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

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on European Union, and in particular Articles 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 (PTS) of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO).

(3) On 17 November 2003, the Council adopted Common Position 2003/805/CFSP ([1]). That Common Position calls, inter alia, for the promotion of the signing and ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT).

(4) The States Signatories of the CTBT have decided to establish a Preparatory Commission ('the Preparatory Commission for the CTBTO'), endowed with legal capacity, and which has standing as an international organisation, for the purpose of carrying 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 for the CTBTO are important objectives of the Strategy. In this context, the nuclear tests carried out by the Democratic People's Republic of Korea has further underlined the importance of the early entry into force of the CTBT and the need for an accelerated building-up and strengthening of the CTBT monitoring and verification system.

(6) The Preparatory Commission for the CTBTO is engaged in identifying how its verification system could best be strengthened, including through the development of noble gas monitoring capabilities and efforts aimed at fully involving States Signatories of the CTBT in the implementation of the verification regime.

(7) In the framework of the implementation of the Strategy, the Council adopted three Joint Actions and three Decisions on support for activities of the Preparatory Commission for the CTBTO, namely Joint Action 2006/243/CFSP ([2]), and Joint Actions 2007/468/CFSP ([3]) and 2008/588/CFSP ([4]), Council Decisions 2010/461/CFSP ([5]), 2012/699/CFSP ([6]) and (CFSP) 2015/1837 ([7]).

(8) That Union support should be continued.

(9) The technical implementation of this Decision should be entrusted to the Preparatory Commission for 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, 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 for the CTBTO,

HAS ADOPTED THIS DECISION:

Article 1

1. For the purpose of ensuring the continuous and practical implementation of certain elements of the Strategy, the Union shall support the activities of the Preparatory Commission for the CTBTO in order to further the following objectives:

(a) strengthen the capabilities of the CTBT monitoring and verification system, including in the field of radionuclide detection;

(b) strengthen the capabilities of the States Signatories of the CTBT to fulfil their verification responsibilities under the CTBT and to enable them to benefit fully from participation in the CTBT regime.

2. The projects to be financed by the Union shall support:

(a) certified auxiliary seismic (AS) stations that are part of the CTBTO International Monitoring System (IMS);

(b) the development of noble gas sampling systems through study of materials for improved adsorption of xenon;

(c) continuing the radio-xenon background measurement campaigns in different regions of the world;

(d) the Ensemble Prediction System to quantify uncertainties and confidence level in Atmospheric Transport Modelling (ATM) simulations;

(e) the scientific evaluation of the increase in resolution for ATM tools;

(f) the development of new software;

(g) enhancing the on-site inspection noble gas processing and detection;

(h) enhancing the automatic processing and integration capabilities in seismic, hydro-acoustic and infrasound National Data Centre-in-a-Box;

(i) integrated outreach and capacity-building targeting State Signatories and Non-Signatories.

In the implementation of the projects, providing support to the activities referred to in this paragraph, Union visibility will be ensured as well as the proper programme management in the execution of this Decision.

These projects shall be carried out for the benefit of all States Signatories of the CTBT.

All project components shall be flanked by proactive and innovative public outreach activities, and resources be allocated accordingly.

A detailed description of the projects is set out in the Annex.

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 for the CTBTO. It shall perform this task under the control of the High Representative. For this purpose, the High Representative shall enter into the necessary arrangements with the Preparatory Commission for the CTBTO.

Article 3

1. The financial reference amount for the implementation of the projects referred to in Article 1(2) shall be EUR 4 594 752.

2. The expenditure financed by the amount stipulated 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 for the CTBTO. The financing agreement shall stipulate that the Preparatory Commission for 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 26 February 2018. 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 for 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

This Decision shall enter into force on the day of its adoption.

This Decision shall expire 24 months after the date of the conclusion of the financing agreement referred to in Article 3(3). However, it shall expire 6 months after its entry into force if no financing agreement has been concluded by that time.

Done at Brussels, 26 February 2018.

For the Council
The President
F. MOGHERINI

(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).

(2) 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).

(3) 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).

(4) 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).

(5) 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).

(6) 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).

(7) 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).

