

# ISTC 2020 ANNUAL REPORT



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## MISSION

**To advance global peace and prosperity through cooperative Chemical, Biological, Radiological and Nuclear (CBRN) risk mitigation by supporting civilian science and technology partnerships that address global security threats and advance non-proliferation.**

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**The International Science and Technology Center (ISTC) is an intergovernmental global security organization that builds innovative partnerships that mitigate CBRN and emerging threats and promote responsible science and technology.**

**The ISTC is headquartered in Nur-Sultan, Kazakhstan. There are branch offices in Armenia, Georgia, Kyrgyzstan, and Tajikistan.**

## TO SUPPORT

# ISTC's COVID-19 Response: Accomplishing Mission Critical Work Through Adversity



**March 11, 2020**

World Health Organization characterizes COVID-19 as a pandemic.

**March 16, 2020**

Kazakhstan shut down due to COVID-19 pandemic.



**April 2020**

European Union CBRN Risk Mitigation Centres of Excellence (EU CBRN CoE) Project 53 (Project 53) organized several online meetings to discuss regional COVID-19 related training needs with participation of Central Asia (CA) and South East and Eastern Europe (SEEE) Partner Countries, as well as representatives from EU Project/Programs and the World Health Organization.



**April 2020**

The ISTC provided equipment support to the Kazakh Ministry of Health (MoH) in the fight against COVID-19. One thousand (1,000) Personal Protective Equipment (PPE) and eighty (80) packs of ribonucleic acid (RNA) kits for rapid purification and extraction of viral RNA by spin-column method were delivered to the MoH in the amount of €26,500. Watch the video here: <http://www.istc.int/en/article/20932>

### May 2020

The EU provided an additional €2M to address COVID-19 needs of CA and SEE partner countries, building and expanding on the activities conducted from 2016-2019. As part of this funding, the EU provided additional COVID-19 supplies, conducted national and regional training on COVID-19 related issues, organized a conference on COVID-19 lessons learned, and provided overall support for regional coordination, cooperation, and exchange of information. The ISTC procured the needed supplies, formulated training activities in close cooperation with partner countries, and supported multiple networking activities to enhance regional and international cooperation.



### September 2020

In an addendum to Project 53, the EU implemented several activities to support Kazakhstan's response to COVID-19 including:

- Providing funds to Kazakhstan's M. Alkimbayev's National Scientific Center for Especially Dangerous Infections (NSCEDI) for diagnostic and waste management supplies and PPE.
- Training by Kazakh experts from NSCEDI on multiple COVID-19 topics to Kazakh laboratory and medical experts from different regions.
- Participation with Biosafety Association of Central Asia and the Caucasus (BACAC) to conduct an international conference on COVID-19 lessons learned. The meeting will be reorganized at a future date and Kazakh experts will be invited to conduct pre-conference workshops and report on their activities and experiences.

### September 9, 2020

Japanese Party provided additional funding to procure the necessary laptops and equipment for ISTC staff to work remotely.

### November 2020



The Issyk-Kul State University of the Ministry of Education and Science of the Kyrgyz Republic and the Kazakh Medical University of Continuing Education of the Republic of Kazakhstan organized an online training on "PCR diagnostics of infectious diseases, including COVID-19" (polymerase chain reaction or PCR nasal swab) for medical staff involved in laboratory diagnostics. The course was attended by over 120 healthcare specialists from Kazakhstan, Kyrgyzstan, Ukraine, Belarus, Uzbekistan, Azerbaijan, Tajikistan, and Georgia.

### November 2020



An offline training for 56 Kyrgyzstan laboratory personnel was carried out on the immunoassay enzyme of the COVID-19 diagnosis, the preparation of the reserve fund, and improving the capacity of the laboratory service. Eight thousand (8,000) PCR kits for the COVID-19 study were donated free of charge.

### February – April 2021

In November 2020, the EU and ISTC began coordinating workshops on biosafety and safe handling of COVID samples. These workshops were held in 65 municipalities across Georgia and attended by hundreds of healthcare professionals who are fighting against COVID-19. The project increases their knowledge of biosafety rules and principles, which helps reduce the risks of contact between patients and healthcare personnel. The efficiency of the workshops will be analyzed based on pre/post tests and training evaluation forms. Results will be used to understand gaps and improve future trainings.





## STATEMENT OF THE CHAIRMAN OF THE GOVERNING BOARD

The year 2020 was challenging for all of us as the COVID-19 pandemic continued to spread around the world.

As governments and organizations struggled to protect their people, the importance

of international biomedical and biosecurity cooperation, the urgency of a coordinated public-health response, and the challenges to that cooperation became clear. This, in turn, highlighted the value of the International Science and Technology Center (ISTC). The many and diverse Parties to the ISTC have long recognized that Science and Technology (S&T) cooperation multiplies the resources and amplifies the reach of individual countries. The ISTC approach – that all programs and research efforts are open, transparent, and unclassified – builds confidence and trust, and further facilitates advances in S&T. The ISTC emphasis on international standards for safety, security, and financial responsibility also provides a lower-risk framework for investment and partnership. As an intergovernmental organization, with strict oversight by all Parties, the ISTC provides confidence-building assurances along with flexible, efficient, and cost-effective mechanisms for scientific engagement.

Although several members of the ISTC family became ill from COVID-19, the Parties were able to continue their joint efforts to overcome the virus through targeted ISTC programming and material assistance.

