTBTO to initiate and further develop professional partnerships with many more international and scientific organizations.

WHAT CONTRIBUTIONS CAN THE CTBTO MAKE?

The CTBTO's radionuclide monitoring network comprises a total of 80 stations; 63 were operational in March 2011 and able to detect airborne radioactivity attached to particulates in the air worldwide. When complete, 40 of the 80 stations will operate systems that detect radionuclides of the noble gas xenon – a chemical element that normally occurs as a gas and is only produced by a nuclear reaction. It is measured to detect clandestine underground nuclear explosions. The "stress test" of the radionuclide network in March and April 2011, when the radionuclide releases from the Fukushima Daiichi

Operators verifying the installation of the detector system at radionuclide station RN38, Takasaki, Japan.

nuclear power plant were detected by 41 particulate stations and a further 19 stations designed to detect noble gases, demonstrated high standards of operational capabilities and resilience in a remarkable fashion.

Initial detections of radioactive materials were made on 15 March[1] at the IMS station at Takasaki in Japan, which is around 200 km away from the accident site. Key radionuclides needed for radiological protection estimates (iodine-131 and caesium-137 – see table on page 32) were detected continuously and reported to the IDC in Vienna. The early detection of niobium-95 and ruthenium-103 was a timely indicator of a meltdown inside one or more of the reactors at Fukushima. Nine days after the accident, the radioactive cloud had crossed Northern America. Three days after that, when a station in Iceland picked up radioactive materials, it was clear that the cloud had reached Europe. By day 15, traces from the accident in Fukushima were detectable all across the northern hemisphere. Based on these atmospheric data, reliable estimates of dose levels for populations outside Japan could be made with a high level of confidence.

The CTBTO contributed to the better understanding of the situation outside Japan by predicting the global dispersion of radioactive material based on its ATM tool. Forward ATM predictions proved to be 95 percent correct and the radionuclides mostly reached the stations within hours of the time predicted. This "precision" was very reassuring to the public; it contributed to trust and public confidence in recommendations issued by authorities dealing with public health.

By 13 April, radioactivity had spread to the southern hemisphere of the Asia-Pacific region and had been detected at stations located in Australia, Fiji, Malaysia and Papua New Guinea.

[1] Due to contamination caused by the high levels of isotopes, measurements before 16 March 2011 could not be analyzed.

DEALING WITH THE IMMENSE PUBLIC DEMAND FOR REAL-TIME INFORMATION IN AN EMERGENCY SITUATION

Immediately after news of the accident became available, TV and radio stations released details of the developments in almost real-time and created immense public demand for timely information about possible consequences. Major concerns about

ATMOSPHERIC TRANSPORT MODELLING

Atmospheric Transport Modelling (ATM) is an advanced computer-based technology for the calculation of the travel path of a given radionuclide, using meteorological data. This calculation can be performed in two ways:

1. **As backtracking ATM, which identifies the area from which a radionuclide may have been released, calculated from the location where it was observed.**
2. **As forward ATM, which predicts where radionuclides may travel from their known point of release.**

the health status in populations even at great distances from Japan, e.g. in Europe, resulted in reactions such as panic buying of iodine tablets. The Federal Office for Radiation Protection (BfS) tried to cope with this situation in Germany by answering the huge number and variety of questions in a timely manner by means of various electronic media. The BfS website was widely used for this purpose; it registered an increase in the "normal" daily hits from some 30.000 to over a million during the first week of the crisis. The electronic media were not only used by German citizens but also by Germans worldwide.

BfS operates one IMS radionuclide station, RN 33 in Schauinsland/ Freiburg. From the very beginning of the accident, BfS had access to all IDC data, bulletins and analyses. As a result of the immense public interest in reliable information during the initial days and weeks after the accident, a national decision was taken to release analyses based on IMS data. IMS radionuclide data were also published regularly on the BfS website together with results from national monitoring stations that have detection capabilities comparable with the IMS stations. The public response to this transparency measure was very positive. Based on this experience, I hope that there will be mechanisms available at the international level in the future that lay down the conditions for sharing IMS radionuclide data directly with those organizations responsible for public health prevention and radiation protection measures. Mechanisms of this kind should clearly identify the roles and responsibilities of the partners involved. The CTBTO would be responsible for providing the following, in a timely fashion:

- A comprehensive picture of the global spread of relevant airborne radionuclides based on the daily data of quality-assured analyses from the IMS radionuclide stations.
- State-of-the art predictions of the radioactive material by using its ATM calculations.

