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Subject: COUNCIL DECISION on Union support for the activities of the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) in order to strengthen its monitoring and verification capabilities and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction

COUNCIL DECISION (CFSP) 2020/...

of ...

**on Union support for the activities of the Preparatory Commission
of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO)
in order to strengthen its monitoring and verification capabilities
and in the framework of the implementation of the EU Strategy
against Proliferation of Weapons of Mass Destruction**

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on European Union, and in particular Article 28(1) and Article 31(1) thereof,

Having regard to the proposal from the High Representative of the Union for Foreign Affairs and Security Policy,

Whereas:

- (1) On 12 December 2003, the European Council adopted the EU Strategy against Proliferation of Weapons of Mass Destruction ('the Strategy'), Chapter III of which contains a list of measures that need to be taken both within the Union and in third countries to combat such proliferation.
- (2) The Union is actively implementing the Strategy and is giving effect to the measures listed in Chapter III thereof, in particular through releasing financial resources to support specific projects conducted by multilateral institutions, such as the Provisional Technical Secretariat of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO).
- (3) On 17 November 2003, the Council adopted Common Position 2003/805/CFSP¹ on the universalisation and reinforcement of multilateral agreements in the field of non-proliferation of weapons of mass destruction and their means of delivery. That Common Position calls, *inter alia*, for the promotion of the signing and ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

¹ Council Common Position 2003/805/CFSP of 17 November 2003 on the universalisation and reinforcement of multilateral agreements in the field of non-proliferation of weapons of mass destruction and means of delivery (OJ L 302, 20.11.2003, p. 34).

- (4) The States Signatories to the CTBT have decided to establish a Preparatory Commission, endowed with legal capacity and which has standing as an international organisation, to carry out the effective implementation of the CTBT, pending the establishment of the CTBTO.
- (5) The early entry into force and universalisation of the CTBT and the strengthening of the monitoring and verification system of the Preparatory Commission of the CTBTO are important objectives of the Strategy. In that context, the nuclear tests carried out by the Democratic People's Republic of Korea further underlined the importance of the early entry into force of the CTBT and the need for maintaining and strengthening of the CTBT monitoring and verification system.
- (6) The United Nations Secretary-General stated in 'Securing our Common Future: an Agenda for Disarmament' that by constraining the development of advanced new types of nuclear weapons, the Comprehensive Nuclear-Test-Ban Treaty put a brake on the arms race and that it also serves as a powerful normative barrier against potential States that might seek to develop, manufacture and subsequently acquire nuclear weapons in violation of their non-proliferation commitments.

- (7) In the framework of the implementation of the Strategy, the Council adopted three Joint Actions and four Decisions on support for activities of the Preparatory Commission of the CTBTO, namely Joint Actions 2006/243/CFSP¹, 2007/468/CFSP² and 2008/588/CFSP³, and Decisions 2010/461/CFSP⁴, 2012/699/CFSP⁵, (CFSP) 2015/1837⁶ and (CFSP) 2018/298⁷.

¹ Council Joint Action 2006/243/CFSP of 20 March 2006 on support for activities of the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) in the area of training and capacity building for verification and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction (OJ L 88, 25.3.2006, p. 68).

² Council Joint Action 2007/468/CFSP of 28 June 2007 on support for activities of the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) in order to strengthen its monitoring and verification capabilities and in the framework of the implementation of the EU Strategy against the Proliferation of Weapons of Mass Destruction (OJ L 176, 6.7.2007, p. 31).

³ Council Joint Action 2008/588/CFSP of 15 July 2008 on support for activities of the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) in order to strengthen its monitoring and verification capabilities and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction (OJ L 189, 17.7.2008, p. 28).

⁴ Council Decision 2010/461/CFSP of 26 July 2010 on support for activities of the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) in order to strengthen its monitoring and verification capabilities and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction (OJ L 219, 20.8.2010, p. 7).

⁵ Council Decision 2012/699/CFSP of 13 November 2012 on the Union support for the activities of the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organisation in order to strengthen its monitoring and verification capabilities and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction (OJ L 314, 14.11.2012, p. 27).

⁶ Council Decision (CFSP) 2015/1837 of 12 October 2015 on Union support for the activities of the Preparatory Commission of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) in order to strengthen its monitoring and verification capabilities and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction (OJ L 266, 13.10.2015, p. 83).

⁷ Council Decision (CFSP) 2018/298 of 26 February 2018 on Union support for the activities of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) in order to strengthen its monitoring and verification capabilities and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction (OJ L 56, 28.2.2018, p. 34).