This shared advancement of science, public health, and medicine associated with emergent, infectious diseases did not happen overnight. Rather, developing the habit of open cooperation in this field required the building of trust. That mutual confidence comes when scientists are working side-by-side over a lengthy period, while

engaging the broader community of biomedical expertise around the world. Hopefully, next year's annual report will record the end of the pandemic, and the many measures taken by the ISTC, and its Parties and Partners.

All Parties to the ISTC are members of the Governing Board, and all decisions require consensus. The ease with which proposals can be vetoed could have hobbled efficiency and narrowed options to address the pandemic emergency. Instead, the sense of community and trust built over decades of collaboration paved the way for important counter-COVID programming and logistical support. As 2020 illustrated, a consensus where the Parties have agreed on priorities enhances the application of S&T and ensures that responsible science is also responsive science.

This year will mark 30 years since the first discussions of the revolutionary idea that governments should establish an international science and technology center. The times and technologies of that era were very different from those of today. The entry into force in December 2017 of the ISTC Continuing Agreement – ratified by the Constitutional provisions of all Parties – embodied the recognition of the value of ISTC for today's changed world. This transforming agreement also incorporated reforms that have enhanced participation and efficiency. With an expanded global mandate, the ISTC needed less overhead and more flexibility. The Continuing Agreement provides targeted management improvements and codifies the diplomatic and tax status of the ISTC so that member governments can collaborate with greater ease. Government, private, and key international organizations continue to partner with the ISTC, addressing disease; pollution; nuclear, biological, and chemical security; clean water and energy; climate change; and other trans-national problems.

The ISTC Governing Board's approval of Kenya's membership application was certainly a highlight of the year. Kenya's prospective membership commemorates the first member country from Africa and the newest member since the ISTC Continuation Agreement in 2017. With or without membership, mechanisms for participation have permitted citizens from over 60 countries to participate in ISTC activities. Networking with other organizations such as the EU's CBRN CoE has facilitated ISTC cooperation with more countries than would have been manageable without that link. Still, the heavy lifting is performed by our members and we look forward to Kenya joining Armenia, the European Union, Georgia, Japan, Kazakhstan, the Republic of Korea, the Kyrgyz Republic, Norway, Tajikistan, and the United States. We are particularly grateful to the government of Kazakhstan, which hosts our headquarters in Nur-Sultan.

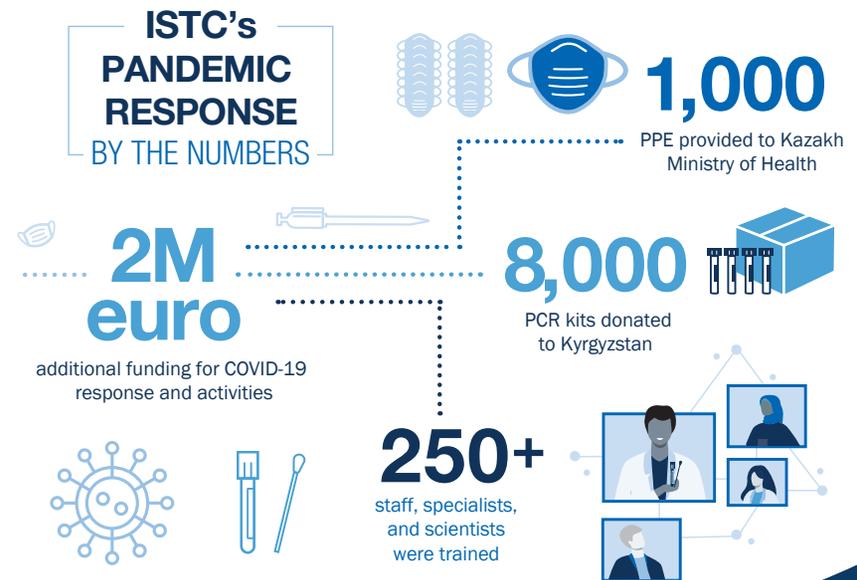
On behalf of all the Governing Board Members, I wish to extend recognition and appreciation to the Parties and the staff of the ISTC for their particularly great efforts this last year. Despite the complications created by the need to work through global pandemic conditions, often remotely, important advances were achieved. My best wishes for the health and happiness of the entire ISTC family.



Ronald F. Lehman, Ph.D  
 Chair, Governing Board  
 International Science and Technology Center

## ISTC FUNDING 1994–2020

PARTY	AMOUNT IN 2020 (USD)	AMOUNT TOTAL
European Union	16,127,100	392,621,110
Japan	388,280	84,820,237
United States	1,068,741	694,025,708
Canada	-	36,547,136
Finland	-	1,185,960
Sweden	-	3,831,906
Norway	-	4,000,639
Korea	-	7,281,141
United Kingdom	141,244	141,244
Other	-	12,566,221
Joint Contributions	505,849	170,714,174
<b>TOTAL</b>	<b>\$18,231,215</b>	<b>\$1,407,735,477</b>





## STATEMENT OF THE EXECUTIVE DIRECTOR

The year 2020 saw major changes and challenges from the COVID-19 pandemic and, like the rest of the world, the ISTC adjusted to remote working and virtual capabilities to continue to implement projects and activities under extraordinary circumstances.

The pandemic affected the ISTC with several staff contracting COVID-19, leading to office closures on three occasions. Mostly, the office remained operational with a minimum number of staff onsite and others working remotely.