ANNEX

Union support for the activities of the Preparatory Commission for the CTBTO in order to strengthen its monitoring and verification capabilities, enhance the prospects for early entry into force and support the universalisation of the CTBT and in the framework of the implementation of the EU Strategy against Proliferation of Weapons of Mass Destruction

1. **Support to the verification technologies and monitoring system**

Project 1: Improving sustainment of targeted certified IMS Auxiliary Seismic (AS) stations

Background

The main focus will be to continue addressing AS stations which need urgent maintenance action specifically those located in countries facing financial hardship including when geographical density of AS stations in operations is poor in regions of interest, while proceeding with preventive maintenance. This is done by addressing equipment obsolescence, and upgrades as well as improvement of equipment sparing.

As in previous programs, there is a need for a full-time dedicated staff to plan and execute work projects at the relevant AS stations as well as funds for spare parts and travel.

Objectives

The principal objective is to bring target AS stations to a technical level compatible with the IMS requirements in a sustainable manner. AS stations are the backbone of the IMS seismic infrastructure and need continuing maintenance. Adequate preventive maintenance and associated equipment sparing can help achieve this objective. This is achieved in conjunction with other tasks such as AS station operator training. Priority will be given to AS stations where there is a strong need for technical and financial support, such as those in Africa, developing Asian and central Asian countries.

Outcomes

Increased data availability and data quality of the AS network: the AS network helps to improve the location accuracy targeted AS stations, including in regions of seismic events detected by the primary network leading to an enhanced seismic coverage of nuclear explosions. A strengthened sustainment structure for AS stations leads to increased visibility for the Union.

Project 2: Contribution to the development of noble gas sampling systems through a study of materials for improved adsorption of xenon

Background

The efficient concentration of radioactive xenon isotopes (^{133}Xe, ^{135}Xe, ^{133}mXe and ^{131}mXe) in small volumes under different physical conditions and the efficient and complete release of these xenon isotopes out of adsorption materials are of utmost importance in improving nuclear explosion monitoring and verifying the worldwide compliance with the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The above mentioned xenon isotopes are key fission radionuclides monitored by the noble gas component of the radionuclide network of the IMS and any improvements that can be introduced into future systems will be invaluable.

Objectives

The objective of this proposal is to gain a better understanding of the adsorption mechanisms, desorption conditions and properties of relevant materials over a range of conditions important for highly effective xenon concentration in the CTBT verification framework. A laboratory study will be undertaken to investigate which parameters are important and to determine fundamental information on how materials can be modified to optimise their characteristics, including, inter alia, adsorption and desorption capacity, density and durability.

Outcome

A laboratory report detailing these results and recommendations for implementation across IMS facilities will be produced, which improves the understanding of how current adsorption materials can be optimised and newer materials identified for improved radio-xenon detection capabilities in IMS facilities.

Project 3: Continuing the radio-xenon background measurement campaigns in different regions of the world

Background

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (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 Preparatory Commission for the CTBTO developed and purchased two transportable systems for measuring ^{133}Xe, ^{135}Xe, ^{133}mXe and ^{131}mXe. Within the framework of Decision 2012/699/CFSP, the two measurement systems operated in Kuwait City, Jakarta, Mutsu and Manado. They provided considerable amount of information regarding the radio-xenon background.

In the framework of Decision (CFSP) 2015/1837, both measurement campaigns in Kuwait and Indonesia were extended. Contacts were initiated with possible next host countries and cooperation agreements are currently under discussion.

Objectives

The CTBTO is planning to relocate the two mobile systems purchased under Joint Action 2008/588/CFSP and currently operating in Kuwait and Indonesia. Cooperation agreements with future host countries are under discussion.

From a network coverage point of view, the Southeast Asian region is of great importance for the CTBTO as no IMS noble gas system is currently operating there. In addition to a significant reinforcement of the coverage in that region of the world, operating a mobile system for a background campaign will allow to:

— improve our understanding in the regional radio-xenon background of equatorial regions, where the dispersion of noble gases is made very complex by many intense phenomena,

— further refine atmospheric and dispersion models to better represent air masses movements in that region of the globe.

The CTBTO is planning to run a measurement campaign in the Southeast Asian region for at least 12 months to cover the whole seasonal variation.