National and international organizations involved in radiation protection and public health would be responsible for the interpretation of the radionuclide data in terms of radiation risk, prevention measures, and public protection recommendations.

SHARING CTBTO RADIONUCLIDE DATA WITH THE WIDER SCIENTIFIC COMMUNITY

The sharing of CTBTO data with the IAEA and other international organizations at the beginning of the Fukushima disaster was a very good first step but in the longer term this is not enough to reach an optimum solution which satisfies all demands.

For example, the Fukushima data set could help meteorologists and climate researchers to further develop their models and to better understand how air circulates nearer to the surface. One specific aspect is a better understanding of the observation of the fast transport of radionuclides to the southern hemisphere. Questions of this nature can best be answered by sharing the radionuclide data with the wider scientific community through WMO or other scientific institutions. Interactive work of this kind could in turn result in significant improvements of the location capabilities of the verification system, which is an issue where improvements are highly welcome.

Another aspect of data sharing is the regular evaluation of the levels of exposure from all sources of ionizing radiation and the associated health and environmental effects by UNSCEAR (www.unscear.org) with the aim of identifying longer-term global trends. The first two substantive reports submitted to the General Assembly in 1958 and 1962, presented comprehensive evaluations of the state of knowledge about the levels of ionizing radiation to which human beings were exposed and of the possible effects of such exposures. Those reports laid the scientific grounds on which the Partial Test Ban Treaty on the prohibition of nuclear weapon testing in the atmosphere was negotiated and signed in 1963.

Radionuclide station RN38, Takasaki, Japan

UNSCEAR would like to use the unique data set from the IMS radionuclide network for its work. Taking into account the common roots and the mutual interests of UNSCEAR and the CTBTO, it would be more than desirable if an agreement for data sharing between CTBTO and UNSCEAR could be established in the near future.

BIOGRAPHICAL NOTE

WOLFGANG WEISS
is a physicist by profession. During the CTBT negotiations in Geneva from 1994 to 1996, he supported the German Government as scientific adviser. He established the International Monitoring System radionuclide station RN 33 in Germany and conducted an international assessment of noble gas techniques. He has been responsible for all questions related to radiation protection and health in Germany at the German Federal Office for Radiation Protection since 2000. Dr Weiss is also the current Chairman of UNSCEAR.

The Fukushima disaster, the importance of CTBTO data and the need for an open data and information policy

BY GERHARD WOTAWA
CENTRAL INSTITUTE FOR METEOROLOGY AND GEODYNAMICS (ZAMG), AUSTRIA

»Considering the usefulness, reliability and relevance of the CTBTO radionuclide data, it is very important to have access to the data in the future during accident scenarios.«

Certain events in life make such an impression that you'll always remember where you were and what you were doing at that very moment. On 11 September 2001, I was at a meeting dealing with cooperation between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) and the World Meteorological Organization (WMO) in Washington, DC, USA. Despite the disaster that struck while I was there, the meeting paved the way for successful cooperation between the two organizations, which has continued for over a decade (for further reading about WMO-CTBTO cooperation in addition to articles in this issue, please see *Spectrum* 11, pages 24 to 27, and *Spectrum* 12, pages 26 to 28).

On 11 March 2011, I was travelling to the inaugural meeting of the International Network of Engineers and Scientists against Proliferation, in Darmstadt, Germany. While I was on the bus from Frankfurt airport, I heard about the devastating earthquake that had struck Japan that day. At the meeting, news about the serious situation at the Japanese nuclear power plants, especially Fukushima Daiichi, spread quickly. It soon became clear that this was going to be an extremely serious accident.

Back in Vienna at the Central Institute for Meteorology and Geodynamics (ZAMG), the model to simulate the spread of radiation had been set up before the first images of the first explosion at the Fukushima power plant were transmitted across the globe on the morning of 12 March at 07:30 CET.