- (8) That Union support should be continued.
- (9) The technical implementation of this Decision should be entrusted to the Preparatory Commission of the CTBTO which, on the basis of its unique expertise and capabilities through the network of the International Monitoring System (IMS), comprising over 337 facilities around the globe, and the International Data Centre (IDC), is the sole international organisation having the ability and legitimacy to implement this Decision. The projects as supported by the Union can only be financed through an extra-budgetary contribution to the Preparatory Commission of the CTBTO,

HAS ADOPTED THIS DECISION:

Article 1

1. For the purpose of continuing the effective implementation of the Strategy, the Union shall support the activities of the Preparatory Commission of the CTBTO, which aim to:
 - (a) strengthen the capabilities of the CTBT monitoring and verification system, including radionuclide detection;
 - (b) strengthen the capabilities of the States Signatories to the CTBT to fulfil their verification responsibilities under the CTBT and to enable them to benefit fully from their participation in the CTBT regime.
2. The projects to be financed by the Union shall support:
 - (a) maintenance of certified auxiliary seismic stations, part of the CTBTO IMS;
 - (b) engagement with State Signatories, including technical system validation and testing using Cloud technology for phase 3 of the IDC Reengineering;
 - (c) development of the Enhanced High Resolution Atmospheric Transport model;
 - (d) a study on possible performance improvements of FLEXPART simulations through Graphics Processing Unit acceleration;

- (e) development of a background estimator tool to quantify radio xenon contributions to detections at IMS stations;
- (f) development of a source-term estimator tool;
- (g) provision of helpdesk and upgrading support to the virtual exploitation data centre platform;
- (h) continuation of the radio xenon mobile measurement campaigns in different regions of the world;
- (i) provision of technical assistance including integrated capacity building and outreach such as enhancement of seismic, hydroacoustic and infrasound (SHI) automatic processing capabilities in NDC-in-a-Box and simplified, standards compliant IDC products and services access for National Data Centres (NDCs);
- (j) support training, workshops and follow-up for emerging NDCs in developing countries worldwide, and acquisition and maintenance of capacity building systems for the NDCs;
- (k) support the evolution and homogenisation of the multi-waveform technology processing and interactive system;

- (l) organisation of open source seismic impact regional introductory courses for two CTBT geographical regions;
 - (m) conduct of outreach to non-signatories and non-ratifying countries, including States whose signature and ratification are required for entry into force of the CTBT, and capacity building for youth, parliamentarians, journalists and scientists in developing or emerging countries.
3. In the implementation of the projects referred to in paragraph 2, Union visibility shall be ensured, as well as proper programme management in the implementation of this Decision.
 4. The projects shall be carried out for the benefit of all States Signatories to the CTBT.
 5. All project components shall be supported by proactive and innovative public outreach activities, and resources shall be allocated accordingly.
 6. A detailed description of the projects is set out in the Annex to this Decision.

Article 2

1. The High Representative of the Union for Foreign Affairs and Security Policy (the 'High Representative') shall be responsible for the implementation of this Decision.

2. The technical implementation of the projects referred to in Article 1(2) shall be carried out by the Preparatory Commission of the CTBTO. It shall perform this task under the control of the High Representative. For that purpose, the High Representative shall enter into the necessary arrangements with the Preparatory Commission of the CTBTO.

Article 3

1. The financial reference amount for the implementation of the projects referred to in Article 1(2) shall be EUR 6 288 892,37.
2. The expenditure financed by the amount set out in paragraph 1 shall be managed in accordance with the procedures and rules applicable to the Union budget.
3. The European Commission shall supervise the proper management of the financial reference amount referred to in paragraph 1. For that purpose, it shall conclude a financing agreement with the Preparatory Commission of the CTBTO. The financing agreement shall stipulate that the Preparatory Commission of the CTBTO is to ensure visibility of the Union contribution, commensurate with its size.
4. The European Commission shall endeavour to conclude the financing agreement referred to in paragraph 3 as soon as possible after the entry into force of this Decision. It shall inform the Council of any difficulties in that process and of the date of conclusion of the financing agreement.

Article 4

1. The High Representative shall report to the Council on the implementation of this Decision on the basis of regular reports prepared by the Preparatory Commission of the CTBTO. Those reports shall form the basis for the evaluation carried out by the Council.
2. The European Commission shall provide information on the financial aspects of the implementation of the projects referred to in Article 1(2).

Article 5

1. This Decision shall enter into force on the date of its adoption.
2. This Decision shall expire 36 months after the date of conclusion of the financing agreement referred to in Article 3(3) or six months after the date of its adoption if no financing agreement has been concluded within that period.

Done at ...,

For the Council

The President

ANNEX

Heading 1: Support Verification Technologies and Monitoring System

Component 1: Project 1: IMS Continuous Sustainment of certified IMS auxiliary Seismic Stations

Project 1: Continuous Sustainment of Certified IMS Auxiliary Seismic Stations

Background

The main focus of this project will be to continue addressing failing auxiliary stations, which need urgent maintenance action preferably located in countries facing financial difficulties, while simultaneously proceeding with preventive maintenance. This is done by addressing issues of obsolete equipment and consequent upgrades, as well as through improvement of equipment sparing levels.

