SCIENCE & TECHNOLOGY CENTER IN UKRAINE

AN INTERGOVERNMENTAL ORGANIZATION
ASSISTING FORMER WEAPONS SCIENTISTS'
TRANSITION TO PEACEFUL PROFITABLE
CONTRIBUTIONS TO GLOBAL R&D

Azerbaijan | Canada | European Union | Georgia | Moldova | Ukraine | USA | Uzbekistan

The Science & Technology Center in Ukraine (STCU) provides Western companies with the services of highly skilled scientists from Azerbaijan, Georgia, Moldova, Ukraine and Uzbekistan as well as tax-free privileges, duty-free import of equipment and Western-style project monitoring. The STCU is an intergovernmental organization dedicated to the non-proliferation of weapons of mass destruction expertise. Since 1993, private companies and government agencies from Canada, the European Union and the United States have used the STCU to manage nearly 900 R&D projects, worth over US $120 million.

WELCOME FROM THE STCU EXECUTIVE DIRECTOR

Andrew A. HOOD
STCU Executive Director

The STCU is ideally positioned to match an unexploited supply of scientific and technical expertise to meet your commercial or non-commercial needs. Through its primary mission of nonproliferation of WMD expertise, the STCU has compiled a treasure trove of experience and knowledge about the many highly talented scientists and technologists in Azerbaijan, Georgia, Moldova, Ukraine and Uzbekistan. And the STCU is a well-established, western-style organization with nearly 10 years of operational experience that can help steer you through the uncertainties of the business and investment environments in these emerging economies. The STCU has:

- Legal status, diplomatic accreditation, tax- and customs exemptions for financed projects and activities, all guaranteed under the international agreement establishing the STCU;
- Proven experience in project management: nearly 900 research projects totaling over $120 million, performed in close collaboration with the European and North American scientific communities;
- Over 120 private sector and governmental agencies which have joined the STCU's Partnership Program to finance their own, tailored S&T projects (totaling more than $30 million) through the STCU.

The STCU's staff of professionals is experienced in working with industry and business representatives, including protecting their business-sensitive information and interests. In this way, the STCU can serve you as a trustworthy and cost-effective bridge to the yet-to-be-tapped opportunities for contract research and technology development in Azerbaijan, Georgia, Moldova, Ukraine and Uzbekistan.

I hope that you will find the STCU worthy of a closer look. It is a win-win-win situation you should not pass up: win for you, win for these former military institutes looking for a chance to perform, and win for the STCU's nonproliferation mission (which, actually, is a win for global security)!