During the Fukushima accident, ZAMG played a number of roles. Firstly, it operates the Austrian National Data Centre and thus has full access to data, bulletins and data analyses from the CTBTO. Secondly, in our national emergency support role, we provided data, information and assessments to our national authorities and also to Austrian Airlines regarding the safety of flights to Tokyo, Japan. At the international level, ZAMG represented the WMO at the Incident and Emergency Centre of the International Atomic Energy Agency (IAEA) and at CTBTO briefings in Vienna.

SIMULATING THE DIRECTION OF THE RADIOACTIVE PLUME

One major component of ZAMG's work was to calculate the predicted direction of the radioactive cloud released during the accident. We did this through Atmospheric Transport Modelling (ATM) calculations, which international organizations such as the IAEA also requested from us.

ZAMG employed a model for its simulations similar to the one applied by the CTBTO. For our simulations, we used input from the European Centre for Medium-Range Weather Forecasts (ECMWF) in Reading, UK. We made calculations of the most important radionuclides that had been released into the atmosphere after the Chernobyl disaster in 1986: iodine 131(^{131}I) and caesium 137(^{137}Cs) - see page 32 in *Spectrum* for brief explanation.

Using its own modelling in combination with CTBTO radionuclide data, ZAMG was able to describe and report on the spread of radionuclides from the damaged power plant through the hemisphere. The ZAMG model simulated with a high degree of accuracy the direction of the radioactive plume across the Pacific Ocean to the west coast of the United States, across the United States, eventually reaching Europe a few days later. On 22 March, ZAMG was the first institute worldwide to make estimates of the source terms (the release levels of radioactive substances) available to the public.

The first estimates by ZAMG were based on data from the CTBTO's International Monitoring System (IMS) station at Takasaki, Japan, on 16 March (due to contamination caused by the high levels of isotopes, measurements before this could not be analyzed). The second estimates were made using data from the IMS station in Sacramento, California. The data showed that there were very high emissions of ^{131}I and ^{137}Cs during the first few days of the accident. These emissions must have been released by the damaged reactor as early as 12 March, which is much earlier than initially reported by the nuclear power plant operators – otherwise the early detections in California could not be explained.

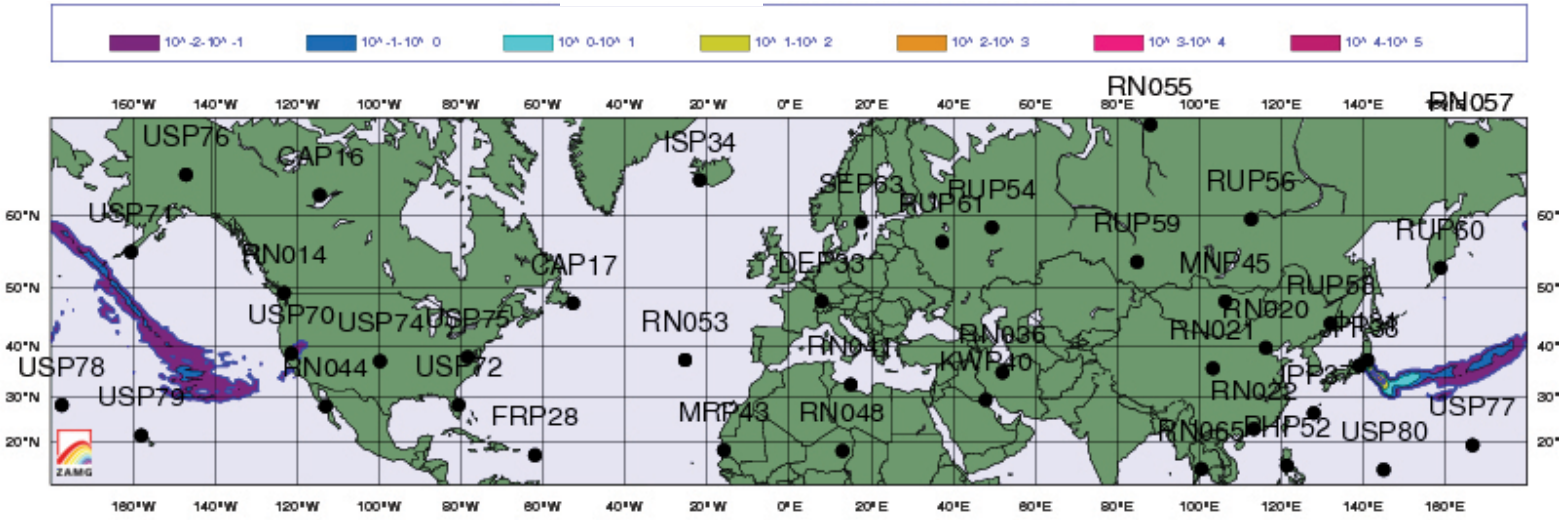
Our first source estimates of ^{131}I and ^{137}Cs amounted to 4 10^{17} and 4 10^{16} Becquerel (the number of radioactive decays per second) respectively during the first few days after the Fukushima accident. To put this into perspective, this ^{137}Cs release is probably in the same order of magnitude as the releases during the nuclear bombings in Hiroshima and Nagasaki in 1945, but less than the Chernobyl release in 1986. Afterwards, releases decreased significantly.

