

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

ANNUAL REPORT

2022



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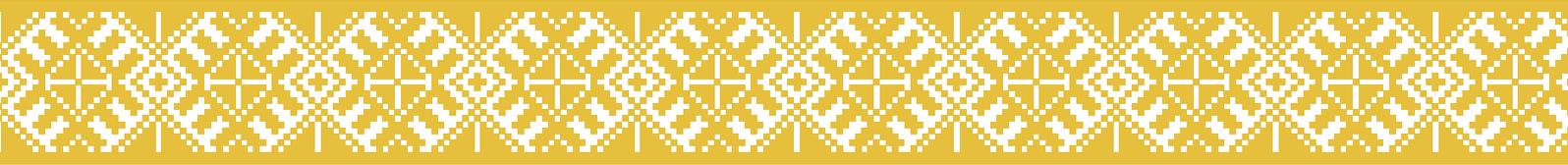
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ABOUT US

2022 STCU ANNUAL REPORT



HISTORY

- The Science and Technology Center in Ukraine (STCU) is an intergovernmental organization with diplomatic status whose Parties use science and technology engagement and cooperation to promote international security and well-being. The STCU was established by international agreement in October 1993. The current Parties to the STCU are Azerbaijan, the European Union, Georgia, Moldova, Ukraine, the United States, and Uzbekistan.
- STCU activities fall in two broad categories: Research Projects, which employ scientists in the development of new science and technology (S&T) and Supplemental Programs, which include workshops, training, and other events to integrate scientists into the global S&T and industrial community. Over the past 27 years, the STCU has been active with over 21,000 scientists in more than 1,000 research institutes and universities engaged in STCU projects and activities, primarily across the GUAM countries (Georgia, Ukraine, Azerbaijan, and Moldova).
- The STCU is headquartered in Kyiv, Ukraine and currently has three branch offices in Tbilisi, Chisinau, and Baku.

FUTURE

- The Center is developing new targeted programs and activities in response to member countries' needs and priorities.
- The Center continues to investigate and engage new sources of funding for R&D projects and programs.
- The STCU is expanding synergistic cooperation with the EU's CBRN Centres of Excellence (COEs) and other governmental initiatives to support regional and local priorities.

Party	Amount Total in Millions of USD (1995-2022)
European Union	\$95.12
United States of America	\$81.77
Canada	\$10.17
Japan	\$ 1.04
Sweden	\$ 1.67
Government Partners	\$110.40
Non-Government Partners	\$ 66.00
Total	\$366.17

STRENGTHS

- More than 27 years of experience funding and managing multi-national R&D projects and activities.
- A network of hundreds of institutes/universities and thousands of scientists with expertise in many fields, including biotechnology, material science, physics, and nuclear safety.
- Transparency in operations, as well as best practices in procedures to allow the Center to effectively manage more than \$360 million dollars of funded projects and activities.
- Full-service project planning and execution with on-site monitoring and audits.
- STCU's International agreement allows cost-effective operations within STCU partner countries as the Center is not required to pay any local duties and taxes.

VISION

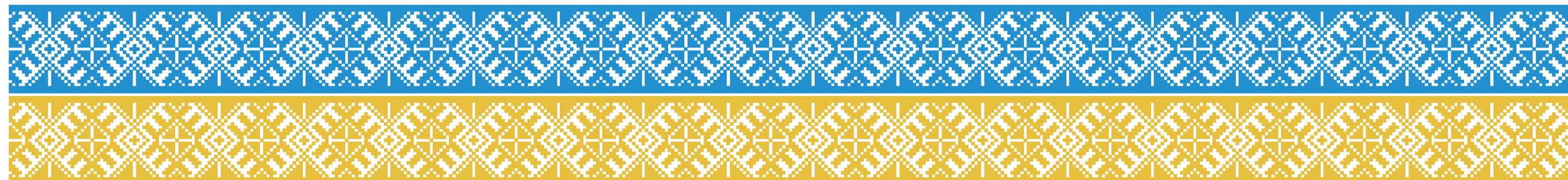
To advance global peace and prosperity through cooperative Chemical, Biological, Radiological, and Nuclear (CBRN) risk mitigation by supporting civilian science and technology partnerships and collaboration that address global security threats and advance non-proliferation.

MISSION

- To address the global security threat of the proliferation of WMD-applicable chemical, biological, radiological, and nuclear knowledge and materials;
- To support the integration of scientists with WMD applicable knowledge into global scientific and economic communities through national, regional, and international research collaboration;
- To develop and sustain a culture of nonproliferation and CBRN security awareness and responsibility through education, mentorship, and training;
- To promote international best practices and security culture to mitigate CBRN security threats.

STCU 1995-2022

- \$366M USD total funding
- 2,200+ projects
- 21,000+ scientists and researchers
- 342 International Partners



WELCOME FROM THE STCU GOVERNING BOARD CHAIRPERSON



*Eddie Maier
Chair of the Governing Board of the Science & Technology Centre in Ukraine*

Some thoughts, facts and memories on the cooperation with Ukraine and other former Soviet countries.

Old timers' input. Viva Science.

Since the middle of the 1990s, after the independence of Ukraine from the Soviet Union, the International Community has deployed enormous efforts to support Ukraine, Russia, and the other former Soviet Republics in their efforts to reorganise their newly formed states; in particular, to establish a market economy. The efforts also went towards former Soviet weapon research scientists to reorient their talents towards peaceful R&D. These actions have been undertaken at a large extent by the International Science and Technology Centre and the Science and Technology Centre in Ukraine.

We must pay tribute to those who have launched this cooperation with the former Soviet countries.

The ISTC Chairman is one of those pioneers who have spent tremendous efforts to promote cooperation with CIS countries.

The first activities of the European Community (nowadays the European Union) through the Directorate General (DG) for Research and Technological Development was undertaken under INTAS¹. Its activities covered a wide range of scientific fields, including physics, astronomy and astrophysics, mathematics, space, aeronautics, telecommunications, information technologies, chemistry, life sciences, earth sciences, environment, energy, engineering sciences, economics, and social and human sciences.

As a freshly recruited scientific project manager, pharmacist and analytical chemist, your chairman helped in the early organisation of the evaluation of R&D proposals in the chemical domain and the protection of the environment. Other support to the Commonwealth of Independent States (CIS) took place under the INCO-COPERNICUS programmes².

An exciting period. We all were proud of giving a hand to scientists and scientific R&D institutes of the former Soviet Union countries, hoping to get them out of their isolation and misery. Help them to join our European spirit. The EU, USA, Japan, Canada did that in coordination.

Later, in 2002, I was tasked to manage the support to CIS nuclear power plant (NPP) operators under the nuclear safety programme of TACIS³. This programme also assured the funding of ISTC and STCU. To support the nuclear operators and modernise their power plants, the EU spent between 70 and 100 million Euros for projects every year (not including Chernobyl remediation). The cooperation under TACIS nuclear safety included mainly Ukraine, Russia, Armenia, and Kazakhstan.

¹ The International Association for the promotion of cooperation with scientists from the independent states of the former Soviet Union (established on 29 June 1993)

² The European Community's specific RTD programme in the field of cooperation with the Central and Eastern European Countries (CEEC) and the New Independent States (NIS) in key areas of RTD policy funded its first 261 projects in October 1995.



Besides, nuclear power plant operators, major investments went to the nuclear safety authorities and their technical support offices, to the remediation of nuclear installations, including the dismantling of old Soviet nuclear submarines.

In Russia alone the EU invested more than a billion Euros in nuclear safety, in about 15 years.

The cooperation was very positive. Amazing links were created with scientists, engineers and NPP operators.

May I quote a very high former Soviet top diplomat in nuclear matters: "Eddie, you cannot imagine how much we are proud that the EU and the International Community has opened its cooperation with us despite decades of cold war. Hopefully, Russia never falls again into 70 years of isolation".

A dreamland until 2006 when dark clouds came over Moscow.

In April 2007, at a meeting with top Rosatom management in Moscow, called to discuss a possible continuation of EU-RF cooperation in the nuclear safety domain, we were told that our support to the Russian Federation for their nuclear sector "was an insult to Russia".

This confirmed warning signals we received already months before from major partners in Russia "the upper management in Moscow is changing".

In 2009, the Russian Federation addressed first signals to ISTC that cooperation should end and ISTC should leave the Russian territory.

Despite Russian dark clouds, we continued our cooperation with our other partners; we welcomed major advances in Ukraine; all power plants were modernised and achieved EU safety standards; and management was upgraded. Many other activities have been funded by EU Member States directly or other partners within or outside STCU.

The completion of the National Maintenance and Management Training Centre for NNEGC Energoatom

Personnel at Zaporizhzhia NPP is one of these major successes.

In March 2022, the Russian Federation army bombed it and there is growing evidence of inhumane treatment of its staff, people that during Soviet times were considered colleagues of those in the nuclear industry in the Russian Federation. The situation is beyond words.

The STCU and ISTC were recently accused by the Russian Ministry of Defence of funding bioterrorist activities in Ukraine. In fact, the EU, Canada, and USA have secured the so-called anti-plague laboratories in Simferopol and Odesa, who worked on bioweapon R&D under the former Soviet Union. Others e.g. in Dushanbe, Almaty, were also modernised and reoriented by ISTC and STCU to go towards health and environment protection activities.

Since 2014, the STCU has managed on behalf of the parties many projects to help Ukraine to fight against CBRN subversive actions by the Russian Federation. For example, Ukrainian and Moldovan border guards were provided with modern equipment to fight against malevolent Russian Federation aggressions.

This list above is, of course, far from being exhaustive. From time to time, it is useful to look backwards at what has been achieved. It is obvious that the support to Ukraine and the other countries in the neighbourhood will continue; at least with those who will not call it an insult to their ego.

God bless Ukraine.