The pandemic impacted our outreach capabilities, as well as our ability to conduct training and workshops. Where such meetings and conferences could be done virtually, the ISTC staff quickly acclimated to the use of online platforms. In this respect, I extend ISTC's thanks to the Japanese Party for providing additional funding to procure the necessary laptops and equipment for staff to work remotely.

Although there were some delays, none of ISTC's projects or activities were cancelled because of the pandemic. The fact that ISTC was able to continue its operations and activities with little to no interruptions, is a testament to the strong character and dedication of ISTC staff.

ISTC quickly found itself pivoting to COVID-19 response-related activities, such as answering the call to provide PPE to the Kazakh Government through the MoH. This extended to the EU putting an additional €2M on Project 53 Bio-Safety and Bio-Security Program specifically for COVID-19 countermeasures for CA and SEEE partner countries. We worked together with the Science and Technology Center in Ukraine to carry out related gaps and needs analysis for 17 Countries for ISTC to procure and provide COVID-19 equipment and training. A further injection of funds was authorized by the U.S. Department of State to deliver COVID-19 related

training workshops. South Korea added their financial support for COVID-19 training workshops in Kyrgyzstan.

Despite these challenging times, ISTC was asked to implement several new projects and activities. This report provides a snapshot of the successes and achievements from 2020, many related and relevant to fighting COVID-19.

Another highlight of the year was the news that Kenya, through its Ministry of Education, indicated their interest and intent to become an official member of ISTC. This was duly approved at the 71st Governing Board in December. Kenya has been an active participant in several of ISTC's Southern African project activities and will play a significant role in the future.

In conclusion, I wish to echo the Governing Board Chairman's thanks to the Government of Kazakhstan for hosting the ISTC headquarters in Nur-Sultan and for their continued support.

I also wish to thank the Governing Board and Party Representatives for their continued support and guidance, especially during these challenging times. I would especially like to express my sincere thanks to the ISTC staff for their dedication, professionalism, and commitment during these unprecedented times which continue into 2021, both in upholding the Parties wishes and adapting so effectively and professionally to implement projects and activities during the pandemic. Like the rest of the world, we look forward to getting back to some sort of normality later in 2021.

A handwritten signature in blue ink, appearing to read 'David Cleave', written over a faint circular stamp or watermark.

David Cleave  
Executive Director, ISTC

# OVERVIEW OF ISTC ACTIVITIES

## Grants Paid by ISTC to Scientists in 2020 and Total Grants Paid (1994-2020) - by Country

Country	# of Paid Scientists in 2020	USD Grant Payments to Scientist in 2020	# of Scientists Registered 1994-2020	USD Grant Payments 1994-2020
Armenia	99	225,673	3,695	30,847,255
Belarus	0	0	1,868	15,923,194
Georgia	95	355,622	2,751	22,984,724
Kyrgyzstan	91	202,135	1,533	11,843,016
Kazakhstan	246	741,741	5,282	43,071,391
Russia	0	0	60,942	434,173,310
Tajikistan	74	254,150	880	9,119,056
Uzbekistan	12	40,070	13	40,700
<b>Total</b>	<b>617</b>	<b>\$1,819,391</b>	<b>76,964</b>	<b>\$568,002,646</b>

\*Some scientists participated in multiple projects but were registered once for these statistics

## 2020 Project Funding and Total Project Funding (1994-2020) - by Beneficiary Country

Country	Number of funded projects 2020	Allocated funds 2020 (USD)	Number of funded projects Total	Allocated Funds Total (USD)
Armenia	1	300,000	215	54,598,118
Belarus	-	0	125	32,005,277
Georgia	1	388,280	207	43,873,494
Kazakhstan	2	438,244	292	110,673,230
Kyrgyzstan	-	0	105	31,759,676
Russia	-	0	2,630	897,686,073
Tajikistan	-	0	72	26,992,226
Ukraine	-	0	1	64,296
Regional	6	16,598,841	16	39,368,914
<b>Total</b>	<b>10</b>	<b>\$17,725,365</b>	<b>3,663</b>	<b>\$1,237,021,302</b>

## 2020 Project Funding by Technology Area

Tech area	Number of funded projects 2020	Allocated funds 2020 (USD)
Agriculture	1	297,000
Biotechnology	3	12,034,000
Chemistry	1	388,280
Environment	1	300,000
Fission Reactors	3	419,985
Medicine	1	4,286,100
<b>Total</b>	<b>10</b>	<b>\$17,725,365</b>

## 2020 Partner Project Funding by Party

Party	Number of projects 2020	Partner Funding 2020 (USD)
European Union	1	297,000
United States	4	578,741
United Kingdom	1	141,244
<b>*Total:</b>	<b>6</b>	<b>\$1,016,985</b>

# MAJOR TARGETED INITIATIVES IN 2020



## Dual-Use Export Control

### Export Control on Dual-Use Material and Intangible Technologies in CA

The ISTC supports EU funded efforts to engage industry, research, and academic communities in CA and adjacent regions by raising awareness of the risks related to intangible transfers of technology through the implementation of a series of projects.

- International Counterproliferation Program projects in Kazakhstan and Armenia look for developing manuals for the industry, focusing on the nuclear and chemical sectors. Also linked to improving the industries' capacities, Armenia started a project proposal for a mobile phone application on commodity identification.
- Academic projects to implement a Master course in export control began negotiations during 2020 in Kazakhstan and Kyrgyzstan. The Kazakh's started with the Eurasian National University.