Similar emission estimates were provided by the I*nstitut de Radioprotection et de Sûreté Nucléaire* (INRS) in France on 23 March and by the Japanese authorities on 12 April.

A SWIFTER RESPONSE TO NUCLEAR ACCIDENTS

Compared with the situation after the Chernobyl accident, the technical capabilities for modelling the spread of radiation are very advanced. This has greatly increased the chances of responding to a nuclear accident in a timely, effective and accurate manner.

In full accordance with the position of the Austrian authorities regarding transparency and openness, ZAMG shared all information and model results with the public through its website. The ZAMG assessments included available information from the CTBTO that was also relevant. The daily volume of downloads amounted to a few terabytes – 1,024 gigabytes – with the largest number of users who accessed ZAMG's website based in Japan followed by the United States, and users from Austria only in third place. Our IT department managed the dramatic increase in traffic to our website well. At no time did the information that was made available create a panic situation, nor did it cause any international outrage or other complications. We strongly believe that in today's world, it is not the availability but rather the absence of data and information that can be perceived as disturbing and troublesome, and that our approach was the right one.



Low levels of radioactivity from Japan reached the U.S. West Coast on 17 March. The image shows the position of the radioactive cloud on 18 March 2011 at 00 UTC. The radioactivity was measured at IMS station USP70, Sacramento, California, on the same day as predicted by the ZAMG model.

SOME OF THE KEY RADIONUCLIDES

CAESIUM-134 (^{134}Cs)
has a half-life of 2.1 years. Only a small amount of ^{134}Cs is produced by nuclear weapon testing but it accumulates in nuclear reactors. It can therefore be used to distinguish between releases from nuclear weapon testing and nuclear power plants.

CAESIUM-137 (^{137}Cs)
has a half-life of 30.1 years. This is the most common radioactive form of caesium and is produced by nuclear fission. ^{137}Cs is one of the major radionuclides in spent nuclear fuel and radioactive wastes associated with the operation of nuclear reactors and fuel reprocessing plants. Large amounts of ^{137}Cs and other radioactive isotopes were released into the environment by atmospheric nuclear weapon tests between 1945 and 1980. ^{137}Cs did not occur in nature before nuclear weapon testing began.

IODINE-131 (^{131}I)
has a half-life of 8.0 days. ^{131}I is a radioactive isotope released into the environment mostly in gaseous form as a result of the atmospheric testing of nuclear weapons and accidents that have occurred at nuclear power plants (e.g. the Chernobyl nuclear power plant in 1986 and the Fukushima power plant in March 2011). It was a significant contributor to the effects on human health from atmospheric nuclear weapon testing and from the Chernobyl disaster.

CTBTO DATA PROVED TO BE OF GREAT VALUE

Considering the usefulness, reliability and relevance of the CTBTO radionuclide data, it is very important to have access to the data in the future during accident scenarios. Without the data, many conclusions in the beginning would not have been possible. I believe that, in the aftermath of the events, the cooperation between CTBTO and the International Atomic Energy Agency (IAEA) needs to be further strengthened, as well as the cooperation between CTBTO and WMO. This future cooperation should build on existing roles, responsibilities and technical competencies, and would certainly create added value for the whole international community. The conventions regulating the notification as well as the assistance after a nuclear incident were created after the Chernobyl accident. The events in Fukushima 25 years later are providing a unique opportunity to review these conventions, to check their effectiveness, and to include the most important lessons learned.