³ TACIS : Technical Assistance to the Commonwealth of Independent States. Launched by the EC in 1991, the TACIS Programme provided grant-financed technical assistance to 12 countries of Eastern Europe and Central Asia: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Moldova (until 2003).

2022 EXECUTIVE DIRECTOR STATEMENT



Curtis "B.J." Bjelajac
Executive Director

February 24, 2023 (Day 366)

Where to start? As is the case in previous years, I usually sit down to write the ED statement in February, almost always a rather quiet month (it is after all the dead of winter in Ukraine). As was the case last year, when in the middle of February 2022, I wrote the 2021 ED Statement – whilst in Warsaw. My family and I were on opposite parts of the world. We were evacuees – myself in Poland and my family on the West Coast of the United States. We would remain separated for four months, as all of us with close ties to Ukraine went from a cautious hopefulness that the threat of invasion would blow over and we would return to Ukraine, to the recurring nightmare that became the opening weeks and months of the Russian Federation's invasion of Ukraine.

Fast forward to today, February 24, 2023. I have decided to write the ED Statement on the one-year anniversary of the start of the Russo-Ukraine war, as I look to bring closure to what was easily the most difficult year for the STCU and our team – our family. As I pointed out in last year's ED Statement, 2021 was a remarkable year for the STCU (a record year in funding), but I strongly believe that 2022 will be the year that we will all look back on and say was STCU's best year ever, solely because of the courage and fortitude shown by every member of the STCU.

As you will see in the following pages of this annual report, the STCU continued its important work despite having the wind knocked out of us (I don't think any of us slept for the first couple months of the war) in the initial weeks of the invasion. Despite this initial setback, with the Russian invasion forces pushed out of the Kyiv region by the beginning of April '22, our team's focus shifted from ensuring each other's safety and security, to helping Ukraine and the Ukrainian scientific community in any way that we could.

The following is a very short list of accomplishments (there are too many to list in such a momentous year) the STCU

achieved over the course of the last year that are difficult to convey with mere facts and figures:

- We took care of each other. This is STCU's most important accomplishment, and I will never be able to convey this feeling properly with the written word. I am just not that good of a writer. For the last year, we took care of each other, looked after one another in a manner that goes far beyond buzzwords like "team", "cohesiveness", etc.. It was more than that. It was a love for each other and each other's well-being that kept us safe.....and sane. All of us were there for each other. Starting with the Parties to the STCU reaching out to ensure we were prepared for the worst, while hoping for the best, continuing with myself and the team working together to ensure that all of our families in Ukraine were ready, and finally carrying over to today as the team continues to check on each other's well-being by saying "Good Morning" to each other daily in our group chat. We weren't perfect in our preparations (Tatiana, I'm sorry for what turned out to be well intended, but bad advice), but we were very close, and to date, that was good enough to get us to this one-year anniversary – safe and healthy. I hope that is the case each day moving forward – one day at a time.

- I am very proud of the STCU's response to the Russian Federation's ongoing disinformation campaign about the STCU. The Center is a force for good and we have always worked in a transparent manner to increase the CBRN safety and security of Ukraine, as well as Georgia, Moldova, and Azerbaijan. As you will see on pages 12 and 13 of this report, we included the STCU's response to the April 14, 2022, press conference of the Russian Ministry of Defense (MoD) in this annual report, as I believe it still does an excellent job of communicating STCU's rebuttal to these allegations. Given the fact that the ISTC (STCU's sister center) worked shoulder to shoulder with the Russian government for twenty years in Russia, implementing similar safety and security projects as does the STCU (the Russian MoD knows this), I can do nothing but shake my head at the pure cynicism shown by the Russian Federation with its continued disinformation. In 2023, the STCU will work with the Parties to redouble its efforts to get its message out to the world about the important work that the Center does to make the world a safer place - despite the Russian government's misinformation. I take heart that as



of the writing of this ED Statement, almost 7,000 Russian scientists and scientific journalists signed an open letter with the opening paragraph as follows:

"We, Russian scientists and scientific journalists, declare a strong protest against the hostilities launched by the armed forces of our country on the territory of Ukraine. This fatal step leads to huge human losses and undermines the foundations of the established system of international security. The responsibility for unleashing a new war in Europe lies entirely with Russia".

The scientific community is very tight and I like to think that a number of the signatories above worked on ISTC projects, and know that the two Centers work for peace – not war.

- Aside from the love and care for each other shown by the STCU team, I would also like to call special attention to those of our team that stayed in Ukraine during the last year. Approximately two-thirds of the STCU team stayed in and around Kyiv and endured the multiple hardships (i.e. lack of heat and electricity) that the Russian Federation put the Ukrainian population through via their months-long missile attacks on Ukrainian civilian infrastructure throughout the winter of 2022-23. It's impossible to count the number of times that I was on video calls with members of the STCU team, as well as project team members, who were sitting with their jackets on (temperatures dropped down to plus 10°C inside on occasion) using a battery-operated lamp because the power and heat were off. At one point, the authorities in Kyiv were forced to implement scheduled blackouts that required an STCU team member to go to the office to turn the computers and servers in the office on after the scheduled power cuts. For over three months, different members of the STCU team in Kyiv selflessly went out into the cold and dark city to ensure that the computers were on when the power was on in the office. As the leader of the organization, who sat comfortably in Western Europe whilst his colleagues endured such hardships, what should/can I say to them to express my gratitude? "Thank you?" Sure, that's always a good start, but I can't wait to see them to thank them in person and then give them a hug that they will never forget.

- As you will see in this Annual Report, this document is a tribute to Ukraine, its people, and especially the Ukrainian scientists with whom we work. The STCU had many accomplishments in Azerbaijan, Georgia, and Moldova, during the year; but it's hard not to focus on the efforts and

achievements of the scientists of our host country. Their efforts in 2022 were Herculean and this annual report attempts to highlight what some of them went through to keep moving Ukrainian science forward. Please enjoy their inspiring stories on pages 14 to 23.

- For the handful of you that read my ED Statement every year (Hi Mom!), you will know that this year's statement is quite different from previous years. Normally, I do my best to summarize the Center's activities, including trends in new project funding, new partner project funding, etc.. This year I won't have the space to cover these activities but invite the reader to review the Financial Activity section on pages 24 to 27, where you will see that despite the invasion by the Russian Federation, the STCU had a steady 2022, which is all due to the unwavering commitment of the EU, US, and Ukrainian Parties.

- I would be remiss if I didn't thank those who helped the Center and myself survive 2022. First, I would like to thank my wife and kids for their patience and understanding, especially since we lived separately for the first four months of the war so that I could be able to help the Center during those stressful first weeks of the war. I want to thank the entire STCU team, which includes the Parties, Board, and especially the Secretariat. There aren't words to express how lucky I am to be part of such a team of dedicated and kind professionals. I would also like to thank some personal friends who were there for me and my family during those impossible first months of the war – special hugs and thanks go out to the KozNem family and the McWs family (including Budmo) for taking care of us. Finally, I would like to thank the people of Ukraine. Your daily acts of bravery and fortitude never cease to inspire and amaze. Thank you.

Finally, I would like to close by pointing out that Ukraine is my adopted home for the past 26 years, and for most of those years, I had to explain to friends, family, and colleagues what and where Ukraine is. Not anymore! As everyone knows by now, it is the land of heroes.

Слава Україні!!

HIGHLIGHTS and ACCOMPLISHMENTS

STCU CONDUCTS ITS 54TH GOVERNING BOARD MEETING IN HYBRID FORMAT IN BRUSSELS (May 4, 2022)

The STCU convened its 54th Governing Board meeting in Brussels, Belgium, in hybrid format. It was the first time since November 2019 that the Governing Board met in person due to the COVID-19 pandemic that burst onto the world stage in the beginning of 2020.

At the meeting, the European Union and United States Governing Board members expressed their steadfast commitment to their fellow Ukrainian Governing Board member and the entire STCU team, many of whom participated in the meeting virtually. The Parties' commitment resulted in the approval of approximately \$5.4M (equivalent to €4.95M) in assistance programming, which included a €3.6M (equivalent to \$3.9M) project to provide equipment for modernization of the dosimetric control system in the Chernobyl Exclusion Zone.

The EU and United States stated that they are working with the STCU, its sister center, the International Science and Technology Center in Astana, Kazakhstan, and the

international scientific community to support Ukraine and STCU partners in the region to identify and support opportunities for Ukrainian scientists displaced by Russia's illegal and unjustified military aggression to collaborate on scientific endeavors that advance global peace and prosperity.

The STCU Governing Board discussed and unanimously condemned Russia's continued campaign of disinformation, falsehoods, and outright lies against Ukraine, the STCU, and its partners, which are an unsuccessful attempt by the Kremlin to create a false pretext for its horrendous actions. The STCU, its Governing Board members, and their partners in the scientific community emphasized that they stand together in support of Ukraine. They went on to confirm that the STCU will continue to carry out this important work to promote peaceful research and collaborations that advance our shared security, health, and safety.



The 54th STCU Governing Board Meeting was held in hybrid format in Brussels, Belgium



STCU CONDUCTS RADIOLOGICAL CRIME SCENE MANAGEMENT EXERCISE IN AZERBAIJAN (December 5th-7th, 2022)

The large amount of nuclear and other radioactive materials that are currently out of regulatory control in many countries is of primary concern for nuclear safety around the world. In addition to the safety issues caused by this orphaned material, it is also understood that criminal groups and terrorists seek to obtain such materials for malicious purposes such as dirty bombs, etc.. Given these risks, significant efforts have been made to control these materials and ensure their security across the world. To stop the illicit trafficking of nuclear and other radioactive materials, many departments and ministries of governments must be involved and coordinate their response to such incidents. These investigations involve many different tasks, such as evidence collection and preservation, as well as formulation of a criminal investigation, and such tasks often need to occur simultaneously to ensure an effective response.