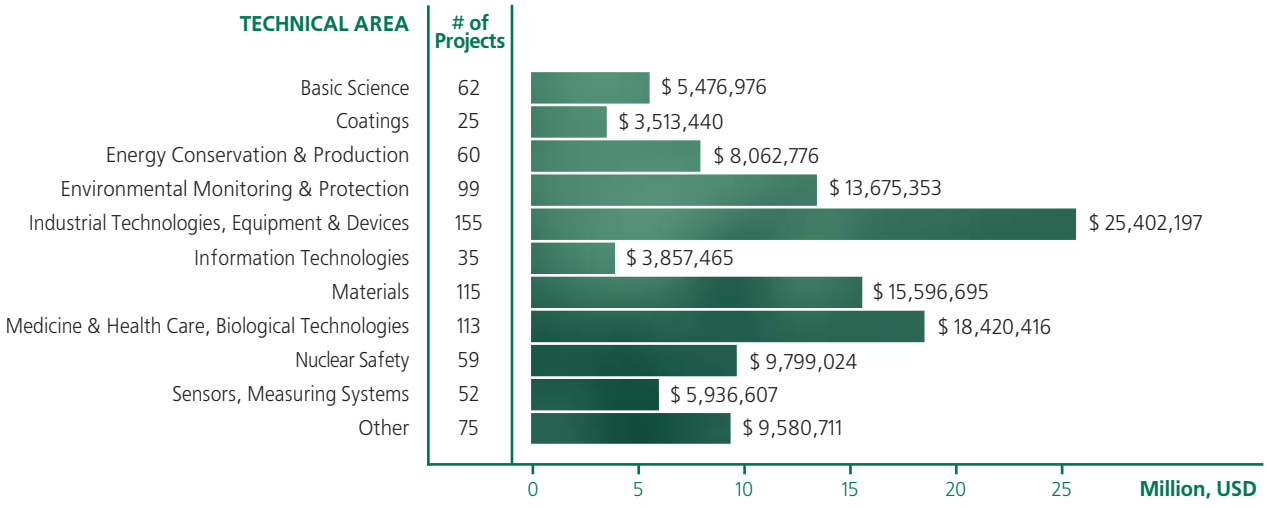
TABLE OF CONTENTS

THE STCU'S MATCHMAKING INITITATIVE

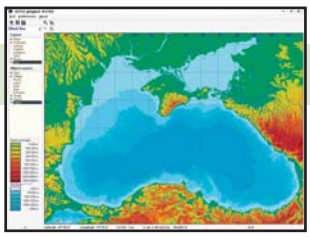
The goal of the Matchmaking initiative is to provide opportunities for information exchange, as well as matchmaking, between scientists and industries about their R&D potential and needs. Environmental monitoring and remediation issues are addressed in a number of proposals registered with the STCU along with over thirty STCU-funded projects. Knowledgeable researchers and trained personnel in this field; technologies for collaborative development, licensing, cooperative marketing and commercialization are all accessible through the STCU.

We kindly ask interested technology end-users (private firms, governmental bodies, educational institutions, etc.) to contact the STCU Governmental Partnerships Program (lyubov.taranenko@stcu.int) and Non-governmental Partnerships Program (boris.komarov@stcu.int) for assistance in matching your technology needs to the supply of excellent, knowledgeable expertise in Azerbaijan, Georgia, Moldova, Ukraine and Uzbekistan.

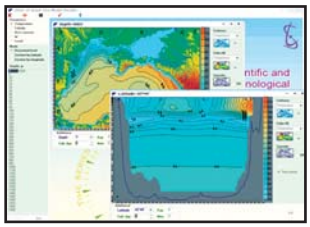
Project Funding by Primary Technical Area, 1996–2004



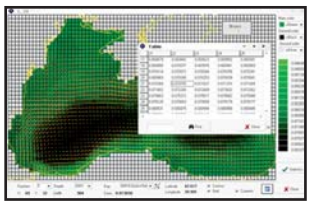
BLACK SEA MONITORING



User interface of the Geographic Information System (GIS)



Modeling of the Black Sea



The GIS form for numerical analysis results

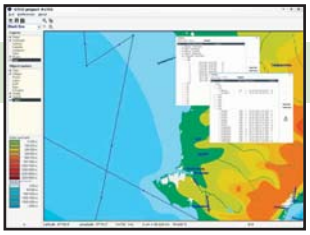
Pollution Transport

Marine environment monitoring is conducted by the Intergovernmental Oceanographic Commission (IOC) and Scientific Committee on Ocean Research (SCOR) within the frame work of the Global Ocean Observing System (GOOS). An essential component of GOOS is a tracking system for analysis of pollution transport and prediction of ecosystem evolution. An efficient tracking system for coastal zones and inland seas where anthropogenic pressure is considerable is in great demand, though a challenge. For example, pollutants dumped into the Black Sea jeopardize the existence of marine life, as well as the well-being of six nations living in this zone.

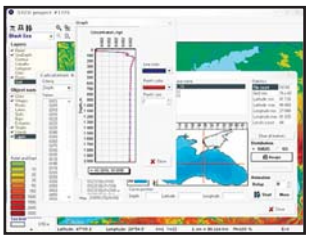
A team from the Marine Hydrophysical Institute in Sevastopol has developed a cost-efficient technology, including software package, for tracking of pollution transport into the Black Sea using satellite remote sensing, hydrology, and radionuclide observations. A well calibrated ecological model that is capable of reconstructing three-dimensional temperature, salinity, current phytoplankton fields and pollution fields in the Black Sea was developed. The model is applicable for other areas in North America, Europe, and Africa.

In particular, previous and current distribution of radionuclides that entered the Black Sea after the Chernobyl accident has been analyzed. Data on the transport of phytoplankton and the spread of the polluted waters of the Danube, Dniester, Dnieper and South Bug rivers throughout the basin are available.