Objectives and Deliverables

The principal objective is to bring targeted stations to a technical level compatible with the IMS requirements in a sustainable manner. Adequate preventive maintenance and associated equipment sparing helps achieve this objective. Similarly, the support to the stations and their operator(s) in the case of urgent corrective maintenance, including onsite station visits, where necessary, will minimise down time and help to sustain stations(s). Attention is drawn to the fact that this is achieved in conjunction with other tasks such as stations operator training and workshops in order to maximise sustainability. As in previous projects under former Union funding, a full time, temporary staff will be employed to plan and execute work projects at the relevant stations.

Increased data availability and data quality of the Auxiliary Stations network because of a strengthened sustainment structure leading to increased visibility for the EU.

Component 2: Projects 2-8

Project 2: Engagement with State Signatories, including technical system validation and testing using Cloud technology for Phase 3 of the IDC Reengineering

Background

The IDC has initiated Phase 3 of the IDC Reengineering project (RP3) aiming to develop a comprehensive software system for SHI processing over the next decade.

The project will bring notable improvements over the existing SHI system, such as:

- enhanced user interface flexibility for analyst tools, enhanced Analyst review workflow, event management, event cross-correlation and comparison, map tool and map integration, visualisation and editing of waveform quality control masks, frequency-wavenumber (FK) display, and support for analyst training;
- comprehensive capturing of data provenance in order to understand how processing results were arrived at, and investigate the evolution of results as available information changes;
- extensibility as a major feature built in all components;
- flexible integrated SHI pipeline configuration supported by graphical tools;

- facilitating a new model for collaborative software development following best practices in the open source software development;
- enhanced monitoring and testing capabilities – Test Data Set Replay.

Reengineering Project 2 (RP2) was carried out through Contribution-in-Kind from the USA as well as funding under Decision (CFSP) 2015/1837. The funding was used, in particular, to sustain technical meetings with experts from Member States in order to ensure wide participation in the RP2. Those funds also supported prototyping activities, to show how software contributed by NDCs can be integrated into the reengineered architecture.

In preparation for RP3, funds under Decision (CFSP) 2018/298 were used to raise the technology readiness level for several algorithms, which could be considered for inclusion into the reengineered software, specifically to provide better ways to process seismic aftershock sequences in automatic or semi-automatic mode.

Objectives

- Support the evolution of the reengineered system to meet NDC needs from the onset, by supporting the NDC requests for software and related updates, and functionalities for performing NDC activities.
- Offer a low-barrier access for State Signatories to support, assess and validate the progress of the IDC Reengineering project.

- Enhance the engagement of the NDC community in Phase 3 of the IDC Reengineering project
- Evaluate the feasibility of a future 'NDC-as-a-service' offering, using cloud technology.

Deliverables

- A cloud-based evaluation and testing platform for NDCs, to review the functionality as well as non-functional requirements of the reengineered SHI system.
- Multiple hosted instances of the platform to allow non-interference of different NDCs.
- A prototype 'NDC-as-a-service' system, hosted in the cloud.

Outcome

The main benefit of the project is to allow low-barrier access for State Signatories and NDCs to the current state of the reengineered system, especially for NDCs without extensive computing capacity and system support knowledge. Based on this work, the feasibility as well as the cost implications of a potential future 'NDC-as-a-service' offering will be provided.

Project 3: Enhancement of High Resolution Atmospheric Transport Model

Background

For the purpose of long-range transport modelling, CTBTO uses an advanced Atmospheric Transport Modelling (ATM) system based on the Lagrangian Particle Dispersion Model FLEXPART. This system allows for modelling on a global scale. However, for special events, there is also the need to perform simulations on a local scale (high resolution). Funded by the Union under previous Council Decisions, the basic version of the High Resolution Atmospheric Transport Model (HRATM) based on FLEXPART-WRF was developed. The initial tests revealed which features have to be enhanced or implemented differently to have a fully reliable system.

Objectives

Enhance an existing high-resolution atmospheric transport model (EHRAT) and develop an interface for its launch.

- Familiarisation with the current version of the HRATM installed at CTBTO and the list of suggested enhancements.
- Familiarisation with the ATM pipeline, specifically with the format of meteorological data.
- Propose, develop and test solutions to address these enhancements;

- In view of the fact that the current version works only with National Centres for Environmental Prediction (NCEP) data, propose and implement changes that would allow running the HRATM with the European Centre for Medium-Range Weather Forecasts (ECMWF) data.
- Test different cases.
- Develop an interface for launching EHRAT in the existing ATM pipeline; if agreed, it can be part of the current launching interface used to run ATM simulations for expert analysis at CTBTO.

Outcome

The EHRAT will become one of the ATM tools used by the ATM experts and NDCs to test and validate hypotheses related, for instance, the estimation of the source-term location.

Project 4: Study in Graphics Processing Unit (GPU) acceleration of FLEXPART (FLEX-GPU)

Background

For the purpose of long-range transport modelling, CTBTO uses an advanced Atmospheric Transport Modelling (ATM) system based on the Lagrangian Particle Dispersion Model FLEXPART.

Taking into account that, in the future, ensemble modelling may also be part of the operational runs performed by the ATM pipeline a new way to accelerate the simulations is being explored.