With these challenges in mind, the STCU, jointly with the "National Nuclear Research Center" (NNRC) of the Ministry of Digital Development and Transport of the Republic of Azerbaijan, hosted a Radiological Crime Scene Management exercise on combating illicit trafficking of nuclear materials in Azerbaijan. The training was conducted under the umbrella of an STCU Targeted Initiative on Nuclear Forensics funded jointly by the European Union and the United States Department of Energy/National Nuclear Security Administration (U.S. DOE/NNSA). The objective of the training was to bring together specialists in nuclear and radiological measurement, along with their law enforcement colleagues and agencies to better understand and streamline investigations of nuclear and radiological crime scenes in Azerbaijan. The training will make a significant contribution to increasing the responsiveness of nuclear

forensic stakeholders across the country in investigating nuclear and radiological crimes, as well as strengthening regional cooperation. On the second day of the training, with the joint participation of experts from international and national organizations, a practical exercise was conducted, addressing the detection of nuclear and radioactive materials at one of the checkpoints equipped with a radiation portal monitor at Baku International Sea Trade Port. The nuclear forensic analysis of these materials was carried out in the laboratories of NNRC. The training covered the entire timeline from initial nuclear and radioactive material detection, response, and nuclear forensic investigation.



A practical exercise was conducted on the 2nd day at one of the checkpoints at the Baku International Sea Trade Port.

The training was attended by the representatives of a number of ministries and agencies of the Republic of Azerbaijan including: Ministry of Internal Affairs, Prosecutor General's Office, Ministry of Justice, State Security Service, State Customs Committee, State Agency for Regulation of Nuclear and Radiological Activity of the Ministry of Emergency Situations, Chief officer of the State Border Service, "Isotope" Special enterprise of the Ministry of Emergency Situations, Civil Defense Forces of the Ministry of Emergency Situations, the Azerbaijan Republican Center for Hygiene & Epidemiology, and the Baku International Sea Trade Port Administration.

Each agency reported on its operational/technical activities performed in the exercise framework. As a result, it was shown that related operational/ technical activities function well within each agency, and the individual agency Standard Operating Procedures appear complete. However, the exercise revealed that an overarching document, such as an approved national response plan, might provide a more substantial legal basis for operations.

EU's CBRN CoE Project 088 Continues to Move Forward Apace

STCU CONDUCTS FIRST RTWG AS PART OF EU'S CBRN COE PROJECT 088

The first Regional Technical Working Group (RTWG) under the framework of the European Union Centres of Excellence (CoE) Project 088 entitled, "Strengthening of CBRN Medical Preparedness and Response Capabilities in SEE countries" took place from June 14th to June 16th, 2022, at the Avantgarde Levent Hotel in Istanbul, Turkey. The SEE region includes the Republic of Albania, the Republic of Armenia, the Republic of Azerbaijan, Bosnia and Herzegovina, Georgia, the Republic of Northern Macedonia, the Republic of Moldova, Montenegro, the Republic of Serbia, and Ukraine. This project is implemented by STCU and funded by the European Commission's Service for Foreign Policy Instruments (FPI).

The first two days of the meetings were conducted in Plenary and the final day in Bilateral meetings with the overall objectives for the delegates as follows:

1. To create a regional team of managers and experts that will provide technical direction and advice throughout the project
2. To approve criteria for selection of "Master Trainer" candidates
3. To agree a Training Curriculum including Table of Contents
4. To agree a set of Standing Operating Procedures (SOPs)

5. To agree a list of CBRN Training Equipment for each Partner Country for procurement and delivery ASAP
6. To draft a programme of events for the remainder of the project

Each partner country in the project sent one CBRN Emergency Medicine (EM) project manager and one CBRN EM trainer as delegates to the meetings. All delegates attended an ice breaker dinner on the first evening and continued to mix and socialize throughout the week with the goal of creating the cohesiveness of a regional team by the end of the week. Perhaps the most important component in the formation of the regional team was the requirement of each partner country to make a presentation on its own capabilities and ambitions for the project. This presentation enabled all delegates to learn about, share, and discuss CBRN EM throughout the region and was the foundation for the completion of the first meeting objective – creation of a new regional team.

All remaining objectives of the meetings were completed with the approval of criteria for the selection of master trainers, approval of the training curriculum, SOPs, & tentative calendar, and most importantly, the approval of the list of training equipment for each partner country.



Attendees of the first RTWG for the EU's CBRN CoE Project 088



STCU CONDUCTS CBRN EMERGENCY MEDICINE TRAIN THE TRAINER COURSE AS PART OF THE EU'S CBRN COE'S PROJECT 088

The STCU, jointly with the LEPL Emergency Situation Coordination and Urgent Assistance Centre in Tbilisi, hosted an event entitled, "CBRN Emergency Medicine Train the Trainer (TTT) Course". The workshop was held October 10-21, 2022 in the Radisson Blue Hotel, Tbilisi, Georgia, under the framework of the European Union Centres of Excellence (CoE) Project 088.

This training course was designed to give delegates the knowledge and skills to work safely in a CBRN environment and as well as to train their colleagues in their home country. After a week of studying theory at the hotel, the delegates underwent a week of practical training which was conducted at the Emergency Situation Coordination and Urgent Assistance Centre in Georgia. A primary goal of the practical training was to ensure that the participants could conduct similar but shorter practical courses for their colleagues at home. In the future, trainees in each home country will include participants from various government and private agencies such as:

- First Line CBRN Emergency Medicine Responders for Pre-Hospital management of CBRN Emergency Medical Preparedness and Response Operations
- Second Line CBRN Emergency Medicine responders for Hospital management of CBRN Emergency Medical Preparedness and Response Operations
- Managers at these same institutions
- Paramedical personnel
- Medical personnel

Members of the P088 training team will work with all participants "side by side" as they set up and run their initial training courses in their own national CBRN Emergency Medicine Training Centres, which will also be equipped as part of the scope of the project.



Members of STCU P088 team kick-off workshop with their Georgian hosts.

STCU CONFRONTS RUSSIAN DISINFORMATION



On April 14, 2022, the STCU was confronted with the first of a series of disinformation attacks which continued throughout 2022 and into 2023, by the Ministry of Defense of the Russian Federation, accusing the STCU of involvement with a covert offensive biological weapons program in Ukraine. On this date at a press conference conducted in the Ministry of Defense of the Russia Federation, Lieutenant General Ihor Kirillov, Chief of the Chemical, Biological, Radiological, and Nuclear (CBRN) Protection Force of the Russian Ministry of Defense, made a number of unfounded allegations against the STCU, STCU team members, and STCU partners (i.e. U.S. Department of Defense's Defense Threat Reduction Agency, etc.).



Lt. General Ihor Kirillov, Chief of the CBRN Protection Force of the MoD of the RF

In response to this press conference, the STCU quickly worked at all levels (Board and Secretariat) to draft a press release to confront these unfounded allegations head on. An excerpt from the press release is shown below and on the following page. Unfortunately, the allegations against the STCU did not stop with the April 14, 2022, press conference, as Mr. Kirillov and his Ministry of Defense colleagues went on to conduct a number of additional press conferences, spreading more disinformation about the STCU, the ISTC (STCU's sister Center which formally was headquartered in Moscow, but moved to Astana about 10 years ago), and a number of STCU partners – including institutes and scientists.

Given this constant flow of disinformation against the Center and its partners, the Governing Board of the STCU instructed the Secretariat to search for a public relations firm to work with in 2023, to better inform the public about the mission and activities of the STCU. As a result of the search, a contract was concluded in early 2023 with a reputable firm with years of experience of fighting Russian disinformation in Ukraine. As a result, in 2023 the STCU will have a much more professional approach to ensuring that the public hears about the important work of the Center, its team, and its partners. Unfortunately, the STCU knows that the disinformation campaign by the Russian Federation will not stop; however, going forward the STCU will be in a much better position to refute the allegations, and present the public with the truth.

STCU'S RESPONSE TO THE DISINFORMATION CAMPAIGN OF THE RUSSIAN FEDERATION

- The Russian government's allegations that the STCU is involved in a biological weapons program are patently false and have been repeatedly refuted by the Parties to the STCU and many others in the international and scientific communities.



- The STCU is an intergovernmental, science cooperation organization dedicated to the peaceful application of science and the promulgation of best practices, responsible science, scientific ethics, and a code of professionalism.
- The STCU's mission has always been to advance global peace and prosperity through cooperative Chemical, Biological, Radiological, and Nuclear (CBRN) risk mitigation by supporting civilian science, technology partnerships and collaboration that address global security threats and advance nonproliferation.

- The STCU as a multi-government organization has collaborated closely with the Government of Ukraine, and especially with the Ministry of Foreign Affairs and the Ministry of Education and Science, and with Ukraine's scientific Institutes and community for over 27 years in a fully transparent manner.