STCU Project 1547



The GIS form representing oil concentration measurements



The GIS example of oil vertical distribution

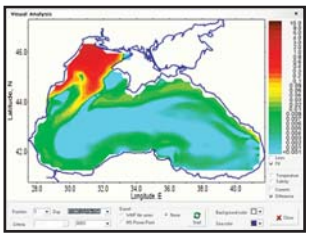
Oil Transport Forecasting

A specialized software package for long-term forecasting of the consequences of oil spills and continuous oil pollution in marine environments has been developed by experts from the Marine Hydrophysical Institute in Sevastopol. It is presented in the form of a CD-based GIS-type product and includes the data for demonstration and estimation of the current level of oil pollution as well as simulation of possible oil spills and continuous oil pollution. It also contains an interdisciplinary model providing users with the possibility to simulate some specific scenarios of oil pollution depending on user-chosen oil properties and boundary conditions. This system would serve as the basis for a regional system of forecasting the evolution of oil contamination in marine environments. Data concerning the potential degradation of the Black Sea ecosystem in case of an emergency oil spill were obtained.

The interdisciplinary model consists of a model of the physical, chemical and biogeochemical behavior of oil in a marine environment, the Black Sea circulation model, and a procedure for assimilating observations. The elaborated model is complex enough to realistically simulate all of these required aspects. The geochemical model describes the long-term evolution of oil in both an oxic and anoxic marine environment.

STCU Project 1725

Sich-1



The GIS image of visual animations

Marine Remote Sensing

In cooperation with the Marine Hydrophysical Institute in Sevastopol, the Yuzhnoe State Design Office in Dnipropetrivsk equipped a space vehicle of the "Sich" system with a new radio channel that is compatible with the international network of HRPT-format receivers. Now Ukrainian Side-Looking Radar (SLR) data and the Black Sea ecological monitoring system, which is based on SLR data, are becoming available globally.

Ukraine was a pioneer in the application of satellite radar observation to oceanography. Launches of oceanographic radar systems have been carried out for over 20 years, since the satellite "Kosmos-1151" launch in 1980 and "Kosmos -1500" launch in 1983. In 1995, the first Ukrainian national satellite, "Sich-1" equipped with the side-looking radar, was launched. The Ukrainian SLR is unique because its broad swath, ~450 km, is combined with the spatial resolution of ~1x2 km that is close to the resolution of meteorological and oceanographic scanners of the AVHRR and SeaWiFS types providing inexpensive data. Ukrainian SLR data has attracted a number of potential customers internationally though previously customer access to the data was essentially hampered by compatibility problems. In particular, the radio channel, which was previously used for transmission of SLR data, was oriented towards the weakly-developed Ukrainian internal network of receivers. However, these problems are now resolved and Ukrainian SLR data is accessible to customers worldwide.

STCU Project 2241

CENTRAL ASIA INITIATIVES

Establishment of CASRI

This international cooperative research project aims towards establishing a network on active seismic information in Central Asia as the basis for further investigations on the assessment of seismic hazards and seismic risk reduction in the Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan.

Historically, the most catastrophic losses in the region have been due to strong earthquakes. The territories of the Central Asian countries lie among the Tien-Shan and Pamirs intracontinental mountains, one of the most seismically active and dangerous zones within continental Asia. More than 27 strong destructive earthquakes with magnitudes M>6.5 occurred within Central Asia during the last 150 years.

The STCU project in Uzbekistan is part of a joint CASRI project involving the Central Asian countries of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. Ten Institutions from these countries are participating in this joint project including three Institutions from Uzbekistan. Experience gained from the CauSIN project, a similar project in the Caucasus region, has contributed to the development and implementation of this project, including sharing lessons, best practices, and geophysical data.

Project results include a unified, distributed joint database; tectonic structures characterization — a regional tectonic map; seismic and landslide hazard assessment; sites selection for new regional seismic stations. Project results will be transferred to appropriate governmental as well as private institutions, organizations along with companies interested in or responsible for managing and mitigating the effects of natural hazards.

STCU Project 3577

Sample preparation

NAVRUZ II

NAVRUZ II is a cooperative international research initiative whose goal is to characterize the contamination of radionuclides and toxic metals as well as create a database on the radiation situation of the water basin of the Central Asia region. It involves research teams from Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. The Institute of Nuclear Research, Tashkent, is involved through an STCU project while other teams participate through ISTC projects.