The CTBTO has acquired a NVIDIA DGX STATION with 4X Tesla V100 GPUs delivering 500 TFLOPS (mixed precision). It runs Linux and comes with a FORTRAN compiler from PGI, which supports OpenACC, which is used to parallelise suitable algorithms such as loops, and matrix calculations designed for GPU systems.

Objectives

A study to ascertain what possible performance improvements in FLEXPART simulations could be made by GPU acceleration and deliver a ready and documented FLEXPART code package with OpenACC support.

- Familiarise with the current version of FLEXPART (9.3.2.) installed at CTBTO and evaluate if it is possible to compile it with the PGI Fortran compiler; evaluate the advantage of using FLEXPART 10 instead of FLEXPART 9.3.2.
- Profile FLEXPART running to find which algorithms/loops are most suitable for an initial attempt at parallelisation and for using the GPUs.
- Evaluate the performance improvement.

- Deliver a ready and documented FLEXPART code package with OpenACC support that should be easy to integrate with the ATM pipeline.

Outcome

If the result of this study is positive, the modified FLEXPART could provide a new way to accelerate the ATM simulations. In the next step, this could be integrated with the ATM pipeline and results could be made available to NDCs.

Project 5: Xenon Background Estimator Tool (XeBET)

Background

The presence of a Noble gas background in constant evolution in the atmosphere makes the positive identification of a sample associated with a nuclear test challenging. An estimation of the radio xenon contribution from known sources to every sample collected by noble gas systems at IMS stations will be generated by the Xenon Background Estimator Tool. This estimation will help decide if the detection can be explained by known sources.

Objectives

Develop a background estimator tool (BET) to quantify the radio xenon contribution from known sources to the detections at IMS stations. This tool will be based on IMS detections, knowledge of known sources and CTBTO SRS. The new tool must be reliable, optimised, timely and easy to test, maintain and upgrade. It will run at first on Development-LAN.

- Perform a literature review to identify the best approach to categorise and quantify civil xenon detections at IMS stations and prepare a project plan for prototype development.
- Collect information from known sources and make it available through SWP.
- Elaborate an on-line database for collecting information from known sources.
- Develop and test a prototype on a sub-set of IMS stations. Prototype must be developed for easy transfer to the CTBTO IDC Development-LAN and made available to NDCs.
- Run prototype on selected challenging detections (e.g. Democratic People's Republic of Korea's tests or other cases) and propose visualisation options.
- Adjust and run BET on a large number of IMS stations.
- Contribute to IT transfer to CTBTO.
- Documentation will describe all assumptions made to develop and run the tool.

Outcome

BET will provide objective information for every IMS noble gas sample to help decide to which extent a specific detection is more likely to be associated to a nuclear test or to known sources. This information in turn will be used as input to a source term reconstruction tool. The results and conclusions of the studies carried out could be based or shared with the WOSMIP (Workshop on Signatures of Man-Made Isotope Production) community.

Project 6: Source-Term Estimator

Background

Several promising approaches to estimate the source-term parameters (location, temporal release profile and total amount of radioactivity released) from detections have emerged in the last several years. This information about the parameters of a source is very important for the CTBTO in case of a Treaty-relevant event. The proposition is to adapt one of those approaches to CTBTO's needs. The new tool must be reliable, optimised, timely and easy to test, maintain and upgrade. It will run at first on IDC Development-LAN.

Objectives

The Source Term Estimator (STE) will generate a first automatic estimation of source term parameters using detections and non-detections from IMS stations. An interface will be developed for IDC and NDCs experts to interactively test different sets of hypotheses.

Deliverables

- Perform a literature review to identify the best approach for source term localisation and quantification, and prepare a project plan for development and testing of the STE.
- Develop and test a prototype on different cases, propose and develop visualisation and interface options. Prototype must be developed for easy transfer to the CTBTO IDC tools and made available to NDCs.
- Contribute to IT transfer to the CTBTO.
- Documentation will describe all assumptions made to develop and run the tool.

Outcome

The STE will provide objective information to help locate a possible test location and estimate its strength. Such a tool has the potential to indicate a more limited area that can contain the source, and can help to estimate the probability to detect radionuclides over time, which is a significant advantage if an On-site Inspection (OSI) is required.

Project 7: Helpdesk support to Virtual Exploitation Data Centre (vDEC)

Background

The vDEC platform allows access to CTBTO archived data for research and academic institutions working on scientific projects. The access is restricted to the data specifically needed for the purpose of the project and a contractual framework defines the mutual agreement between CTBTO and the vDEC user. In particular, publication of scientific work is permitted, provided that the CTBTO is acknowledged as the source of data in the publication.

The platform has been in existence for eight years, and vDEC users have published many peer-reviewed papers in reputable scientific journals.

While a lot of the technical aspects of support for the vDEC platform have been absorbed into the general support activities of IDC staff, there is a need for additional, more specific support. This includes a helpdesk function covering not only access to the computer platform on which the archive is installed and access to the database containing the data, but also the more domain-specific aspects, for instance, help with understanding the data model, the stations specifications, the calibration of the stations, and the like. Support also includes upgrading the configuration of the vDEC platform and of the software installed on the platform.