- Due to the 2019 Ypres event, responsible science projects started to be arranged in Tajikistan and Armenia. Both projects will start in 2021.

### Commodity Identification Training in Armenia

The ISTC supports the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA) efforts to improve the ability of Customs personnel to identify dual-use commodities that are subject to diversion and use in CBRN or missile development programs. The ISTC and Armenia's Research Center for the Problem of Non-proliferation of Weapons of Mass Destruction conducted two Commodity Identification Training events in March 2020 for 22 participants in Vanadzor, Armenia and in September 2020 for 20 participants in Gyumri, Armenia.



## Nuclear Forensics

### Capacity Building in Nuclear Forensics between Armenia and Georgia

The DOE/NNSA Office of Global Material Security approved \$200,000 and the EU included \$100,000 to implement the project "Capacity Building in Nuclear Forensics and Enhancement of Regional Cooperation between Armenian and Georgian Authorities". The proposed project aims to further enhance interagency cooperation on nuclear forensics by placing emphasis on the inter-ministerial and multi-agency aspects. The project duration is three years.

### National Nuclear Forensics Library in the Republic of Kazakhstan

DOE/NNSA approved funding for the *Development of a National Nuclear Forensics Library in the Republic of Kazakhstan as a system for identification of nuclear and other radioactive materials and Samples Exchange* with \$650,000 for two years with potential prolongation. The project will be implemented by experts at the National Nuclear Center of the Republic of Kazakhstan. A component of nuclear expertise is the ability to determine whether nuclear and other radioactive materials are in-line with national stockpiles of those materials. The National Nuclear Forensics Library is designed to interpret the results and assist states

in accomplishing this task. An upward trend in recognizing the importance of nuclear expertise is strengthening the state's nuclear safety infrastructure. Regular International Atomic Energy Agency (IAEA) General Conferences on Nuclear Safety in adopted resolutions strengthens the work of states and their competent bodies in the field of nuclear forensics, including the establishment of national databases and libraries of nuclear materials. This thesis is contained, in particular, in the Key Conclusion of the IAEA's 2014 Conference on Achievements in the Field of Nuclear Forensics: "The role of the national library for nuclear forensics in facilitating the interpretation of data and conducting investigations in the field of nuclear safety is one of the keys to countering growing threats, possessed by nuclear and other radioactive material that is beyond regulatory control".

Ensuring nuclear safety and the role of states in establishing the national library for nuclear expertise is covered by the IAEA publication No. 15, "Recommendations for the Nuclear Security of Nuclear and Other Radioactive Material that is out of Regulatory Control" in which states are invited to assess their capabilities in the field of nuclear forensics, including considering the establishment of the National Nuclear Forensics Library.



## Biosafety & Biosecurity

### COVID-19 Support in Central Asia and SouthEast and Eastern Europe

The EU provided an additional €2M to EU CBRN CoE Project 53 in May 2020. The additional funding provided relief for COVID-19 in CA and SEEE Partner Countries.

ISTC has begun provisioning of highly needed COVID-19 supplies, formulated training activities with Partner Countries, and supported multiple virtual networking activities for regional and international coordination, cooperation, and exchange of COVID-19 information.



## Nuclear Non-proliferation, Security & Safety Capacity Building

### Nuclear Safety and Safeguards Support for Southern African States

Through the EU funded project, the ISTC supports capacity building activities for safe uranium mining and transport, and facilitates the exchanges with and within sub-Saharan Africa. ISTC assists the 16 member states of the Southern African Development Community (SADC) to increase their levels of nuclear safety and security. In February 2020, the SADC Secretariat and ISTC organized a workshop in Dar es Salaam on nuclear safety and nuclear transportation safeguards. The project successfully launched a web-based Information Tracking System (ITS) in Tanzania, Malawi, Zambia, and South Africa to monitor cross-border transport of uranium ore concentrate. In 2020 ITS was extended to Democratic Republic of the Congo, Zimbabwe, Mozambique, and Madagascar. Authors of the eight country-specific reports presented their findings at a series of webinars and a new training course was prepared by experts from the Forum of Nuclear Regulatory Bodies in Africa.

### Nuclear Security Support in Eastern and Central Africa

Across Africa, nuclear regulators improve nuclear security regulatory frameworks, implement adequate policies, and prepare for emergency response. The EU-funded & ISTC-implemented CBRN CoE Project 60 assists 11 participating countries in Eastern and Central Africa through consultancy, trainings, and workshops to improve laws and regulations, mend inventories of radioactive sources, and raise awareness among stakeholders. In May 2020, the Project Steering Committee assessed the results of the first stage, including 20 train-the-trainer courses and

table-top and field exercises. Through the COVID-19 pandemic, project experts provided advice on legal frameworks and the conducts of field inspections. Since the start of the project, half of the participating states enforced new laws or regulations. More than 400 young professionals and students took part in nuclear advocacy activities, with a quarter of the participants being women.

### Peaceful Uses of Nuclear Energy and Nuclear Applications and the Role of National Security

Preceding the IAEA General Conference in September 2020, ISTC and the African Commission on Nuclear Energy (AFCON) organized an online discussion among experts on *African Uranium Resources: Exploration, Exploitation and Cooperation Opportunities*.

In November 2020, the EU SADC hosted an AFCON webinar on *Fostering and Sustaining Non-Proliferation Verification Systems through Development of National and Regional Nuclear Safeguards Capacities*.