A UNIQUE VERIFICATION SYSTEM

Finally, I would like to mention that the major lesson I learned from Fukushima was actually a non-technical one. In a crisis situation in the world of the 21st century, it is evidently not enough to stick to mandates and to fulfil duties. Everybody is expected to do everything that is possible, as quickly as possible. This is true for national as well as international organizations. In this sense, I think that together, the technical staff of national organizations like ZAMG as well as CTBTO staff can be proud of what was achieved, based to a remarkable degree on the invaluable data collected by a unique international verification system.

BIOGRAPHICAL NOTE

GERHARD WOTAWA
is the Coordinator of the Group on Earth Observation/Global Earth Observation System of Systems at the Central Institute for Meteorology and Geodynamics (ZAMG). He was responsible for managing the ZAMG's response during recent crisis situations such as the Eyjafjallajokull volcanic eruption in 2010 and the Fukushima accident. Prior to this, Dr Wotawa worked as an Atmospheric Sciences Officer at the International Data Centre at the CTBTO from 2000 to 2009.

TRINIDAD AND TOBAGO'S LONG STANDING SUPPORT CONTINUED FROM PAGE 10

in the Caribbean, including the Seismic Research Centre in Trinidad and Tobago, should an earthquake occur or trigger a tsunami that may affect the Caribbean. In light of the fact that the PTWC utilizes the CTBTO monitoring data, Trinidad and Tobago is already a potential recipient of this invaluable technology.

The indispensable contribution of the CTBTO monitoring system to global safety and security was never more fully demonstrated than during the devastating 9.0 magnitude, tsunami-generating earthquake which struck Japan in March 2011. The data from the CTBTO monitoring stations were among the fastest and most accurate, which allowed Japanese authorities to issue tsunami warnings within a few minutes, thereby allowing many people to escape to higher grounds. The CTBTO data also allowed for early tsunami warnings to Japan's neighbours, as well as to the wider Pacific region.

THE WAY FORWARD

The global community of States deserves commendation for its unified efforts to mitigate the effects of armed conflict. Having been bestowed with the privilege and honour of a leadership position, my role is to encourage my fellow leaders, particularly women leaders, to join me in placing emphasis on strategic frameworks and mandates for implementing and measuring changes in the lives of men and women in conflict-affected territories.

It is my firm belief that States can definitely strengthen the prospects for sustainable peace by including a gender lens in the approach to peace-building efforts, through equal involvement of women and men in policy formation, accountability, post conflict and humanitarian planning.

I remain deeply committed to these causes.

EDITOR-IN-CHIEF:
Annika Thunborg,
Spokesperson and Chief of Public Information

PREPARED, COORDINATED AND EDITED BY:
Denise Brettschneider

CTBTO CONTRIBUTORS:
Matthias Auer, Emmy Duran, Kana Kato, Julia Kreienkamp, Angela Leuker, Awoba Macheiner, Joelle Matte, Thomas Muetzelburg, Peter Rickwood, Robert Werzi

LAYOUT:
Todd Vincent

DISTRIBUTION:
Pablo Mehlhorn

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Vienna International Centre
P.O. Box 1200
1400 Vienna, Austria
T +43 1 26030 6200
F +43 1 26030 5823
E info@ctbto.org
I www.ctbto.org

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15TH ANNIVERSARY OF THE CTBT

- A comprehensive ban on all nuclear explosions by everyone, everywhere
- Testing has virtually screeched to a halt: over 2,000 tests before September 1996; a handful of tests since
- A 1 billion dollar investment, making the world safer and more secure
- Over 260 stations worldwide listening to the land, sea and air and sniffing the atmosphere for signs of nuclear explosions
- A democratic Treaty: large and small countries have equal rights
- A global stethoscope: over 30,000 events (e.g. earthquakes) registered every year
- North Korean tests in 2006 and 2009 detected confidently and reliably
- On-site inspections enhanced by large-scale simulation exercises
- Helping tsunami warning and climate change research; monitoring earthquakes and volcanoes
- Tracking radiation levels and dispersal after the Fukushima nuclear accident
- Sharing technical knowledge and expertise
- Building partnerships with the wider scientific communities
- Close to universality: a Treaty signed by almost every country on Earth