- STCU's biotechnology priorities in Ukraine are to help Ukraine enhance the safety of the day-to-day work of existing labs and to continue to ensure that Ukraine can detect and report, internally and internationally, disease outbreaks before they pose security or stability threats to Ukraine or other countries in the region - including the Russian Federation. All STCU's efforts have been peaceful in nature and subject to rigorous export-control measures and vetting processes. STCU has never sponsored any gain of function research or "human experimentation", as alleged by the Russian Federation.
- Over the years, the STCU has worked to enhance the safety and security of Sanitary Epidemiological Stations and veterinary laboratories in Ukraine. STCU is just one of many organizations providing equipment and training to these facilities. Other supporters include, among others, the European Union, the United States, Canada, World Health Organization, international universities, and research institutions.
- The Russian Federation's disinformation campaign conveniently omits several facilities that the STCU worked with in the past but are now under the control of the Russian Federation or its proxies in the occupied regions of Donetsk and Luhansk. For example, following the Russian Federation's illegal annexation of Crimea in March 2014, STCU was forced to cancel a €4M project sponsored by the European Union to enhance the safety and security of the Anti-Plague Station located in Simferopol. Despite the STCU working with this facility in the past, there is no mention of this facility in the Russian Federation's disinformation campaign targeting the STCU.
- Ukraine itself is a State Party to the Biological and Toxin Weapons Convention (BWC). All Ukrainian facilities are owned and operated by the government of Ukraine, which aims to improve human and animal health capacity for the people of Ukraine.
- The STCU, in all its work on public health, medicine, and biotechnology, complies with all international legal, professional, and ethical standards, as well as those established by the individual governments that are party to the STCU.
- The STCU does not conduct any classified work. Over the past 27 years, STCU projects have funded and contributed thousands of peer-reviewed publications to many of the world's leading scientific journals.
- STCU operations are open and transparent. All STCU projects are approved by a Governing Board of member state officials and are regularly subject to review and audit, including regular site visits for monitoring purposes to facilities where STCU projects are implemented. The STCU's commitment to transparency is often exploited by the Russian Federation. Much of the information provided by the Russian Federation as "evidence" as part of its allegations against STCU is innocuous and can be simply downloaded from the STCU website (see examples below):

http://www.stcu.int/documents/reports/distribution/pp/P781_PP.pdf

http://www.stcu.int/documents/reports/distribution/contracts/P364_EN.pdf

http://www.stcu.int/documents/reports/distribution/contracts/P444_EN.pdf

<http://www.stcu.int/documents/reports/distribution/nomination/12232.pdf>

2022: Challenges and Achievements

The Science and Technology Center in Ukraine has faced many challenges during its 27-year existence, but in 2022 we were tested in the worst possible way – by war. The Russian invasion of Ukraine not only claimed tens of thousands of lives, forced a refugee crisis affecting millions, inflicted hundreds of billions of dollars in damages, but scientific research and the livelihood of our colleagues and partners were also affected. However, STCU passed the test because of the resilience, reliability, and resourcefulness of our scientists and researchers who managed to bravely continue their work in often unsafe situations while simultaneously protecting their families and supporting their country during the invasion. Like the Ukrainian soldiers defending the nation, the scientists and researchers courageously perform their duties against the odds. This year, our annual report's success stories are about them.

While STCU works in the four GUAM (Georgia, Ukraine, Azerbaijan and Moldova) countries, we have dedicated this year's annual report to Ukraine given the dramatic events and heroism of the Ukrainian people during the invasion. It's our hope that Ukraine will be victorious so that next year's annual report will resume covering success stories in the other countries where we work. Our successes and efforts of our partners are due to the generous support of our donors, both regional and global, who share our vision of peaceful research and scientific discovery that better our lives and communities. The continued and consistent support of our donors is crucial. We thank them for standing with STCU in these dark and difficult days.

Another challenge that we faced in 2022 was the ongoing Russian disinformation campaign about SCTU as well as sister center, the International Science and Technology Center in Astana, Kazakhstan. Once a key supporter of the STCU and ISTC and their mandates, Russia has retreated

from support for these scientific initiatives and engaged in an active disinformation drive which attempts to undermine peaceful scientific research that addresses such as disease cures and treatment, the safety of the environment and nuclear waste storage, providing clean drinking water and combating climate change, among many other scientific and societal challenges. We will continue to counter the disinformation by openly and transparently conducting our work.

This year's annual report focuses on seven success stories about how our partners overcame the difficulties of the invasion to heroically perform their work. Several of these firsthand accounts occurred in the city of Kharkiv which is a vibrant center of research and technology. Take for example, Dr. Serhiy Lebedev, a Senior Lecturer at the Karazin National University in Kharkiv, who reluctantly but hurriedly, left Ukraine's second largest city the day Russia army invaded in February 2022. After protecting and providing for his family during that uncertain time, he returned six months later to resume work at his university. As he walked past the badly damaged buildings from indiscriminate Russian ordinance, Dr. Lebedev re-entered his laboratory which was damaged by cold temperatures and high humidity to piece together his work during frequent electricity blackouts. He also managed to resume his valued teaching regiment which had been disrupted by the war and educate the next generation of scientists.

Or take the account of Andrei Zalizovsky, a Doctor of Physics and Mathematics at the National Academy of Sciences in Kharkiv, who after securing his family's safety in Western Ukraine, returned to work on the STCU radioastronomy project. He managed to resume his important work on weather measurement while actively helping his fellow scientists relocate and continue their research in Europe and North America.



STCU's partners at the Kharkiv National Aerospace Institute were able to overcome the adversity of the invasion by transferring the testing and validation for the project involving the engine valves thermal management with advanced loop heat pipe, from Ukraine to Latvia in partnership with Allatherm. Now the project is back on track and will be completed by November 2023 to achieve its objectives. This innovative project utilizes a passive cooling system which will enable reliable and efficient long-term operation of engines for the next generation of European passenger aircraft.

Other scientists working at the Kharkiv National Academy's Institute of Radioastronomy had to quickly and carefully move valuable equipment to safer places in Ukraine while managing to resume their work after several months. These scientists worked in the bomb shelter basements of half-demolished buildings without heat or water, amid frequent blackouts and constant artillery and missile fire. Amazingly, their dedicated work allow them to supply unique cloud radars using LIDAR technology to meet their orders and honor their work contracts. This modest export of peaceful radars from Ukraine is continuing to help in the fight against global warming even while Ukraine remains under attack.

The February invasion also affected scientists from the National Science Center Kharkiv Institute of Physics and Technology (KIPT), who were also forced to flee Kharkiv to protect their families and loved ones. After moving their families to safety, The KIPT team, under the leadership of Deputy Director General Valery Mikhailov relocated many efforts to Kyiv in order to continue their work in nuclear forensics. They also managed to get approval for the newest project involving the nuclear fingerprint of down-blended uranium.

Near the capital of Kyiv, STCU was able to help mitigate a

potentially catastrophic disaster in the Chernobyl Exclusion Zone. STCU's mission is to improve radiation safety at one of the world's most infamous nuclear power plants. However, because of the carelessness of the invading Russian army, the topsoil in the zone was disturbed dispersing dangerous radiation and potentially contaminating the area through increased exposure. Thankfully, with the retreat of the Russian army from Kyiv region, and specifically the Chernobyl zone, STCU's supply and administration of radiation control and surveillance equipment continues to monitor and improve overall radiation safety daily.

In Western Ukraine, STCU-supported scientists from Lviv Polytechnic National University continued participation in the innovative project, "Heavy Metal Free Emitters for New Generation Light Sources". The invasion and subsequent attacks on energy infrastructure caused electricity blackouts which challenged project implementation and experimental work on technological laboratory equipment. This equipment required additional repair and time costs, but the challenges were overcome by the Ukrainian project team who successfully completed their tasks despite the difficulties.

These projects are all substantively different, but they share a common thread of resilience which helped sustain their ongoing implementation during wartime. They reflect a dedication and expertise which is central to the STCU's multi-decade mandate of peaceful and productive scientific research benefiting all humankind. We salute the bravery, commitment, and professionalism of our STCU partners. We are proud to work together to support their efforts. With partners like them, we are more confident than ever of a bright, peaceful, and prosperous future for Ukraine. Please take time to read the details of these remarkable stories in this year's annual report and we are confident you will be inspired.

MITIGATING RADIATION RISKS FROM THE RUSSIAN INVASION IN THE CHORNOBYL ZONE

Funding Parties:  

Funding amount: €3,773,430

The STCU Project 9702 improves radiation safety within the Chornobyl Exclusion Zone (ChEZ) by upgrading environmental radiation monitoring around the Vektor Complex and the Buriakivka near-surface disposal facility and improving the dosimetric control within the ChEZ. Unfortunately, Russia's military invasion of Ukraine which transited through the Chornobyl Nuclear Power Plant Exclusion Zone, has caused serious changes to the initial project plans.

The Russian invasion marked an unprecedented case of intrusion into radiation-hazardous objects with conscious disregard and wilful violations of radiation safety norms

In addition to elevating radiological risks, the Russian army vandalized and looted the central analytical laboratory leading to dramatic degradation of radiation monitoring abilities in the zone. After the de-occupation of the Exclusion Zone, local staff of the Special State Enterprise, "Ecocentre", and the Vektor Complex ensured fulfilment of their statutory obligations, despite the extremely difficult situation caused by the invasion.

Resumption of the enterprises' activities in individual radiation contamination control and radiation surveillance in the Exclusion Zone became possible mostly due to strong support from the European Union. The EU's allocation of



Destroyed radiation control points in Leliv and Dytyatky



The central analytical laboratory and automated system of radiation state control after the vandalism and looting by Russian soldiers.

and requirements, for transiting a radioactive-contaminated territory. During the movement of a large amount of Russian heavy military equipment through the exclusion zone, monitoring posts of the automated zone's radiation control system registered excessive levels of the dosage rates of gamma radiation. In addition, the Russian military removed the top layer of soil (which is classified as radioactive waste) while digging fortifications and trenches in the area of the Red Forest temporary radioactive waste storage facility. As a result of the Russian intrusion into the exclusion zone and adjacent territories, radiation was worsened and contaminated the premises and objects which has increased risks of spontaneous exposure to others.

project funds for provision of urgently needed equipment to replace what was destroyed or stolen by the Russian invaders made a difference. This supply of radiation control and surveillance equipment dramatically improved the overall radiation safety for local personnel and territories, while enforcing radiation safety and security on the borders of the Exclusion Zone and adjacent radiation regime zones. Currently, all radiation control and office equipment delivered through the project is being used as intended to contribute to restoring full-scale safety and security activities.