The CTBTO aims at operating another mobile system in the East Asian region. Considerable insights on the characterisation of the radio-xenon background were previously provided by a short Union-funded measurement campaign. A longer measurement campaign is crucial to complement and refine our knowledge of the regional radio-xenon background. The main objective of this complementary campaign is to allow the characterisation of the East Asian region throughout an entire 12-month cycle covering all seasonal conditions. The location will be selected with the goal of running an intensified regional network of sensors (i.e. with higher density as compared to the current IMS noble gas network). This will be the first occurrence of having at least two systems very close to each other, allowing more scientific studies on cross-validation of the systems, cross-correlation of the detections, small scale Atmospheric Transport Modelling (ATM) developments, etc. This study could benefit of a partnership with States in the region that also plan for voluntary contributions on this subject.

After the end of these campaigns, the CTBTO is planning to perform additional measurements in areas where the global radio-xenon background is not sufficiently known and understood. Preferred locations are equatorial sites in Latin America, Asia and Africa.

To continue the measurement campaigns, funds are required for the shipment to new locations, operation and maintenance of the two mobile noble gas systems for 2 years.

Outcome

The benefits are a better understanding of the global noble gas background variation and better coverage of the noble gas monitoring network. Following these measurement campaigns, the systems will be available for use by the CTBTO for follow-up studies of the noble gas background on different geographical scales and as backup and/or training systems.

Project 4: Ensemble Prediction System (EPS) to quantify uncertainties and confidence level in ATM simulations

Background

Referring to the Part I, paragraph 18(a), of the Protocol to the CTBT, the International Data Centre ('IDC') should provide values and associated uncertainties calculated for each event located by the IDC. Since ATM contributes to the location of events, associated uncertainties should be provided.

It is recognised that uncertainties can be estimated using a set of equivalent simulations, an ensemble, rather than a single simulation. This project will use meteorological EPS data (European Centre for Medium-Range Weather Forecasts, National Centres for Environmental Predictions or others) to generate a dataset containing multiple simulations for the same cases. This dataset will then be used to develop tools to estimate uncertainties and confidence levels in ATM simulations. An independent dataset will serve to validate and demonstrate the new tools.

Objectives:

— develop a validated prototype to estimate uncertainties and confidence level in ATM simulations,

— define the needs in collaboration with users,

— identify meteorological EPS data to use,

— build a dataset of ATM simulations,

— develop tools to estimate uncertainties and confidence levels,

— validate tools,

— adapt the new launching interface to produce uncertainties and confidence level,

— make the validated prototype available for testing on real cases.

Outcome

EPS-based products will help in taking important decisions by providing objective information to quantify uncertainties and confidence level in ATM simulations for any particular case. It will also provide a scientific basis to demonstrate how to extract valuable information from ATM guidance in spite of the inherent uncertainties associated with atmospheric simulations.

Project 5: Scientific evaluation of the benefits of increase in resolution for IDC's ATM tools

Background

Guidance resulting from ATMs usually benefits from an increase in resolution of the driving meteorological fields and of the ATM itself, especially for shorter time range. Two projects in that direction are nearing completion at IDC; operationally producing Source Receptor Sensitivity (SRS) fields at higher resolution (1 hour, 0,5 o) and generating high resolution (HR) meteorological fields on an on-demand basis for specific events (on-site inspections (OSI), nuclear tests, nuclear incidents, etc.) anywhere on the globe. These HR meteorological fields will be ingested by Flexpart a software tool using a Lagrangian transport and dispersion model to produce ATM products of a very high resolution (~ 0,05 o) as required. A scientific validation will be performed to demonstrate and quantify the benefits from these two projects on ATM products.

Objectives:

— demonstrate the added-value of the increase resolution using observations and model comparisons,

— develop a launching interface to quickly produce forward and backward ATM simulations, HR meteorological fields, and ATM guidance based on HR meteorological fields at any location.

Outcome

The scientific demonstration of the benefits of increasing the resolution on the ATM guidance will help confirming the utility of the new capacities (operational SRS at higher resolution, HR meteorological fields) in the operational system.

The launching interface will make possible the production of detailed guidance during OSIs or during other exceptional events (nuclear tests, nuclear incidents, etc.).

Project 6: Activities in Preparation for Phase 3 of IDC Reengineering

Background

From January 2014 to April 2017, the CTBTO has undertaken the IDC Reengineering Phase 2 (RP2) project, aiming to develop comprehensive software architecture to guide new software development and updates to existing systems over the next decade.