Since users expect the platform to evolve with time, and the archived data is growing in size, a planning function is also needed that would develop a vision for the near-term evolution of the platform. Finally, the support will provide maintenance of the public database of publications based on CTBTO data obtained through vDEC access.

Objectives

- Support daily activities of vDEC users through a helpdesk function.
- Plan for upgrades and new functionalities to be installed.
- Maintain a public database of publications based on CTBTO data obtained through vDEC access.

Deliverables

- Quartely report on support activities.
- Plan for upgrades and enhancements.
- Public database of publications based on CTBTO data obtained through vDEC access.

Outcome

- Enhanced support for vDEC users, increasing their satisfaction.
- Enhanced vDEC platform.
- Documentation of vDEC scientific outcome.

Project 8: Continuing the radio xenon mobile measurement campaigns in different regions of the world

Background

The Preparatory Commission for the CTBTO is carrying out radio xenon measurements with very sensitive systems. With the contribution received from the Union within the framework of Joint Action 2008/588/CFSP, the Commission developed and purchased two transportable systems: the SAUNA TXL-2 and the SPALAX-DR for measuring ^{133}Xe , ^{135}Xe , ^{133}mXe and ^{131}mXe . Within the framework of Decisions 2012/699/CFSP, (CFSP) 2015/1837 and (CFSP) 2018/298, several mobile radio xenon measurement campaigns were conducted worldwide.

With the contribution received from the Government of Japan in 2017, the Commission purchased a third transportable system. This system is currently deployed at Horonobe, Japan. The two-year period of operation under Japanese funding ends in January 2020.

In the framework of Decision (CFSP) 2018/298, one measurement campaign is being held at Mutsu, Japan. The second system has been refurbished and will be deployed at Fukuoka, Japan.

Objectives

With the third mobile system deployed at Fukuoka, the high-density configuration around the IMS noble gas system JPX38 at Takasaki is complete. The CTBTO is planning to continue operating the systems at their current location, upon agreement with the local host, until the data set collected is considered scientifically and statistically profitable for future studies by the experts' community and the NDCs. The three mobile systems in Japan shall be operated in this configuration for at least one year. Then the mobile systems would be relocated, according to a clear deployment strategy. A possible new location will be considered for each of these three systems based on what scientific output can be expected that is needed for calibration and performance of the IMS noble gas systems as described in the CTBT.

Any upgrades or refurbishments will be performed at the end of the campaign as required.

Cooperation agreements with future host countries are under discussion.

To continue these measurement campaigns, funds are required for the shipment of the mobile noble gas systems to new locations, and to run and maintain the three systems for two years. Funds will also be available for organising expert meetings for a review of the results. Special effort will be made to use these expert meetings as an opportunity for capacity building and discussing future studies based on measurement campaign data. Upon request of the host country, the project will also support capacity building regarding noble gas monitoring including related civil and scientific uses.

Outcome

The main benefits of the temporary measurement campaigns with mobile radioxenon systems are the development and advance scientific methods focused on calibration and performance of the verification system as described in the CTBT and, where appropriate, related capacity building.

Heading 2: Technical assistance including integrated capacity building and outreach

For all projects under this heading, the PTS is encouraged to prioritise experts from CTBTO member States which at least partially honour their assessed contributions.

PART 1: Technical assistance and capacity building

Project 1: Enhancement of SHI automatic processing capabilities in NDC-in-a-Box [SeisComp3 SEEDLink and NET-VISA components] & simplified, standards compliant IDC products and services access for NDCs

Background

The IDC has introduced automatic processing capabilities in SHI NDC-in-a-Box SeisComp3 based on the NET-VISA associator. This new capability, which is currently being tested by NDCs, allows users to reproduce VSEL bulletin results achieved at the IDC. Building on this achievement, the IDC proposes to enhance the NET-VISA SeisComp3 component to also support the usage of NDC specific local stations and regional networks.

Additionally, the IDC is building a new capability to improve support for open source seismic analysis packages, such as SEISAN, by offering real-time waveform data transmission to NDCs using the standard SEEDLink protocol. This service will only be available to NDCs connected through the Global Communications Infrastructure network. This limitation is imposed by technical shortfalls in the SeisComp3 SEEDLink server component. The IDC proposes to enhance the SeisComp3 SEEDLink server by introducing robust authentication and encryption mechanisms so that the service can also be offered to authorised users through a secured internet connection.

To improve support in accessing IDC products and services, the IDC proposes to implement Federation of Digital Seismograph Networks (FDSN) compliant web services. This new, standards-compliant data access method will allow many users of open source seismic analysis packages, such as SEISAN, to easily retrieve products and data from the IDC from within applications that support this standard. It will augment Virtual Data Messaging System (VDMS), but not replace it, as many VDMS messages are not defined in FDSN web services (e.g. key requests) standard. All web services defined by the FDSN standard (fdsnws-station, fdsnws-dataselect, fdsnws-event and fdsnws-availability) shall be implemented.