ADVANCING AIRCRAFT ENGINE FUEL EFFICIENCY DURING WARTIME

Funding Parties:  

Funding amount: €225,750

The Russian invasion caused immense damage and resulted in many projects being postponed or cancelled. Fortunately, the STCU Aircraft Engine Valves Thermal Management with Advanced Loop Heat Pipe project (known as EVAL) was not one of them, thanks to help from STCU partners in Latvia. The EVAL project involves the ultra-high bypass ratio, or UHBR, engine, which is the most promising, fuel-efficient propulsion concept in the aircraft industry today. Since the engine has cooling issues connected with drastically increased temperatures inside the engine compartment and the sensitivity of electronic components, the European Union - funded EVAL project is tasked with building a cooling solution based on a loop heat pipe (LHP). The LHP is a robust, miniaturized, two-phase heat transfer device considered useful for the electronics, aviation, and spacecraft industries. This is why the EVAL project combines radically new working fluids with reliable, easy-to-integrate European LHP technology consisting of an evaporator-reservoir modular unit ALTOM.

The EVAL project is implemented by a consortium of two R&D partners including the National Aerospace University (KhAI) which is experienced in complex thermal management systems for aerospace and terrestrial applications and the high-tech SME Allatherm SIA from Latvia with specialization in two-phase heat transfer technologies and devices. STCU provides administrative management and coordination for the project, and the research and innovation (R&I) activities are supervised by Liebherr-Aerospace Toulouse SAS.

The EVAL project is part of the European Union's HYDEA project, which stands for "HYdrogen DEMonstrator for Aviation", and proposes a strong and time-effective technology maturation plan to develop an H2 propulsion system to secure an Entry Into Service of a zero-CO2 low-emission aircraft by 2035, consistently with the expected timeframe of the European Green Deal and CA SRIA objectives. HYDEA will holistically demonstrate the feasibility of hydrogen propulsion on an aircraft engine in a compacted timeframe (2023-2026) up to Ground test.

Prior to the start of war in February 2022, the team successfully achieved two key milestones:

- Selected the toluene as the working fluid for the EVAL demonstrator of the LHP-based passive cooling system based on the analysis of 782 chemical substances used as working fluids in different thermal management systems; and,
- Developed the LHP conceptual design and layout arrangement within the UHBR engine that meet the valve

geometry, free space dimensions, temperature and heat flux conditions within the engine compartment; as well as the parameters of the secondary airflow.

Because Kharkiv was a frontline city and a focus of the Russian invasion, the EVAL project was suspended from March until October 2022 since it was impossible to implement laboratory activities during that time. Thanks to cooperation and the supportive position of its Latvian partner Allatherm and with the European Commission's flexibility, the EVAL consortium modified the approach enabling the KhAI team to implement the planned project activities remotely to stay safe during Russian bombings and attacks. This new approach transferred the EVAL demonstrator testing and validation campaign from Ukraine to Latvia. Nonetheless, the KhAI team still remotely controlled the test bench operations and had online access to the generated test data to be able to fulfil its project obligations. In November and December 2022, the EVAL team implemented all necessary activities for the test bench transfer from the KhAI premises in Kharkiv to the Allatherm premises in Latvia.



The EVAL test bench in the Allatherm offices in Latvia.

Despite the delays due to the war, the EVAL project is expected to be completed by November 2023 and achieve its objectives. The EVAL innovative passive cooling system will enable reliable and efficient long-term operation of the UHBR engine for the next generation of European passenger aircraft. The EVAL team is also planning to explore the possibilities of the spill over of project outputs into non-aerospace sectors where precise thermal management is required in harsh environments such as nuclear power plants, with an exclusive focus on civil applications. EVAL adaptations keep the project on track and the project is contributing to exciting innovations for the future of aerospace.



NUCLEAR SAFETY WORK CONTINUES DESPITE WAR

Funding Organization: U.S. Department of Energy's NNSA

Funding amount: \$275,000

Due to the Russian invasion of Ukraine, many scientists from the National Science Center Kharkiv Institute of Physics and Technology (KIPT) were forced to leave the city to save their families and loved ones. Some took their families to relative safety before returning bravely to Kharkiv. Others stayed with their families in safer parts of Ukraine and in the European Union countries to work remotely. The KIPT's Laboratory of Nuclear Materials and Export Control team, which researched nuclear forensics and International Atomic Energy Agency safeguards under the leadership of Deputy Director General Valery Mikhailov, also experienced this geographical separation due to war.

Importantly, interactions and cooperation among the scientists did not stop, which allowed the team to continue to perform its main tasks and functions. Though the STCU Project P748, "Manufacturing of Uranium Reference Materials for Nuclear Forensic Laboratories in GUAM Countries", funded by the U.S. Department of Energy's National Nuclear Security Administration was temporarily postponed, it managed to complete production of uranium reference samples for nuclear forensic laboratories in Georgia, Moldova and Azerbaijan, as well as perform their metrological certification. The team also continued consultations with the nuclear regulator of Ukraine regarding the classification of nuclear material in samples, ensuring requirements for packaging and transportation with a view to their further transfer to four countries that make up the GUAM organization (Georgia, Ukraine, Azerbaijan and Moldova).

At the end of 2022, work was administered on the long-term conservation of analytical equipment in the laboratory that includes the ICP-MS Element 2 mass spectrometer, the WDXRF Bruker S8 Tiger X-ray fluorescence spectrometer, the NWR 213 laser ablation system and the xrFuse 2 melting unit to ensure proper conservation and safety. All equipment was received between 2011 to 2015 within the framework of international projects funded by the United States and Japan.

Long-term cooperation between KIPT and the Kyiv Institute for Nuclear Research (KINR) in nuclear forensics has allowed the team to continue its research activities in the capital of Kyiv. The KINR Nuclear Forensics Laboratory team led by Deputy Director Vladimir Trishin, and with the work of KIPT experts, conducted research on uranium age-dating by High Resolution Gamma Spectrometry using

various efficiency calibration approaches as part of the knowledge transfer and development of scientific skills in a nuclear forensics project. The goal of these studies is validating the Non-Destructive Assay uranium age-dating testing method based on the $^{214}\text{Bi}/^{234}\text{U}$ chronometer and combined with various efficiency calibration approaches. Uranium samples from the Certified Reference Material 146 and Certified Reference Material 969 sets; various types of HPGe detectors at KIPT and KINR; and, program codes In Sita Object Counting Systems (at KIPT) and MCNP Monte Carlo N-Particle Transport Code (at KINR) will be used.



Lab equipment is prepared for long-term conservation

As a highlight of 2022, the project team will be a part of the new STCU Project P783 (\$275,000 funded by the U.S. Department of Energy's National Nuclear Security Administration) entitled, "Nuclear Fingerprinting of Down-Blended Uranium" which will be approved at the STCU's 56th Governing Board Meeting in June, 2023. The project will be a continuation of cooperation between United States and Ukrainian analytical laboratories in nuclear forensics, to fingerprint uranium materials that originated from post-Soviet republics. The study's goals are determining signatures of down-blended uranium and establishing differences in attributes of down-blended uranium produced by different technological processes. The project's work will begin as soon as the war allows. Meanwhile, the team will continue working with GUAM nuclear forensics experts on methods and techniques for the characterization of nuclear and radioactive materials currently out of regulatory control.

As the KIPT Nuclear Forensics team says, "War cannot stop our work."



NOT COVID, NOT COLD, NOT WAR CAN STOP THIS SCIENTIST IN KHARKIV

Funding Organization: Belgian Nuclear Research Centre

Funding amount: : €110,000

Editor's Note: This is the firsthand account of Dr. Serhiy Lebedev, PhD in Physics and Mathematics, Senior Lecturer at the Kharkiv Karazin National University and Partnership Project Lead for STCU.

February 23, 2022, was just another normal day for all Ukrainians. I was in the laboratory at the usual time around 10:00 AM., and I collected a test sample to be studied under 500°C, according to the project work plan. It takes almost five hours to arrive at this temperature, so I waited while performing my other tasks. I didn't have classes that day, and while the classes were remote due to Covid, they still took a lot of time which made it difficult to combine lectures and experimental work. At about noon, Andriy Paputsia arrived, and we discussed the experiment. After I went to the Nova Poshta office to send documents to STCU, expecting to receive them back a month later. Then I returned to the lab to test the sample and discuss plans for the next day with Andriy. We could not imagine that tomorrow would bring another reality.

At home in the evening, my wife and I put our one-year-old daughter to bed. After spending time laying tiles on my balcony, I went to bed at around 12:30 AM. We live in a nine-story apartment building in the northern part of Kharkiv, which is exactly where Russians began their assault on my hometown. I woke up from artillery fire around 4:00 AM, but I could not and did not want to believe that it was a full-scale invasion. An hour later I went out to the balcony to see Grad rockets flying over the Northern Saltivka district where I lived. It was horrible and suddenly I realized that we now live in a new reality. At 6:00 AM my wife said we had one hour to pack our belongings. We packed our suitcase, a couple of bags with necessities, a desktop computer and laptops. We left Kharkiv at 7:00 AM and the city was filled with chaos and traffic jams. Some people were even trying to leave the city even on foot! Finally, at 11:00 PM that evening, we reached my in-laws' home in the Kirovohrad region. We hoped that our stay would be for just a week or ten days. When we returned to Kharkiv almost six months later in early August, it was an entirely different city.

During the first week of war, we did not believe it would be so long and bloody. I was lucky to get my family out of town on the first day, but others were not so fortunate. For example, now my friends' children hide under the table when they hear aircraft flying because they had to wait to

be evacuated and/or had to find their own ways to leave the frontline city. Many friends are still away because their children were traumatized by the atrocities of war and will be scarred for the rest of their lives.

Thus, I did not have a chance to do my research work again until August, because unfortunately I could not take the equipment away. When I returned to the Karazin University where I work, I saw the damage inflicted from two bombs on the State Regional Administration nearby, and the shattered windows of my university building. Security guards had to break down the doors in the building to check damage caused by shattered glass.

Starting in September, my classes resumed remotely, and I returned to work to try to set up equipment again and prepare the experiment. Upon my return I found a measuring cell was damaged by cold temperature and high humidity in the lab. In addition, the university was frequently without electricity, so I took some glue and the measuring cell to my home to make repairs there to continue with the STCU partnership projects.