The resulting architecture brings notable improvements over the existing one, among others:

— 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, support for analyst training,

— comprehensive capturing of data provenance in order to understand how processing results were arrived at and investigate the evolution of a result as the available information changes,

— extensibility as a major feature built in all components,

— flexible seismic, hydro-acoustic and infrasound (SHI) pipeline configuration supported by graphical tools,

— facilitates a new model for collaborative software development following best practices in open source software development,

— enhanced monitoring and testing capabilities — Test Data Set Replay.

RP2 was carried out with support through a contribution-in-kind from the USA and funds under Decision (CFSP) 2015/1837. Those funds were used in particular to sustain technical meetings with experts from Member States in order to ensure a wide participation in RP2. These funds also supported prototyping activities, to show how software contributed by National Data Centres (NDCs) can be integrated into the reengineered architecture.

In preparation for a third phase of IDC reengineering that will implement codes based on the RP2 architecture, the IDC is seeking to raise the technology readiness level for several algorithms that could be considered for inclusion into the reengineered software. This proposal specifically addresses algorithms that provide better ways to process seismic aftershocks sequences in automatic or semi-automatic mode.

Objectives

The objective of this project is to prototype and compare the performance of up to three approaches at improving the processing of aftershock sequences.

The algorithms under consideration are:

— two cross-correlation based approaches,

— an approach based on auto-regressive AIC methods.

Deliverables

— For each of the three approaches above, experimental automatic processing pipelines will be setup, integrating the three algorithms under consideration (each in a separate pipeline). This implies automation of some manual steps in these methods.

— Each pipeline will run on the same set of representative events that cause aftershocks.

— A set of automatic tests will be designed and implemented allowing collecting statistical information on the three algorithms when run on a representative set of events, for performance comparison purposes.

— Statistical data collected as a result of automatic tests will be used to compare the performance of the algorithms on representative data sets.

— SHI MDA analysts will also assess the results produced by the three algorithms from the point of view of their quality as a starting point for analyst review.

— The final deliverables should be a report and recommendation summarising the findings above establishing which of the three approaches (if any) should be pursued for further development and implementation in an operational system. This should include estimates for the remaining effort needed to complete development.

The project will be executed over a duration of 1,5 years, starting in the second quarter of 2018. It is estimated that about 60 % of the total effort, mainly in the first year of the project, will be spent on setting up the experimental pipelines. The remainder of the total effort will be dedicated to designing automatic tests, collecting their results and analysing results.

Outcome

The main benefit of the project is to raise the technical readiness level of an algorithm that has great potential in reducing analyst workload. Software with sufficiently high technology readiness can be implemented in a reengineered system with less risk. On the basis of this work, a more robust effort estimate for the work remaining to be done to implement the selected algorithm in operations can be done.

Some of the prototype code developed in the course of this project may be integrated in the final operational software.

2. **Strengthening OSI capabilities**

Project: OSI noble gas processing and detection enhancement

Background

The Provisional Technical Secretariat (PTS)-owned OSI noble gas (NG) system for processing and detection of radio-xenon (OSI NG system) has been developed with funding from the European Union (Decision 2010/461/CFSP). The system was delivered early in 2014 and successfully used later that year during IFE14, an Integrated Field Exercise organised in 2014 by the Preparatory Commission for the CTBTO to simulate an almost entire OSI in Jordan. During this exercise, the OSI NG system reliably and accurately determined the ratio of ^{131}mXe to ^{133}Xe. Furthermore, the system met the technical requirements on the minimum detectable activity for these isotopes.

While the exercise has shown that the OSI NG system meets the key performance parameters of radio-xenon detection, the Technical Report of the IFE14 External Evaluation Team also identified a number of operational parameters which need to be addressed in the further development of capabilities for noble gas processing and detection. Likewise, in 2016, OSI-Workshop 23 on Further Development of the OSI Equipment List concluded that the capabilities for radio-xenon purification and measurement need improving in terms of robustness, simplicity and engineering as a matter of priority in order to enhance their operational performance. The enhanced OSI NG system is required to finalise the design and operationalisation of the OSI field laboratory which has direct implications on the required rapid deployment and in-field support capabilities.

Objectives

In accordance with recommendations from the review and follow-up process of IFE14, the objective of this proposal is to enhance the existing OSI NG system. The project aims to tailor the system for air transport and easy movement to, from and within the Base of Operations as well as for reliable and simple operation in a field laboratory environment. In support of OSI Action Plan project 3.11 Noble Gas Laboratory, which aims, inter alia, at increased user friendliness, modularity and system reliability, the following system components need to be redesigned and/or developed:

— detector stand and lead shield, in order to facilitate installation and adjust the centre of gravity,

— gas separation, in order to reduce power consumption and switch the carrier gas from helium to more readily available materials in remote locations,

— software, in order to simplify processes suitable for an inspector-operated system,

— overall engineering design, in order to maximise integration in line with the OSI rapid deployment concept.