Objectives

Provision of online material for NDCs in integrating IMS data with locally used open source seismic analysis packages such SEISAN

- Enhance the automatic processing capabilities of SHI NDC-in-a-Box by supporting NDC specific local stations and regional networks in NET-VISA.
- Simplify and modernise access to real-time IMS waveform data for authorised users.

Deliverables

All deliverables for this project consist in enhancements to the software modules that are part of the NDC-in-a-Box (including new software modules for future versions of NDC-in-a-Box).

Outcome

- Continue building on the efforts for NDC-in-a-Box software initiated under Decision 2012/699/CFSP and continued under Decisions (CFSP) 2015/1837 and (CFSP) 2018/298 in allowing NDCs to process the data available from both the IMS and local stations, as well as regional networks.
- Collaborate with NDCs to simplify authorised and secured access to real-time IMS waveform data.

Project 2: Training, workshops and follow-up for emerging NDCs (worldwide developing countries) acquisition and maintenance of Capacity Building Systems (CBS) for the NDCs

Background

Capacity building has proven to be fundamental for strengthening the CTBT's verification regime.

The Commission has successfully continued with the support to States Signatories in providing means to develop capabilities to actively participate in CTBT verification. Developing countries from different continents have started taking advantage of the provision of data and products by the International Data Centre, as these are useful not only for verification purposes but also for civil, scientific and industrial applications.

The capacity-building strategy of the Commission has been recognised by the Working Group B (WGB). During the lifespan of the Union funding, scientific and technical staff (in the order of hundreds) have taken specialised training on the use of the NDC-in-a-box software package, as well as CTBT-related knowledge that directly rewards the potential national authorities at each State.

Developing country institutions hosting National Data Centres NDCs have also been benefitting from the provision of basic equipment to start or further develop their laboratories for data processing.

Objectives

The objectives of the Commission's capacity-building activities are:

- software and infrastructure development;
- technical workshops;
- training for emerging NDCs on IMS data access and on IMS and IDC tools;
- training of experts from emerging NDCs through visits to EU NDCs;
- systematic training for extended NDC-in-a-box (eNIAB) software;
- support for integrating the processing of IMS data with national and regional seismic networks;
- support for NDCs in integrating IMS data with locally used open source seismic analysis packages such as SEISAN;
- provision of remedial technical assistance in the form of CBS equipment and related maintenance and replacement.

Outcome

The capabilities of States Signatories, in particular in developing countries, to participate in the CTBT verification regime will be enhanced.

Project 3: Evolution and homogenisation of the multi-waveform technology processing and interactive system

Background

The IDC has redesigned the infrasound automatic system and developed extended-NDC-in-a-Box projects with initial release of the software in 2016 and major updates in 2018 and 2019. The infrasound processing system efforts consisted of the development of an automatic processing array station system and the interactive review software. The tools developed have been integrated in NDC-in-a-Box (including the latest release version 5.0 in 2019) and in the IDC processing environment. In addition, the hydro-acoustic processing system has potential to greatly leverage from the efforts made in developing the infrasound technology, as many components between these two technologies are compatible on a large scale. However, there is a need to pursue efforts to homogenise the software components and processes while taking into account a number of independent and specific technology needs.

Thanks to NDC-in-a-Box and dedicated infrasound trainings provided using previous Union funding, NDCs have gained capabilities for infrasound technologies and they are making intensive use of the NDC-in-a-Box tools. The IDC continuously receives requests for dedicated waveform technology trainings, including infrasound and hydro-acoustic technologies, and demands for new or enhanced specialised software.

The IDC proposes to continue efforts to complete the infrasound and hydro-acoustic processing systems in support of IDC and IMS needs and to address the NDCs' requests for state-of-the-art software. The project aim is to bring the hydro-acoustic processing system on par with the redesigned infrasound system and homogenise the common software components and refine specific individual technology dependencies, while continuing to advance the processing to keep abreast with the latest technology developments. This project should also allow IDC to plan a smooth integration of IDC specific tools into the IDC re-engineered system presently under development.

Objectives

- Support the evolution of the station processing system to continuously meet IMS and IDC operations sustainment needs.
- Support the NDC requests for software, software update and functionalities for performing NDC activities.

- Continue the implementation of state-of-the-art functionalities to improve infrasound and hydro-acoustic signal analyses and interpretation for source identification, in order to maintain the scientific credibility of the hydro-acoustic and infrasound technologies at the CTBTO.
- Pursue efforts to include wave propagation models with uncertainty quantification, in particular for infrasound technology by taking into account high resolution atmospheric specifications for network processing and in-depth event analysis to meet Medium Term Strategy objectives.

Deliverables

All deliverables for this project consist of enhancements to the software modules that are part of the IDC processing system and NDC-in-a-Box (including new software modules for future versions of NDC-in-a-Box).