Now it is winter, and the central heating is turned off while the temperature inside keeps falling.; I have covered windows of the lab and my offices with polystyrene and sealed the openings with construction foam. This allows me to administer the experiment at under +3 to +5°C, which is definitely better than at freezing. In order to maintain at least 7°C inside the lab I am using an electric heater. However, it takes from 3 to 5 hours to preheat the sample before the experiment: While the experiment lasts only about half an hour, the preparation requires half a day, and my hands are frequently freezing while performing the experiment.

Nevertheless, we are continuing our scientific work and are confident that we will overcome all of these challenges victoriously. Slava Ukraini!



NEITHER WAR IN KHARKIV NOR HARSH WEATHER IN ANTARCTICA CAN DISRUPT GEOSPACE MONITORING

Funding Organization: European Office of Aerospace Research and Design (EOARD)

Funding amount: \$150,000

Editor's Note: This is the firsthand account of Dr. Andrei Zalizovsky, Doctor of Physics and Mathematics, Senior Staff Scientist, and Head of Geospace Radiophysics Department at the Radioastronomy Institute, National Academy of Sciences of Ukraine.

Like everyone else, I was not expecting to hear artillery fire on the morning of February 24th, although the signs were there from early 2014. The first thing I did was evacuate my family to a safe place and luckily, we had such a location: My sister had been living in the European Union for some time, and so we spent the first three days of the war traveling from Kharkiv to the EU border.

After moving my family to safety in the EU, I signed up at the conscription center to be available if my country needed me. Next, I had to think how to organize our research in this new environment. I had been a visiting professor at the Polish Academy's Space Research Center, or CBK-PAN, for almost four years before the full-scale Russian invasion. Because of this relationship, the Geospace Radiophysics Department of the Radioastronomy Institute could continue to work with CBK-PAN's support. Thanks to Professor Ilona Stanislawska and the Center's assistance, temporary lodging was provided for many Ukrainian scientists and their families traveling to Warsaw or cities further west.

Fortunately, the EU and Poland, allocated funds for the employment of Ukrainian scientists due to the invasion. Starting in the summer of 2022, many scientists from the Ukrainian Radioastronomy Institute received grants and found job placement in temporary positions at CBK-PAN. This included four of our department personnel who worked from summer through the autumn in their respective research areas. In addition, one of our scientists was offered a position at the Leuven Catholic University in Belgium and another colleague conducted research at New Brunswick University in Fredericton, Canada beginning in September.

While we were simultaneously evacuating family, friends, and colleagues, we continued to work on the new partnership project P775 with the STCU, through the EOARD #22IOE019 project. Fortunately, all internal approvals from the Ukrainian side of the project were obtained the year before the invasion.

In April 2022, we contacted the EOARD Program Officer to update him on the project status, because two Radiophysics Institute observatories were under temporary occupation. The good news was that the project participants were alive, and most of them continued actively working from safer locations in the Kharkiv region, other parts of Ukraine, or abroad. Also, the Arctic and Antarctic regions were accessible and could be used to address project goals. A positive response was given by the EOARD Program Officer, so STCU was able to start the P775 project on June 1, 2022.

Using STCU funding, we moved the project server to Warsaw for safety. Now it operates as a Ukrainian server on the CBK-PAN campus. Two-channel doppler high frequency receivers installed at the low frequency array (LOFAR) Borowiec observatory near Poznan are similar to those operating in the Arctic. This was critical because the Ukrainian observatories remained under Russian occupation until September. At the LOFAR Borowiec observatory, we also successfully tested the operability of the passive ionosonde to respond to signals of the active ionosonde that operated in the Kharkiv region and at the test site of the Academic Ionosphere Institute near Zmiyiv.

An expansion of Ukraine's research base for space weather measurements was made in October and November during the visit of P775 project participants to the Nyzhnie Selyshche Geophysical Station in the Transcarpathian region of Ukraine. This facility is operated by the Carpathian branch of the Subbotin Academic Institute of Geophysics. Our scientists set up the K-index measurements and geomagnetic pulse characterization based on readings of the magnetometer operated at that station. Unfortunately, due to frequent blackouts and communication losses, the automatic K-index computation and transmission via the internet is still in the pipeline. However, most preparatory work has been completed and we will be ready to show results online as soon as the power supply is stabilized.

Another radiophysics observatory to measure space weather parameters was deployed on board the Noosphere research ship in 2022 with support of the National Antarctic Research Center. This ship was bought from the United Kingdom in 2021. A measurement position set up in late



January 2022 included a 2-channel high frequency doppler receiver used to study long-range propagation of high frequency radio waves. An ionosonde receiver position was set up to receive signals from our own ionosonde design which is currently operated off the Kharkiv region test site of the Academic Ionosphere Institute and at the Academician Vernadsky Ukrainian Antarctic Station (UAS). It also includes a very low frequency measuring receiver to detect lightning discharges and measure parameters of the ionospheric D region.

This measurement position was used during the Noosphere's travel from Odessa to the UAS in Antarctica and back to Punta Arena in Chile from January-April 2022. Luckily, the Noosphere was in the tropical part of the Atlantic and on its way to Antarctica at the time of Russian invasion. Currently the Noosphere works in the Antarctica region. Active preparations are underway for a measurement campaign from the Noosphere planned for March and April 2023 along the navigation line between Punta Arena and the UAS and after in reverse.

Geospace monitoring at the Academician Vernadsky Ukrainian Antarctic Station is one of the high-priority activities of our department. Despite the war, 2022 was still productive for our Antarctic studies. During the work season we upgraded ionosondes which are the key instrument to monitor ionosphere above the station. The IPS-42 ionosonde active at the station for over 40 years was given a new digital interface connecting the instrument to a modern computer. Also, a new antenna and feeder system, including the central 14-meter mast and four smaller

peripheral elements, was installed to support a Ukrainian design digital ionosonde.

This large-scale construction effort improved system sensitivity and provided a new quality which was the automatic resolution of signal polarizing modes. Now both of the ionosondes transmit real time data into cloud storage which is useful for the P775 project. Other improvements at the station included an upgrade of a low-frequency global thunderstorm activity detection system through the dramatic expansion of a frequency range and enhancement of the data value.

The Geospace Radiophysics Department of the Academic Radioastronomy Institute continues working despite the war and the fact that personnel have been dispersed across several continents. One of the P775 project participants is currently serving in the Ukrainian army. Four professionals continue work on the project inside Ukraine and another works at the Academician Vernadsky Antarctic Station. Four other scientists continue working on the project from abroad from Poland and North America. Our plan is to place two more P775 project participants at the Academician Vernadsky Ukrainian Antarctic Station starting in April 2023.

It is a great honor for us to be part of the EOARD partnership project, which gives us the opportunity for joint research with the U.S. Air Force Research Laboratory, one of the leading research centers in the United States. We not only make our contribution to science but also to the development of our nation, which brings us closer to victory. We are confident that our commitment and persistence will pay off.



The Noosphere upon which Project P775 placed a radiophysics observatory in order to measure space weather parameters



UKRAINIAN COURAGE AND COMMITMENT TO COMBAT CLIMATE CHANGE AND WAR

Funding Organization: Meteorologische Messtechnik GmbH (METEK)

Funding amount: €2,300,000

Russia's aggression against Ukraine is not only on the battlefield, but also aimed at destroying scientific and academic infrastructure which is a key part of Ukraine's defense capabilities. Scientists from Kharkiv saw this firsthand during the first days and weeks of the invasion. Many research institute buildings were destroyed, including the National Academy's Institute of Radioastronomy. Institute personnel who stayed in Kharkiv selflessly protected and preserved institute property by moving it to safer locations and restored structures damaged by Russian weapons.

At first glance, it would seem that scientific research is out of the question in a wartime environment, but to the contrary, the war did not block planned academic work and contract commitments. For example, the Institute's microwave electronic department continued actively pursuing development and overseas supply of so-called cloud radars, a type of laser imaging detection and ranging, or LIDAR, technology, jointly with the German METEK company. Unlike LIDARs, cloud radars support detailed measurements and analysis of all types of clouds and precipitation. These instruments provide unique, real-time data on cloud particle density and cloud movement, sizes and shapes distribution.

Clouds are a decisive factor in Earth temperature regulation by reflecting sunlight back into space and keeping warm temperatures within the atmosphere. As greenhouse gas increases due to human activity, cloud veil parameters change causing further warming. Some clouds operate like a blanket retaining heat and causing warming while others reflect sunlight and cool down the Earth. The resulting effect of clouds on global warming is still a subject for research and academic debate. However, it is clear that the Earth's temperature may be regulated through the impact from cloud veil.

Cloud radars are designed to study causes of global warming and ways to overcome it. Thus, the instruments built by the institute are of interest for numerous academic institutions worldwide. Such radars supplied jointly with METEK operate in dozens of countries. Prior to the war, an order was placed for such systems to be installed at the German scientific station in Antarctica. Obviously, the

Antarctic is an extreme condition for radar operation and maintaining their operation continuously and autonomously. Nonetheless, our professional scientists maintain are confident that technical and scientific difficulties will be addressed.

While the Russian invasion temporarily interrupted this work, the required instrumentation was moved to safe places and the activity resumed after several months. The team honors the heroic resilience of those who continued working in bomb shelter basements of half-demolished buildings without heat or water, amid frequent blackouts and constant artillery and missile fire. While many personnel left Kharkiv, all, including designers, programmers, theoretical scientists, managers and suppliers, have continued working even if from a distance. This made the full resumption of the project a surprise for our clients because the team has been able to supply these unique cloud radars to fill their orders and the team continues fulfilling its work contracts. Meanwhile, new orders are being placed which is a vote of confidence in the team's work and Ukraine's resilience.