Stability among the countries of Central Asia is sensitive to economic and political turmoil. Issues concerning water quality and quantity have already become critical in some regions, and are rapidly becoming critical in others. Water samples of various river systems of the region are sensitive to various technogenic impacts.

The project follows — and expands upon — a similar project operating by Sandia National Laboratory through funding from the US Department of Energy. The role of Sandia National Lab is to help facilitate project activities by contributing and integrating critical technologies, and by providing a neutral participant free of regional territorial or political concerns.

Project results include the inventory and characterization of radiation conditions in the region of the Amudarya and Syrdarya Rivers drainage-basin; a database on the quantity and quality of water and on radiation contamination of individual sections; recommendations on proliferation control and warning on radiation contamination. The data will contribute to future studies related to the Aral Sea problem and to other ecologically unfavorable zones.

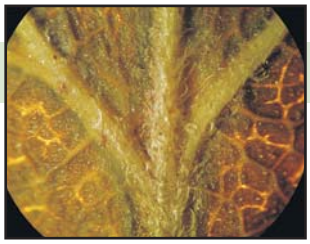
STCU Project Uz-107

A map of the Central Asian region

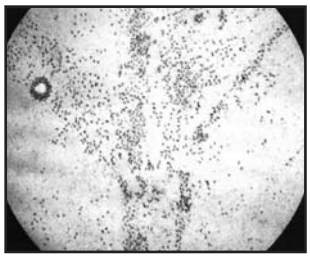
Sampling locations

SITE ASSESSMENT AND REMEDIATION IN UKRAINE

(a)



(b)



(a) fragment of a leaf portraying its veinlets; (b) tracks on the Lausan film corresponding to the veinlets in (a)

Pollution Inventory of Extraction Sites

A team from the Institute of Fundamental Studies in Kyiv has contributed to the prevention of negative ecological impacts from the extraction of mineral resources. Consequences of the extraction of ore, oil (gas), and coal, which are capable of releasing elements into the environment, which are hazardous to human health, were studied. Two groups of hazardous elements were analyzed: (1) radioactive elements and (2) toxic elements. Sites in the Donetsk Basin (coal, ore), Transcarpathia (ore), Kirovograd (ore), and Poltava (oil, gas) were monitored.

Data on the distribution of toxic elements, mercury, antimony, arsenic, cadmium and thallium, in ore, coal, and rocks from coal mines were obtained by means of F-radiography of plant materials. Recommendations on improving the ecological situation for existing dumps near mercury and gold-polymetallic mines were developed.

The accumulation of radioactive radium and uranium on oil and gas drilling equipment was studied while the relevant mathematical models and industrial equipment deactivation methods were developed. Uranium migration in air and ground water was mapped in the Kirovograd region, where uranium open-pit quarries and large waste dumps are located.

STCU Project 1282

The exterior and interior view of a warehouse in the village of Petushki, Cherkasy region

Obsolete Pesticides Management

The disposal of toxic substances and persistent organic pollutants in particular is a part of the transnational environmental safety policies of the US Environmental Protection Agency (EPA). About 500 000 t of obsolete pesticides accumulated in the world are to be treated appropriately. About 20 000 t of them are located in Ukraine.

Under the Cooperative Agreement between the EPA and the STCU, the US EPA proposed a demonstration project that is being carried out at specific sites and serves as a technical model program that is replicable and sustainable. This project is to assess the risks of an obsolete pesticides stock for the environment; to develop a typical model of stock management and obsolete pesticides destructions. Project activities include analytical work, local staff training, cooperation with local authorities in informing the population, and coordination with governmental authorities. Six selected pilot stocks in Ukraine are to be inventoried and cleaned up (re-packing and partial destruction); soil near the stocks is to be remediated.

A joint team including experts from the National Agrarian University, Institute of Organic Chemistry, and Institute for Bioorganic Chemistry and Petrochemistry in Kyiv are conducting the project. Project results will be used by the authorities of the Ministry of Ecology and Natural Resources of Ukraine, Ministry of Agrarian Policy, and local administration boards with the aim of implementation in other regions of Ukraine.