### Building Capacity on Multilateral Verification of Nuclear Disarmament

In conjunction with the Verification Research, Training and Information Centre, the ISTC organized the first online workshop on Building Capacity on Multilateral Verification of Nuclear Disarmament. This project focuses on harnessing, developing, supporting, and sustaining expertise and capacity on nuclear disarmament verification in regions around the world.



## Seismic Monitoring & Hazard Mitigation

### Using OpenQuake Software Usage to Analyze Earthquake Hazards

ISTC organized several workshops for participants and collaborators on using OpenQuake software to analyze earthquake hazards. OpenQuake enables users to assess site risks and potential impacts of earthquakes based on existing regional earthquake catalogues. Training addressed multiple OpenQuake aspects, including fault sources, ground motion models, area sources, and analytical routines.

### The Uplift and Seismic Structure of the Greater Caucasus

A large-scale, regional passive seismic experiment is underway in the Greater Caucasus with ISTC support. The seismic data recorded under the project will improve understanding of the uplift mechanism for the Greater Caucasus mountains and will inform robust modeling of 3-D seismic velocity structure and improved accuracy in determining earthquake hypo-centre locations.

# KEY TRAINING AND EVENTS



## Nuclear Security Workshops in Vienna

In cooperation with IAEA and the Vienna Center for Disarmament and Non-Proliferation, during the International Conference on Nuclear Security 2020 in Vienna, ISTC organized a roundtable on Regional Cooperation in Nuclear Security, Safety and Safeguards in Africa, with the nuclear regulators of Malawi, Zambia, Zimbabwe, Tanzania, and Kenya.



## Nuclear Security Roundtable in Vienna

In November 2020, the U.S. Nuclear Threat Initiative organized virtual meetings with Vienna-based diplomats and nuclear officials entitled: Global Dialogue on Nuclear Security Priorities. The ISTC-implemented EU Project 60 in Eastern and Central Africa featured on the workshop's agenda is a good example of how to strengthen peer review and encourage IAEA's International Physical Protection Advisory Service mission.



## Commodity Identification Training in Armenia

The ISTC completed the Commodity Identification Training at two customs points in Armenia. The training improves the ability of Customs personnel to identify dual-use commodities that are subject to diversion and use in CBRN or missile development programs.



## Strengthening Scientific Networks

In conjunction with the Verification Research, Training and Information Centre, ISTC organized the first online workshop on Building Capacity on Multilateral Verification of Nuclear Disarmament in November 2020.



## Peaceful Uses of Nuclear Energy and Nuclear Applications and the Role of National Security

In August 2020, ISTC, AFCONE, and National Commission for Science, Technology and Innovation in Kenya organized *Benefits from Interregional Dialogue on Nuclear Governance: Africa and Central Asia* webinar, featuring inter-regional cooperation in peaceful uses.



Participants of ISTC Activities in 2020



Nuclear Non-proliferation, Security & Safety Capacity Building Initiative



Biosafety & Biosecurity Initiative



Dual-Use Export Control Initiative



Seismic Monitoring & Hazard Mitigation Initiative



### Epidemiological Challenges Roundtable

In October, with the support of the Kyrgyz Science Foundation and ISTC, an online roundtable was held on “Epidemiological Challenges - Creating a Regional Mechanism for Joint Work.” In November, Kyrgyz Science Foundation held a second meeting of Regional Council of Scientists with the aim to analyze the epidemiological situation, share experiences, and discuss the most acute issues.



### OpenQuake Software Webinars

ISTC organized workshops for participants and collaborators from Kazakhstan, Kyrgyzstan, and Tajikistan using OpenQuake software to analyze earthquake hazard and risk at specific sites, and for assessing the potential impacts of earthquakes based on regional earthquake catalogues.



### Training on “PCR diagnostics of infectious diseases, including COVID-19”

An international training course was organized with the financial support of the ISTC. The course organizers were the molecular-genetic laboratory of the Issyk-Kul State University (Kyrgyzstan) and Kazakh Medical University of Continuing Education (Kazakhstan).