At a time when many military locator systems are being imported to Ukraine from abroad, scientists, designers and workers are proud their cloud radars are made in Ukraine. This modest export of peaceful radars from Ukraine is continuing helps in the fight against global warming even while Ukraine remains under attack. The team remains confident that it will be victorious and after defending Ukraine, it will help to conquer global warming through the work of its cloud radars.



FROM DARKNESS TO LIGHT: LVIV TEAM OVERCOMES BLACKOUTS TO WORK ON NEW LIGHTING SOURCES

Funding Organization: Kaunas University of Technology

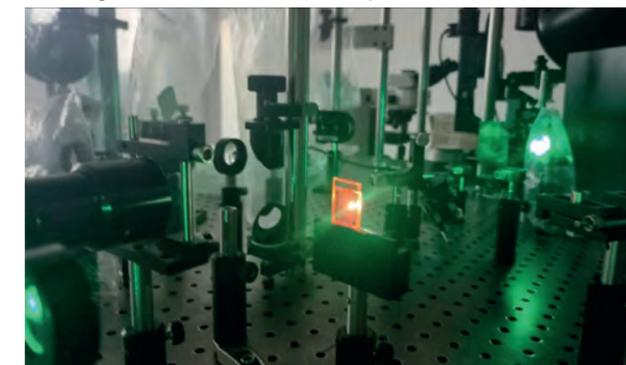
Funding amount: €276,450

Scientists from Lviv Polytechnic National University have been participating in the innovative project, "Heavy Metal Free Emitters for New-generation Light Sources" since 2019. However, Russia's full-scale invasion of Ukraine on February 24, 2022, brought many challenges to project implementation. Experimental work on technological laboratory equipment required additional repairs and time due to the continuous shelling of energy infrastructure in Ukraine and subsequent blackouts.

However, these challenges were overcome by the Ukrainian project team continuing their successful integration into the European consortium and fulfilment of assigned tasks. For example, scientists managed to get newly synthesized compounds from their European colleagues and develop multilayer, efficient, light-emitting structures and organic lasers based on those compounds. Such innovative research is also being carried out successfully in EU countries.

The project is administered within the framework of the European Union Horizon 2020 Research and Innovation Program under the Marie Skłodowska-Curie Grant Agreement. The project unites a consortium of scientists and specialists from 11 universities and leading businesses in six European countries working in organic electronics. Developing a new generation of environmentally attractive and efficient organic emitters for modern lighting systems and display technologies is the goal of the project.

Comprehensive studies of molecular modelling of compounds that are characterized by the phenomenon of thermally activated long-term fluorescence, or TADF, were administered at the start of the project. Synthesis and characterization of the most promising compounds with TADF and lasing properties were performed. Materials were tested in the structures of TADF light-emitting devices and organic lasers industrial requirements.



A view of the equipment in use

Despite the difficulties of the war, project results were presented to the scientific community at international conferences and summer schools. In addition, several scientific articles were published in respected scientific international journals in cooperation with other consortium experts. Finally, one of the main project achievements was the establishment and expansion of scientific cooperation with our European partners. This cooperation is a unique experience for Ph.D. students and young scientists as an opportunity to increase their knowledge, practical skills and scientific competitiveness. This practical knowledge and skill are used based on European standards are used for the courses teaching electronics at the Lviv Polytechnic National University to train new specialists. As the project team says, "We are not letting the war prevent us from doing our work and training the next generation."



Members of the P742 team

FINANCIAL ACTIVITY IN 2022

2022 was always going to be a down year for funding compared to 2021, which set a record for the highest amount of funding in a year (\$24.5M), beating the previous high by 20% (2006 = \$19.8M). However, given the Russian invasion of Ukraine at the beginning of the year, the amount of funding approved in 2022 was remarkable. In 2022, the STCU Governing Board approved just over \$8.1M in new projects, a decrease of approximately \$16.4M in total new project funding compared with the record 2021 year, but quite high given the circumstances, and in line with management expectations of annual funding oscillating in a band of between \$8M - \$12M per year.

The 2022 funding number although exceptional, was dominated by two projects that represent almost two-thirds of the funding: 1). €3.6M for upgrading communication networks and other monitoring infrastructure in the Chernobyl zone with the European Commission's DG-INTPA and, 2). \$1.5M project in Georgia to strengthen chemical security funded by the U.S. Department of State's, Bureau of International Security and Nonproliferation, Office of Weapons of Mass Destruction Terrorism. All other funded projects in 2022 were much smaller and most were extensions of currently ongoing government partner projects. Thus, the funding for the year 2022 was remarkable, yet highly concentrated, and thus risky.

New partner project funding in 2022 also drastically decreased compared to the record 2021 year. The \$4.0M of new partner project funding in 2022 was \$6.6M less than

that received in 2021. In 2022, new project funding from all partner organizations represented 49.6% of the total amount of new STCU project funding. This percentage is much lower than the 80% of total funding the STCU has historically received from partner organizations and reflects the continued pivot to much bigger government funded projects such as the two projects highlighted in the paragraph above.

Despite the ongoing war, funding in 2023 is expected to increase slightly over 2022 (~\$10.0M), as there will be several large procurement projects that the STCU is scheduled to implement to replace damaged or stolen CBRN equipment as result of the ongoing war in Ukraine (especially as a result of the occupation of the Chernobyl Exclusion Zone). That's the good news.

The bad news is that there will be lasting effects on STCU funding because of the Russian invasion of Ukraine. Non-government funded projects at the STCU represented about \$2M-\$3M annually (roughly 20%-30% of recent annual funding) and totaled \$66.0M over the course of the Center's history (18% of historical funding received by the STCU), providing a reliable source of non-donor funding for the Center over the years. Unfortunately, with the Russian invasion of Ukraine in February 2022, it is apparent that given the heightened risks now associated with investing in Ukraine, this number will go down drastically and may approach zero for the foreseeable future.

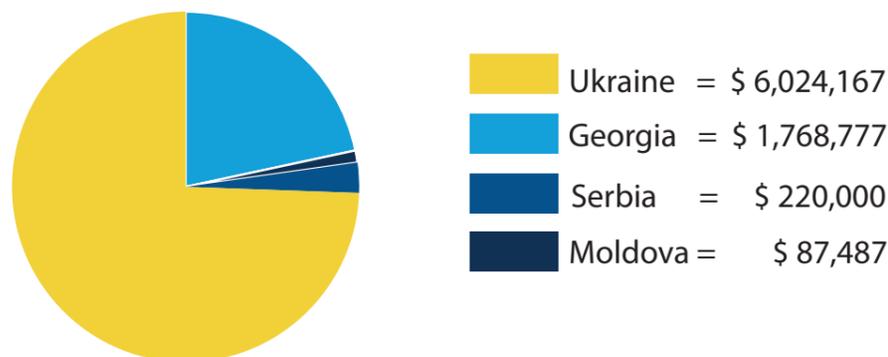
2022 is a case in point, as the STCU signed only one contract with a non-government partner after the February 2022 Russian invasion, an amendment to an already existing project ongoing in Georgia. Given that almost all non-government partner projects signed over the STCU's history were with Ukrainian organizations, this does not bode well for future non-government funding at the STCU.

Finally, another indication that the invasion will have an impact on future non-government turnover is that there were only three new partners approved to work with the STCU in 2022. It appears the invasion has not only almost stopped the signing of new non-government partner projects, but also has slowed the flow of new partners wanting to join the

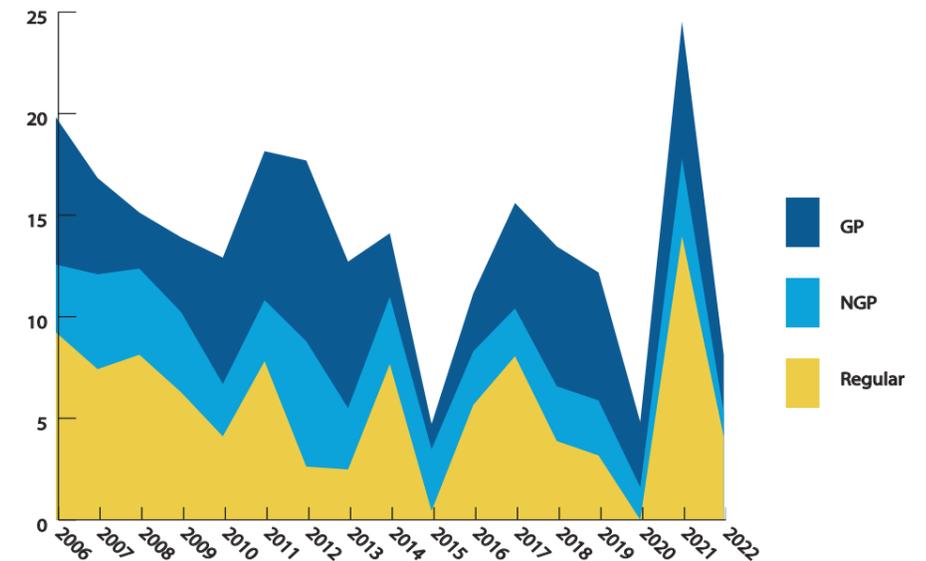
STCU, with new non-government partners drying up almost completely.

Finally, for the second time, external auditors from Crowe Erfolg Ukraine audited the financial management and accounting systems, as well as the system of internal controls for both the operations of the STCU administration and STCU-funded projects. The results of this audit can be found on the STCU's website at: www.stcu.int/documents/stcu_inf/reports/audit/2022/. Some weaknesses were identified in conjunction with the December 31, 2022, financial statement audit and will be corrected during 2023.