Outcome

An improved and more efficient and effective PTS-owned OSI noble gas laboratory with simplified user interaction and improved reliability and robustness will enhance the work of inspectors during an OSI; consequently, this supports Union policy and determination for the CTBT to enter into force.

3. **Integrated capacity building and outreach activities**

A. *Further development in the roll-out of the NDC-in-a-Box*

Project 1: Enhancing automatic processing and integration capabilities in SHI NDC-in-a-Box

Background

In July 2016, the Preparatory Commission for the CTBTO released version 4.0 of NDC-in-a-Box which includes new modules developed during the 'Extended NDC-in-a-Box' project. The release significantly improved NDC processing capabilities, with tools for automatic and interactive analysis for infrasound data and through integration with the SeisComP3 software suite for automatic processing of seismo-acoustic data. The IDC STA/LTA detector and the DTK-PMCC detector were integrated with the SeisComP automatic processing pipeline. Following this release, the IDC locator can be called from the SeisComP interactive review tool scolv. Several conversion modules support integration of IDC data and products into a SeisComP-based processing pipeline and facilitate synchronisation of station configuration information between NDCs and the IDC, through data retrieval and import modules or through database replication.

While the new modules allow NDCs to reproduce results of the IDC detectors for seismic and infrasound data, processing of hydro-acoustic data has not been considered yet. In addition, the events produced by the Seiscomp-based automatic processing pipeline differ significantly from those generated at the IDC. This is due to differences between the software used to build events in the IDC and SeisComP pipelines.

Objectives

The objective of this project is to expand the capabilities of the SeisComP and the SeisComP modules being made available in NDC-in-a-Box to:

— Integrate the IDC signal detector for hydro-acoustic data in NDC-in-a-Box, including determination of features specific to hydro-acoustic detections. This would allow NDCs to detect arrivals from IMS hydro-acoustic stations using the same software that is used in IDC processing.

— Integrate the NET-VISA detector used at the IDC into the SeisComP processing pipeline, and offer the end-user an interface to configure NET-VISA as the default associator to be used in SeisComP. This would help NDCs that process IMS data using the SeisComP automatic pipeline to create an event set that is closer to the one built at the IDC.

— Enhance capabilities of integrating IMS data into other open source seismic analysis software such as SEISAN.

Deliverables:

All deliverables for this project consist in enhancements to the software modules that are part of NDC-in-a-Box as well as new software modules to be made available in future versions of NDC-in-a-Box. These new and enhanced software modules are as follows:

— existing NDC-in-a-Box scdfx module integrated into SeisComP enhanced to allow it to process hydro-acoustic data and to store all features that hydro-acoustic detections at the IDC possess,

— IDC HASE module for azimuth and slowness determination of hydro-acoustic arrivals integrated into a SeisComP module,

— NET-VISA associator integrated into SeisComP, as an optional associator that can be configured to be used in lieu of the SeisComP default associator,

— SeisComP enhanced to enable it to store additional features for hydro-acoustic detections, as well as pixels and pixel families for infrasound detections,

— SeisComP export modules enhanced, such that detections and their features for hydro-acoustic and infrasound software can be exported to the Open Source Database,

— current software enhanced to allow complete IMS seismic station configuration and IMS data to be imported into SAEISAN for processing in combination with non-IMS data of interest to NDCs.

The project will be executed over the course of 12 months, using agile software development methodologies such as Scrum or Kanban, with releasable software increments and with increased functionality produced every 4 weeks.

It is planned to hold two workshops with NDC representatives with the following objectives

— The first workshop will introduce the project and will provide NDC representatives the opportunity to present use cases relevant to their own NDC that may benefit from running an automatic associator (NET-VISA) as part of SeisComP, to form SHI events. NDCs are also expected to provide test data from networks of interest to them to the IDC, for testing purposes.

— The second workshop should serve as the start of a testing period for the software completed during the project. This software will likely include the NET-VISA associator integrated in SeisComP and AS station processing tools for hydro processing integrated into SeisComP.