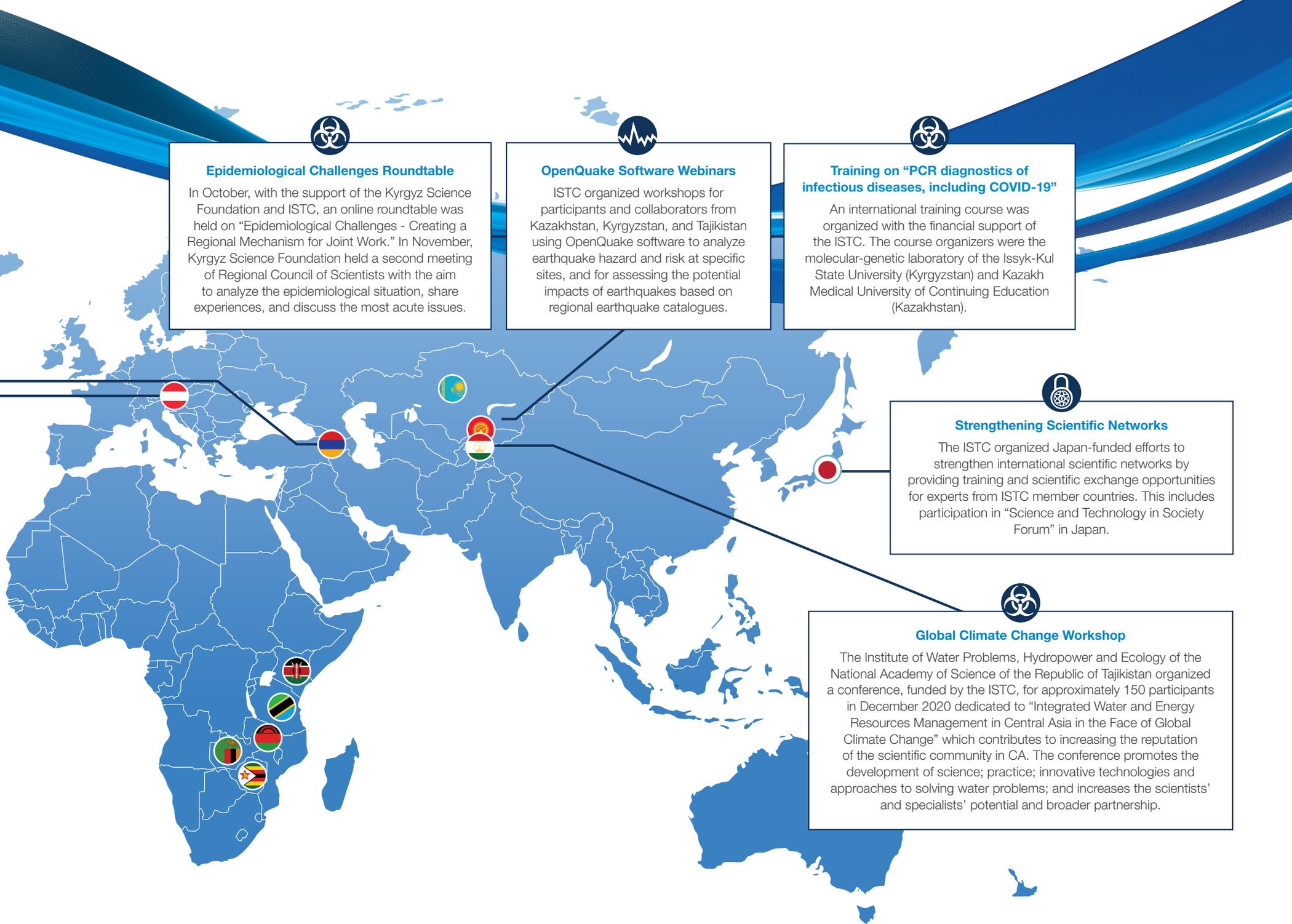
### Strengthening Scientific Networks

The ISTC organized Japan-funded efforts to strengthen international scientific networks by providing training and scientific exchange opportunities for experts from ISTC member countries. This includes participation in “Science and Technology in Society Forum” in Japan.



### Global Climate Change Workshop

The Institute of Water Problems, Hydropower and Ecology of the National Academy of Science of the Republic of Tajikistan organized a conference, funded by the ISTC, for approximately 150 participants in December 2020 dedicated to “Integrated Water and Energy Resources Management in Central Asia in the Face of Global Climate Change” which contributes to increasing the reputation of the scientific community in CA. The conference promotes the development of science; practice; innovative technologies and approaches to solving water problems; and increases the scientists’ and specialists’ potential and broader partnership.



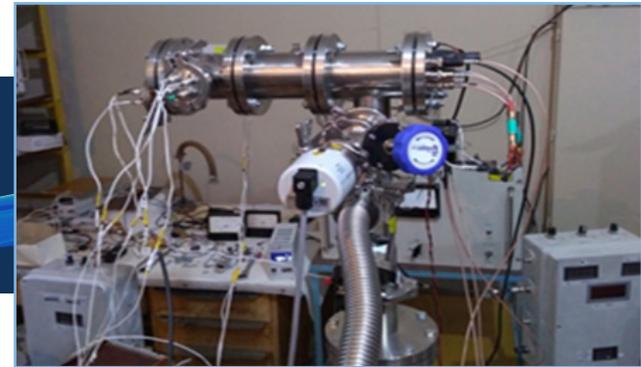
# REPUBLIC OF ARMENIA

## Optical system for environment remote sensing with a radially-quadratic transmission apodizing filter was developed.

The novel technology which is employing an apodizing filter has enabled the monitor evolution processes in the environment with non-matrix detectors. The technology is proven to be useful in monitoring variations in coverage of grass on the mock-up surface which imitates the vegetation recovery in natural conditions after a fire. Total project cost was \$308,705, funded by the United States.



Project participants at the mock-up with distributed grass and soil substances.



### PROJECT HIGHLIGHT

## Radio frequency timer for kilo electronvolt (keV) electrons

The framework of the project included development, construction, and testing of a dedicated helical deflector to perform circular and spiral sweeps of keV electrons. Performance was conducted by radio frequency fields in a frequency range of 500-1000 MHz, multiple types of position sensitive detectors, and readout techniques. The internal time resolution of such a system can reach a level of about 1ps. Results of current theoretical and experimental studies have been presented at the 2<sup>nd</sup> and 3<sup>rd</sup> International Symposiums on “Single Photon based Quantum Technologies”.