New Project Funding in 2022 by LOCATION OF RECIPIENT ORGANIZATION

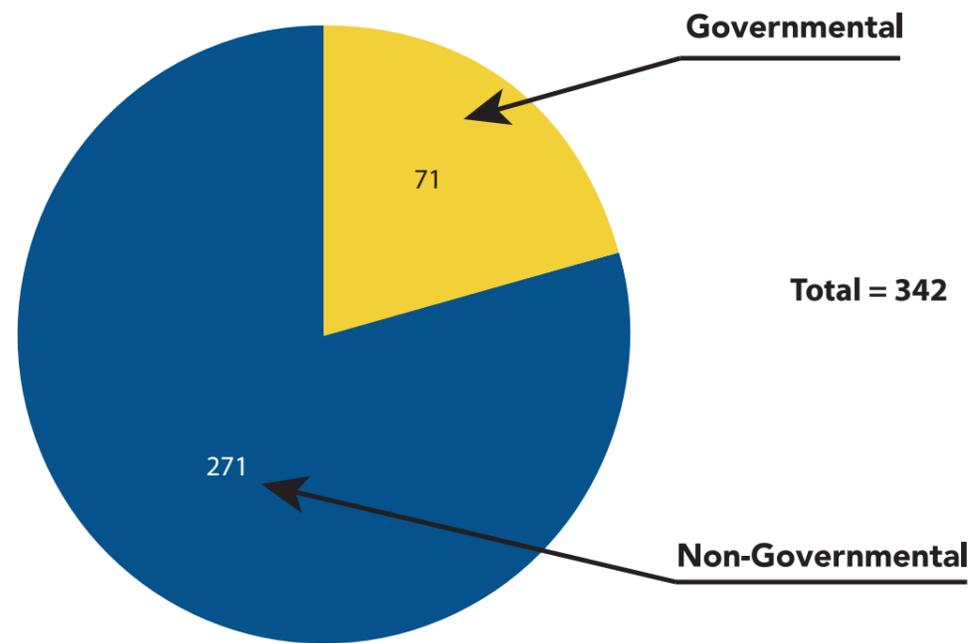


Regular/Partnership Funding, 2008-2022 (funding in millions USD/year)

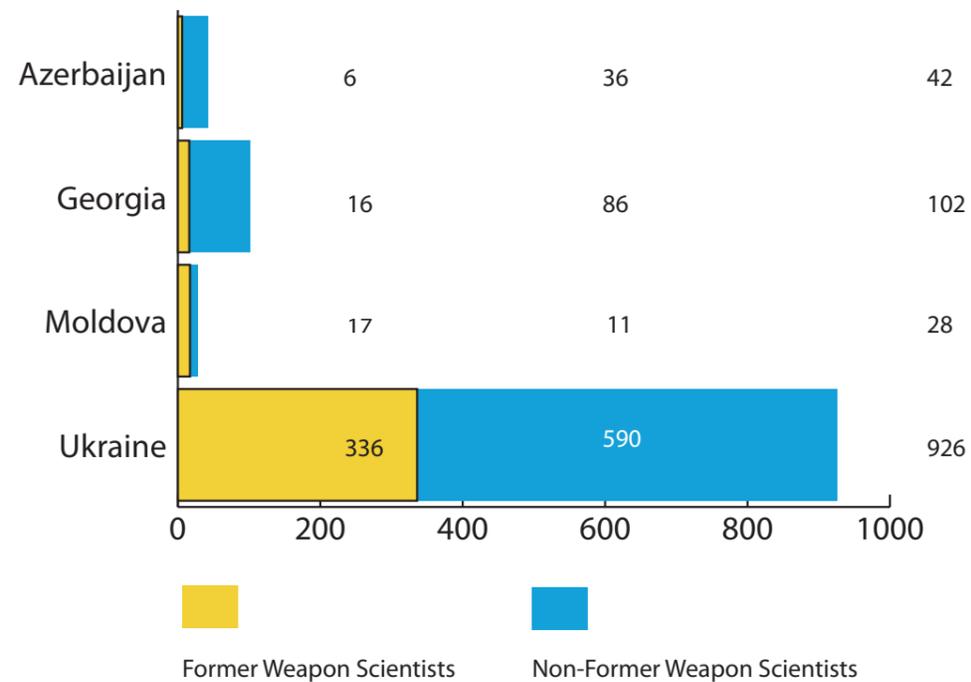


Year	Regular	Non-Governmental	Governmental	Total
2022	\$4,08 M	\$1,18M	\$2,84M	\$8 M
2021	\$13,97M	\$3,83M	\$6,74M	\$25M
2020	\$0,00M	\$1,61M	\$3,21M	\$5 M
2019	\$3,17M	\$2,71M	\$6,30M	\$12M
2018	\$3,88M	\$2,70M	\$6,88M	\$13M
2017	\$8,06M	\$2,35M	\$5,19M	\$16M
2016	\$5,66M	\$2,64M	\$2,85M	\$11M
2015	\$0,44M	\$3,04M	\$1,24M	\$5 M
2014	\$7,67M	\$3,31M	\$3,13M	\$14M
2013	\$2,48M	\$3,02M	\$7,21M	\$13M
2012	\$2,62M	\$6,17M	\$8,90M	\$18M
2011	\$7,81M	\$3,01M	\$7,33M	\$18M
2010	\$4,11M	\$2,58M	\$6,22M	\$13M
2009	\$6,28M	\$3,95M	\$3,68M	\$14M
2008	\$8,13M	\$4,24M	\$2,76M	\$15M

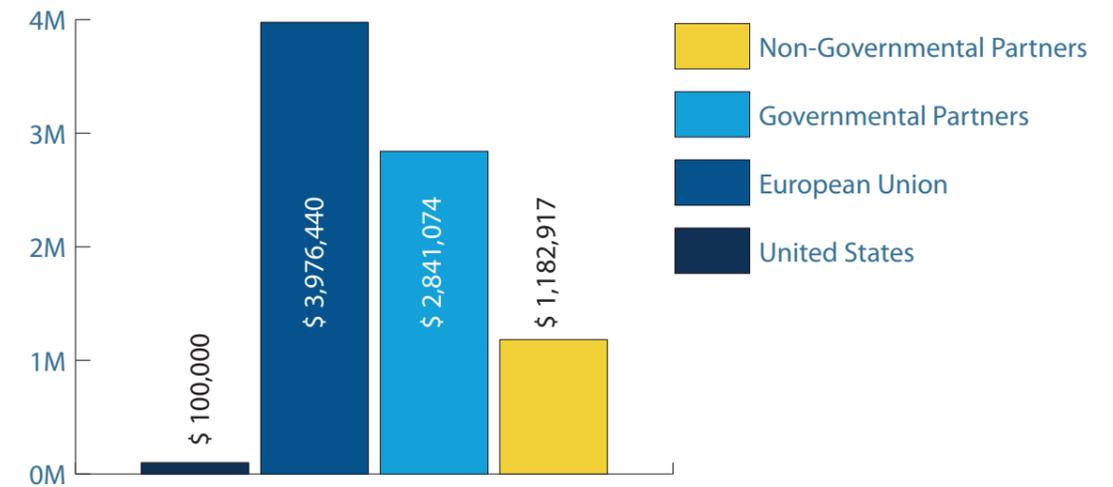
Total STCU Partners, Governmental/Non-Governmental



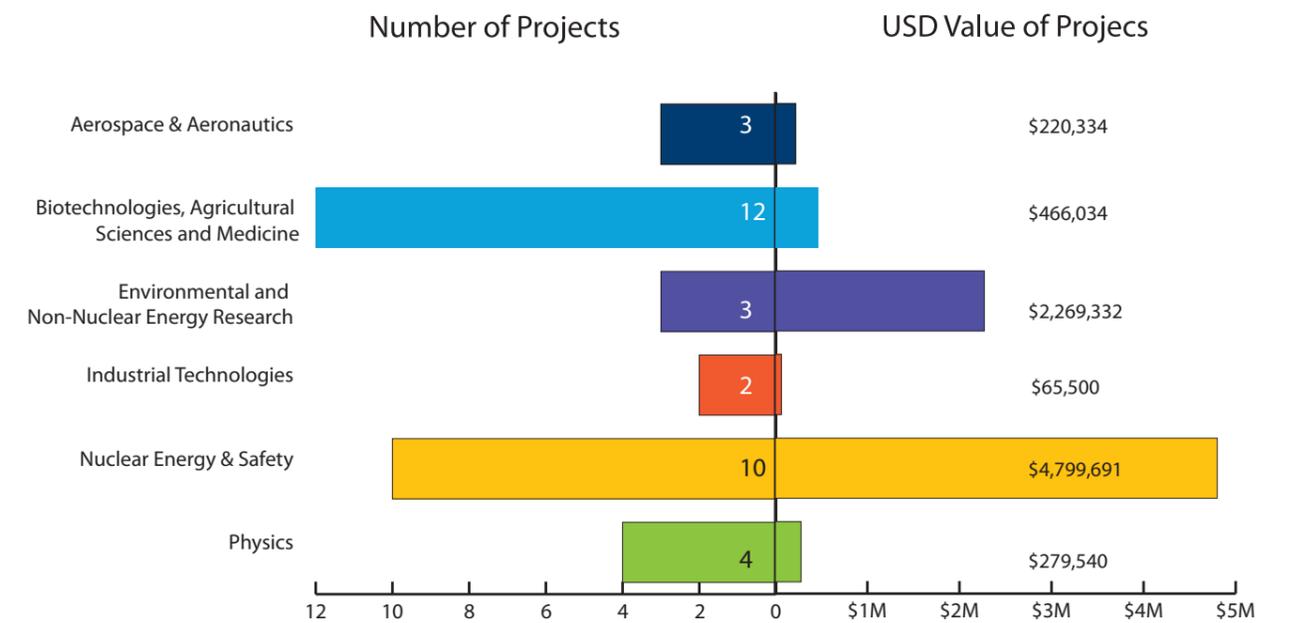
Participants Redirected on STCU Projects During 2022 by LOCATION OF RECIPIENT ORGANIZATION



New Project Funding in 2022 by SOURCE



New Project Funding in 2022 by PRIMARY TECHNICAL AREA



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