Outcome

- Continue building the technical and scientific credibility of the IDC infrasound and hydro-acoustic systems and ensure the sustainment of IDC and IMS operations as outlined in strategic goal 1 of the Medium Term Strategy 2018-2021
- Continue building on the efforts for NDC-in-a-Box software initiated and developed from previous Union funding, allowing NDCs to process the data available from the IMS for both CTBT monitoring and for national purposes. These efforts have created a strong NDC user base and the proposed project would further increase NDCs' trust in the credibility of the verification system. This also provides NDCs with additional capabilities to automatically process IDC data, mixing data from IMS and non-IMS stations in NDC-in-a-Box and reproducing IDC results in NDC-in-a-Box automatic processing.
- Collaborate with NDCs to build state-of-the-art infrasound and hydro-acoustic systems as part of IDC re-engineering efforts.

PART 2: Project 1 Capacity building for OSI technologies

Project: OSI Regional Introductory Courses for 2 CTBT Geographical Regions

Background

OSI Regional Introductory Courses (RIC) have proven to be fundamental in strengthening the CTBT's verification regime, specifically in the development of an OSI Inspectorate Training Program and in the nomination of surrogate inspector trainee candidates for that programme from Signatory States.

The Commission is in the final stages of the OSI Surrogate Inspector 3rd Training Cycle. The geographical and gender distribution of this current training cycle is statistically the most diverse trainee population compared to the 1st and 2nd Training cycles.

Records show a correlation between the increased numbers of nominees from a geographical region after the conduct of a RIC. The 2 most recent RICs (conducted in Argentina in 2019 and South Africa in 2016) showed a substantial increase in expert nominees from the Latin America and Caribbean (LAC) region and Africa respectively, both of which were previously underrepresented regions in OSI training activities. The percentage of post-RIC representation for the LAC region however, did not match that of Africa, simply because the RIC in Africa was conducted immediately prior to the start of the 3rd Training Cycle, whilst the RIC in Argentina was conducted 2 years later during the middle of the training cycle.

While RICs have been conducted biennially in the past, this project proposes to conduct 2 RICS in 2 different CTBT geographical regions within 12 months of each other, in order to have the broadest geographical and gender pool of trainees prior to the start of the 4th OSI Surrogate Inspector Training Program.

Objectives

OSI Regional Introductory Courses have two objectives:

- to acquaint national technical experts and personnel from the States Signatories of the region with the OSI regime;
- to broaden the pool of experts from the States Signatories of the region who are available to participate in OSI-related activities and to identify potential candidates for the Provisional Technical Secretariat (PTS) roster of surrogate inspectors.

Outcome

Provision of foundational knowledge of the CTBT and its OSI-related provisions as well as an overview of OSI activities and equipment, using hands-on training for experts from States Signatories, in particular developing countries, resulting in an increase in nominations and participation in future OIS training programs.

PART 3: Outreach to non-signatories and non-ratifying countries including Annex 2 States & capacity building of Youth, Parliamentarians, journalists and scientists in developing or emerging countries

Project 1: Outreach to scientists, academics, civil society, international and non-governmental organisations, parliamentarians and other policy makers, towards entry into force of the CTBT

Background

Expert-level interaction with the Preparatory Commission is an indispensable means of maintaining both political support for, and technical edge and foresight in, all aspects of the CTBT.

Over the past few years, a series of conferences and academic, diplomatic and scientific outreach events (for example, biennial CTBT Science and Technology Conference, Regional CTBT Workshops and Conferences, Symposiums) have been instrumental to build, maintain and expand confidence in the verification regime of CTBTO. They have also enhanced public awareness of CTBTO role and underscored the importance of the CTBT as a cornerstone of the global non-proliferation and disarmament regime.

The project below capitalises on previous activities, which were funded by the Union under previous Council Decisions and former Joint Actions and further strengthens PTS access to strategic knowledge and competences.

The project will make use of cross-organisational synergies and linkages with the broader PTS outreach strategy.

Objectives

Item (i)

Strengthening the SnT process through engagement with leading scientific and technological centers across the globe

Continued access to scientific and technological knowledge is vital for the PTS to maintain a technical edge and be accurately prepared for any emerging technological challenge. In addition, fostering cooperation with leading scientific centres would allow CTBTO to raise awareness of the CTBT and its role among a rising trans-national generation of new scientists and technical experts.

Deliverables

This project proposes to conduct up to four courses and training programmes of different sizes on CTBT issues, particularly on the scientific and technical aspects of the CTBT.

Developing countries and Annex 2 States will be specifically targeted, in line with the entry into force and universalisation strategies of the PTS. Following on from the planned Science and Diplomacy Symposium 2020, set to be funded under Decision (CFSP) 2018/298, the project will provide seed funding for the next in the series of Symposiums and the Science and Technology Conference 2021, with a particular emphasis on contributing to participation by women and developing country participants, as well as non-ratifying Annex 2 States, including young members of the CTBTO Youth Group and Group of Eminent Persons.

Item (ii)

Universalisation of the Treaty through Regional and Sub-regional Workshops:

Achieving a world free of nuclear testing through a legally-binding and enforceable regime is a responsibility of the whole international community.

To achieve this goal, a proactive strategy for awareness raising, confidence building and regional cooperation must be taken.