Photo: Prototype device

Leading Institute	A.I. Alikhanyan National Science Laboratory (Yerevan Physics Institute) Foundation
Foreign Collaborators	University of Glasgow, School of Physics and Astronomy; Johannes Gutenberg-Universität Mainz (JGU) Institut für Kernphysik; Extreme Light Infrastructure- Nuclear Physics (ELI-NP) and Tohoku University, Department of Physics, Graduate School of Science
Project Duration	April 2018 – April 2022
Funding Parties	European Union and Japan
Project Cost	\$300,550



# GEORGIA

## Mycobacterium bovis infection in South Caucasus and its Health Burden

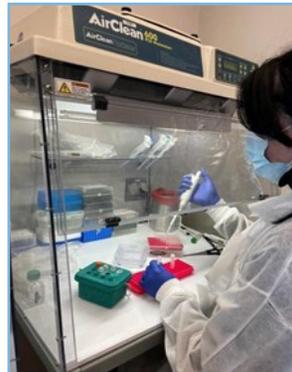
The epidemiology of bovine tuberculosis (bTB) in South Caucasus (SC) has been examined for potential public health effects and policy recommendations were made available to senior public health officials in SC. The latter has been done taking into consideration bTB rates across countries and existing bTB control policies in SC. Total project cost was \$291,150, funded by Japan and the United States.



Photo courtesy of USDA ARS

## Study risk factors and molecular characteristics of extensively drug-resistant and pandrug-resistant hypervirulent Enterobacteriaceae in Georgia

The framework of the project investigates the prevalence, risk factors, and molecular characteristics of extensively drug-resistant and pandrug-resistant hypervirulent *Enterobacteriaceae* in Georgia that monitors the situation and minimizes the threat that may come from *Enterobacteriaceae*. Total project cost was \$120,000, funded by Japan.



### PROJECT HIGHLIGHT

## *Dirofilaria spp.* - Assessment of regional distribution in Georgia and Armenia

This is the first attempt to describe dirofilariosis epidemiology in Georgia and Armenia by using molecular testing. The study will assess the effectiveness of the study methodology, and it might reveal distinctive genetic features of *Dirofilaria spp.* in SC.

Graphic: Geographic information map of the regional distribution of animals with dirofilariosis (working version)

Leading Institute	International Association "Veterinarians Sans Frontiers – Caucasus"
Foreign Collaborators	Cornell University, (United States); Universidad de Salamanca, (Spain); University of Bari, (Italy); University of Parma, (Italy); Nihon University, (Japan); Seoul National University, (Korea).
Project Duration	November 2018 – November 2021
Funding Parties	European Union, Japan
Project Cost	\$298,030



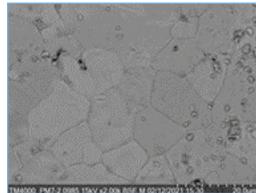
# REPUBLIC OF KAZAKHSTAN

## Advancement of material-technical and regulation-methodological framework for Nuclear and Radiologic Materials Forensics in the Republic of Kazakhstan

The analytical study was completed for nine samples of nuclear materials stored in the INP asset balance zone. The research methods include radiation monitoring, x-ray fluorescence analysis, optical and electron microscopy, alpha- and gamma-spectrometry, and elemental and isotope analysis of ICP-OES (inductively coupled plasma-optical emission spectroscopy) and ICP-MS (mass spectrometry). The analytical signatures of the samples were prepared based on the obtained research results, which were loaded in the prototype of the National Nuclear Forensics Library. Total project cost was \$550,000, funded by the U.S. DOE/NNSA.



Samples prepared for transfer to Lawrence Livermore National Laboratory



Electron microscopic image of the sample PM7-2

## Experimental Study of New Type Reflector Element based on beryllium pebbles

This project studied the neutron-physical characteristics of the new-type reflector element based on beryllium pebbles and to demonstrate opportunity for maneuvering the neutron spectrum inside the reflector by means of variation in the pebble packing density. Development of the proposed technique for neutron spectrum adjustment will make it possible to take away extra restrictions on an amount and sizes of irradiated specimens, as well as to reduce an amount of radioactive waste, since the proposed element of beryllium reflector can be used repeatedly.

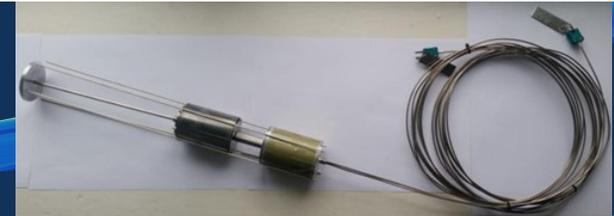
The design of the irradiation channel has been developed and manufactured. Total project cost was \$250,340, funded by Japan.



The ED sectional 3D view



Beryllium pebbles



### PROJECT HIGHLIGHT

## The study of properties of the irradiated SiC-matrix of the high temperature gas cooled reactor (HTGR) fuel element

The objective of the project is to investigate irradiation properties of the advanced silicon carbide (SiC)-matrixed fuel element. The result strengthens its safety feature against air- and water-ingress accidents by SiC's oxidation-resistance property and its security against nuclear proliferation by both chemical/physical extraction and chemical conversion of nuclear materials. In 2020, the preparation of equipment for irradiation of SiC-matrix samples in the WWR-K reactor was carried out. A mock-up of the irradiation device has been fabricated, which is designed to verify the calculation results.