Outcome

The final deliverable will be an enhanced automatic processing pipeline based on SeisComP to be distributed to NDCs.

The main result is to provide NDCs with additional capabilities to automatically process IDC data, to mix data from IMS and non-IMS stations in NDC-in-a-Box and to reproduce IDC results in NDC-in-a-Box automatic processing.

Project 2: Evolution of the infrasound processing and interactive system

Background

Since 2013, the IDC has been working on both the redesign of the infrasound automatic system and on the Extended-NDC-in-a-box projects with release of the software in 2016. The infrasound processing system efforts consisted on the development of an automatic processing array station system and the interactive review software. Those tools have then been integrated in NDC-in-a-box and in the IDC environment.

The initial feedback from NDCs is positive, as NDCs have gained capabilities for infrasound technology. The IDC is currently receiving requests for dedicated infrasound technology training as well as suggestions for enhancements and evolution of the tools, which goes beyond the planned maintenance activities.

The IDC would like to continue efforts to complete the infrasound processing system to support IDC and IMS needs and to support and address NDC request for software.

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 better analyse infrasound signals in order to maintain the scientific credibility of the infrasound technology at the CTBTO,

— working on the inclusion of infrasound wave propagation models with uncertainty quantification, combined with high-resolution atmospheric specifications during infrasound phase association, event formation and in-depth event analysis to meet mid-term strategy objectives.

Outcome

— to continue building the technical and scientific credibility of the IDC infrasound system and to ensure the sustainment of IDC and IMS operations;

— to continue building on the efforts for NDC-in-a-Box software started under Decision 2012/699/CFSP and continued under Decision (CFSP) 2015/1837 in allowing NDCs to process the data available from the IMS for both CTBT monitoring purposes and for national purposes. These efforts have created a strong NDC user base and the proposed project results will help gaining NDC trust in the credibility of the verification system;

— to collaborate with NDCs to build a state-of-the-art infrasound system as part of IDC re-engineering efforts.

B. *Integrated outreach and capacity building through technical assistance, education and training*

Project: Engagement with State Signatories as well as Non-Signatories in Support of the CTBT and its verification regime through integrated outreach and capacity building

Background

Capacity building has proven to be fundamental for strengthening the CTBT's verification regime. Many stations of the CTBT's IMS are, or will be, located on the territory of developing countries and are managed by developing country institutions. Moreover, many developing countries are in the process of establishing and improving their NDCs to enable them to take full advantage of the data and products generated by the verification system. In this regard, capacity building systems (CBS) have been delivered to over 40 NDCs through Union funding, which need regular maintenance and occasional replacement.

Integrated outreach and capacity building activities provide experts from developing countries with needed background and training to facilitate their participation in the decision-making and policy development processes of the Preparatory Commission for the CTBTO. Such participation is essential in affirming the democratic and participatory nature of the CTBT, which in turn serves as a confidence building measure to obtain support from Non-Signatory States.

As a key element of the integrated outreach and capacity building, the Secretariat pursues training and education activities aimed at building up and maintaining the necessary capacity in the technical, scientific, legal and policy aspects of the CTBT and its verification regime focusing on States that have not signed or ratified the CTBT. These training and education activities involve cross-divisional efforts and resources and also benefit from the participation of members of the Group of Eminent Persons and support from CTBTO Youth Group members.

Objectives

The objectives of the integrated outreach and capacity building activities of the Preparatory Commission for the CTBTO are to:

(a) contribute to the universalisation of the CTBT;

(b) advance prospects for the CTBT's entry into force; and

(c) strengthen and maintain support for the CTBT's verification regime.

Activities for Universalisation and Entry into Force:

— development of online educational materials and tools,

— training, scientific and diplomatic workshops and conferences,

— participation in major events on non-proliferation and disarmament issues.

Activities for strengthening and maintaining support for the CTBT's verification regime:

— software and infrastructure development,

— technical workshops,

— systematic training for Extended NDC-in-a-box (eNIAB) software,

— support for integrating the processing of IMS data with national and regional seismic networks,

— provision of remedial technical assistance in the form of CBS equipment and its maintenance or replacement.

Outcome

Enhanced abilities and awareness of the CTBT and its verification system and strengthened operational capabilities of the verification regime. States that need to sign and/or ratify the CTBT, including those listed in Annex 2 to the CTBT, will become familiar with the benefits of the CTBT and the verification regime.