For example the Pacific Island States Regional Workshop held in 2018, and the South East Asian Regional Workshop hosted in 2014, reaped dividends in terms of securing additional signatures and ratifications of the Treaty such as Thailand and Tuvalu.

Deliverables

This specific segment of the project will focus on convening at least four sub-regional conferences. Two of them will take place on the African continent with the scope of encouraging remaining African countries to ratify the CTBT. One workshop will be convened among English speaking African nations. The second one will focus on the Francophone membership.

The other two workshops will instead involve young scientists and will seek to spearhead regional scientific dialogue in Asia and in Europe respectively.

Item (iii)

Reviving Academic Interest in CTBT:

During the 80s and the 90s, debate flourished within academia on how to bring to a halt global nuclear testing. Intellectual impetus was inspired and largely sustained also by social movements of young environmentalists interested in achieving stronger global cooperation towards a more sustainable way of living. Today, academic work on the CTBT and the norm against nuclear testing is scant. As a result, educational curricula rarely discuss the role of the CTBT and its important function. This project can remedy this situation by providing small seed funding to cover:

Deliverables

- The convening of three academic workshops: in London, Paris, Moscow, Washington, Berlin or Algiers.
- The commissioning of at least five papers that discuss the way in which the CTBT is critical in building strategic trust and confidence both at regional and global level.
- Outreach to at least 10 universities teaching issues related to arms control and non-proliferation issues to encourage them to include the CTBT in their educational curriculum at both undergraduate and graduate level.

Item (iv)

Establishing a CTBT publication for young scholars

Since the establishment of its Youth Group in 2016, CTBTO has undertaken concerned efforts to ensure consistent presence by young people in all its workshops and events. In addition, during the Science and Technology Conference 2017 and 2019, a magazine called Newsroom Project was issued to highlight younger scholars' perspectives on how to bring into force the CTBT.

Deliverables

Given the positive feedback received, this project would ensure a consistent and periodic (ideally twice yearly) release of the magazine. Most importantly, the funding of this project would improve the quality of the publication and transform it into a venue for dialogue and ideas exchange among young scholars on the CTBT.

Outcome

In addition to enhanced global security, Union support for this project will bolster the EU Strategy against the Proliferation of Weapons of Mass Destruction and the Common Position of the Council of the European Union on the universalisation and reinforcement of multilateral agreements, in the field of non-proliferation of weapons of mass destruction and means of delivery. The projects will engage a broad community of stakeholders on CTBT-related issues; will promote intra-organisational synergies, efficiency and effectiveness, within the PTS; and will further intensify the outreach to key stakeholders in States yet to sign and/or ratify the CTBT, including Annex II States, in order to achieve entry into force and universalisation of the CTBT.

Project 2: Project for the participation of technical experts from Developing Countries in official technical meetings of the Preparatory Commission (informal reference 'Pilot Project')

Increased participation of developing and emerging country experts in official technical meetings of the Commission and in scientific and technical meetings held by the PTS. The experts are provided with an opportunity to enhance their scientific and technical knowledge and skills with respect to the verification technologies (seismic, hydroacoustic, infrasound and radio).

Background

Many developing and emerging countries lack the financial resources to enable their experts to participate in the scientific and technical work being undertaken in official technical meetings of the Preparatory Commission. This means that there is a clear deficit in the involvement of developing country representatives in recommendations made and decisions taken, on key technical issues relevant to the CTBT's verification regime. This deficit is problematic given that many stations of the CTBT's International Monitoring System are, or will be, located on the territory of developing and emerging countries and are managed by the country's institutions. Moreover, many developing countries are in the process of establishing and improving their National Data Centres to enable them to take advantage of the data and products generated by the verification system.

This lack of participation also means that many countries are excluded from an important means to enhance their capacity, knowledge and skills related to the verification technologies of the CTBT. These technologies are relevant not only for the disarmament and non-proliferation objectives of the CTBT, but also for important civil and scientific applications of broader benefit to communities in these countries, such as disaster warning for tsunamis, earthquakes and volcanic eruptions.

Thus, during Part II of its Twenty-Seventh Session (13-17 November 2006), the Commission agreed to establish a pilot project aimed to address this challenge. At its Fifty-first Session (7-9 November 2018), the Commission decided to continue the project for a further three years, from 2019 to 2021.

So far it was possible to sustain funding for up to 12 experts. With this additional funding more experts could be selected from usually larger pool of candidates' nominations.

Objectives

Strengthening the universal character of the Preparatory Commission for the CTBTO and capacity building in developing and emerging countries through increased involvement of those country experts in CTBTO policy-making processes and their enhanced capacity in relation to the CTBTO's verification technologies and the latter's broader civil and scientific applications.

Outcome

Increased participation of developing and emerging country experts in official technical meetings of the Commission and in scientific and technical meetings held by the PTS. The experts are provided with an opportunity to enhance their scientific and technical knowledge and skills with respect to the verification technologies (seismic, hydroacoustic, infrasound and radionuclide).