Photo: A mock-up of the irradiation device

Leading Institute	Institute of Nuclear Physics of the Ministry of Energy of the Republic of Kazakhstan
Foreign Collaborators	Japan Atomic Energy Agency
Project Duration	March 2020 - February 2023
Funding Parties	Japan
Project Cost	\$400,000



# KYRGYZ REPUBLIC



## Expanding Global Knowledge of Tuberculosis by Creating a TB Portal in the Kyrgyz Republic

The purpose of the project is to improve global research capabilities of the tuberculosis (TB) researchers by developing the Kyrgyzstan TB Portal. The Kyrgyzstan TB Portal will collect medical images, microbiology lab results, treatment information, bacterial genome, as well as the social-economic and clinical data from the anonymized records of the Kyrgyzstan TB patients (mostly with multidrug resistant and extensively drug-resistant TB), and will make the data available to the worldwide community of TB researchers. The common software core, data collection interfaces, dataset definitions, and user interface developed for the Multi-Country TB Data Portals program will be utilized for the data entry. The ability for the Kyrgyzstan and worldwide community of TB researchers to understand the nature of the TB disease will be greatly improved by using a common database containing patients' medical images, treatment information, lab work, and clinical data. This common database can facilitate adherence to the treatment protocol as well as serve as a consistent repository of records of the treatment regime for particular histories of disease.



- During the reporting time, data on 380 samples from 131 patients were entered into the TB Portal.
- [Online] Training was conducted for staff and clinicians.
- Clinical forms were developed for patient data and laboratory research.

Total project cost was \$74,500, funded by the U.S. National Institutes of Health / National Institute of Allergy and Infectious Diseases.

### PROJECT HIGHLIGHT

## Seismic network expansion in the Caucasus and Central Asia

In 2020, each participant selected proposed locations to install seismic stations. Site selection was based on filling gaps in network coverage, as well as meeting specific scientific research and hazard monitoring objectives. Participants completed reconnaissance reports for all sites, carefully documenting all aspects of station access, installation, maintenance, and communications.

*Graphic: A map of the proposed stations across the region. The map illustrates how the station coverage enhances seismic monitoring in each country and across the region.*

Leading Institute	Institute of Seismology, Bishkek, Kyrgyzstan
Foreign Collaborators	Lawrence Livermore National Laboratory, Livermore, CA, USA; Incorporated Research Institutions of Seismology, Washington, DC, USA
Project Duration	October 2019 – September 2022
Funding Parties	U.S. Department of Energy / National Nuclear Security Administration, Washington, DC, USA
Project Cost	\$3,008,028.54



# REPUBLIC OF TAJIKISTAN

## Legal Acts for Supervision Over Remediation Activities of Radioactively Contaminated Areas

Legal acts will be developed as a significant contribution to the process of remediation of territories contaminated with radioactive waste by the uranium industry in Tajikistan, Kyrgyzstan, and Kazakhstan. Total project cost was \$358,000, funded by the European Union.



State Regulation Center on Environment Protection and Ecological Safety working group in Kyrgyzstan

## Geothermal waters of Pamir as an alternative source for food security

Providing the population with ecologically clean food in the context of a shortage of land resources in the Pamir region, especially poultry and fish products, the proposed project is aimed at studying the cascading use of geothermal energy to produce vegetables, meat, and eggs year round. The implementation of the project will make it possible to create a permanent Geothermal Research Center for other regions of Gorno-Badakhshan, where there are more than 60 geothermal resources. In cooperation with and financial support from the government of Japan, represented by the Japan Technological Progress Association and the ISTC, studies are being carried out at an altitude of 3,600 meters above sea level to determine the possibility of an integrated use of geothermal energy in order to obtain high-vitamin and environmentally friendly food products throughout the year. The results of the project can be used throughout Japan and in other high mountain regions. Total project cost was \$186,243, funded by Japan.



Fishpond and greenhouse



### PROJECT HIGHLIGHT

## Hydrochemistry Monitoring and Risk Assessment of Mining & Uranium Tailing in Transboundary River Watershed of CA Countries - Tajikistan, Kyrgyzstan, Kazakhstan and Uzbekistan (Phase 1)

Obtaining an improved understanding of the environmental contamination in land-water-ecosystem of the Syr-Darya and Amu Darya River basins. To assess the contamination, samples of water, bottom sediments, and alluvial sediments were collected from the main rivers, their tributaries, and flood zones to analyze concentration of heavy metals and other trace elements.

Graphic: Map of Syr-Darya and Amu Darya Rivers. Credit: Wikimedia user Shannon1.

Leading Institute	Institute of Water Problems, Hydropower and Ecology, Tajikistan National Academy of Sciences
Participating Institute	U.S. Department of the Interior, U.S. Geological Survey
Project Duration	October 2019 – March 2021
Funding Parties	European Union
Project Costs	€300,000

# PROJECTS COMPLETED IN 2020

TITLE	LEAD INSTITUTE	FUNDED BY	COLLABORATOR COUNTRY
<b>Synthesis and screening of new nantiomerically enriched non-protein (S) and (R)-<math>\alpha</math>-amino acids, peptides and polymer</b>	Yerevan State University	 	  
<b>Reactor steels under neutron irradiation</b>	National Nuclear Center of the Republic of Kazakstan / Institute of Nuclear Physics	Partner	
<b>Chemical toxicants at the Semipalatinsk nuclear test site</b>	National Nuclear Center of the Republic of Kazakstan / Institute of Nuclear Physics	 	
<b>Characteristics of epidemic plague and cholera outbreaks in Kazakhstan</b>	M. Aikimbayev Kazakh Scientific Center of Quarantine and Zoonotic Diseases		
<b>Tajikistan Rabies Genome</b>	National Food Safety Diagnostics Center	Partner	
<b>Improving capabilities to detect and characterize Brucella in Tajikistan</b>	National Center of Veterinary Diagnostics	Partner	

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