STCU Project P169

Site inventory

Repacking

A plot used in a phyto-regeneration study

SITE ASSESSMENT AND REMEDIATION IN UKRAINE (continued)

Map highlighting the hydrogeological conditions at the Devladivske uranium deposit (Project 3183)

Monitoring of Uranium Mining Sites

The uranium ore mining and milling enterprises in Ukraine are located within some of the most highly-populated areas and on some of the most valuable agricultural lands of the Dnipropetrovsk and Kirovograd regions. Almost 50 years of enterprise operations have resulted in the radioactive contamination of the environment. Now, the Pridniprovsky Chemical Plant, which performed uranium ore reprocessing, has stopped the production of uranium concentrate.

A team from the Pridniprovsky Scientific Center in Dnipropetrovsk estimated the environmental impact of recent uranium production and elaborated recommendations on the decontamination and recultivation of radioactively contaminated territories. The radionuclide content in radioactive waste, underground and surface water, soils, vegetation, and air was measured; migration parameters determined, and a simulation of the further behavior scenario of contaminants was performed for the period of one thousand years.

STCU Project 1160

A team from the Institute of Fundamental Studies in Kyiv is studying the hydrochemical environment of the water producing horizon in the Devladivske uranium deposit in Ukraine. The deposit was mined by the in situ leaching method (ISLM) using the sulfuric acid scheme over many years between 1984-1998. The immediate and long-term prognosis, up to 2030, about the state of underground and surface water and the evolution of the hydrochemical environment is available.

Taking into account that the uranium deposits of the ground oxidizing zonality are found in many countries, including the USA, China, Bulgaria, and Romania, the project results would be useful for the design of an ISLM process among the same type of deposits as well as for the development of environmental protection measures.

STCU Project 3183

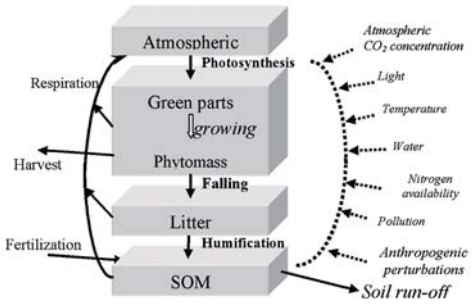
Project participant Dr. Stryamets during an experimental study of forest ecosystem parameters

Greenhouse Gas Inventory

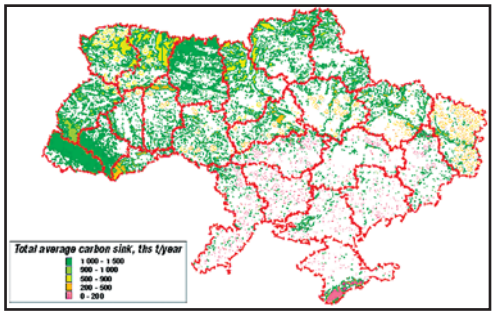
An information technology for the detection and monitoring of the greenhouse gas inventory in Ukraine was developed by the State Scientific and Research Institute of Information Infrastructure in Lviv. Research on the features of the Ukrainian ecosystem and the developed techniques for obtaining the data related to greenhouse gas emissions created the basis for this development as well as the mathematical models of the main ecosystems using the neural network technique.

Databases, software, as well as the tools for interpreting the results are available. Simulation results, prognosis of greenhouse gas emissions, as well as an assessment of the carbon budget were performed for various scenarios of Ukrainian economic development. The features of the carbon budget of the Carpathian region of Ukraine and its role in the European environment is a particular focus.

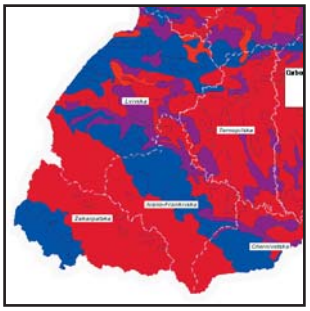
STCU Project 1700



Structural model of the carbon cycle in ecosystems



Carbon absorption by the forests of Ukraine



Organic carbon stock in soils of the Carpathian region

SITE ASSESSMENT AND REMEDIATION IN UKRAINE (continued)

General view of the gasification installation created in Project 651

Dr. Tokarevsky and the laboratory unit for the study of the segregation process used in Project 3029

Chornobyl Waste Processing

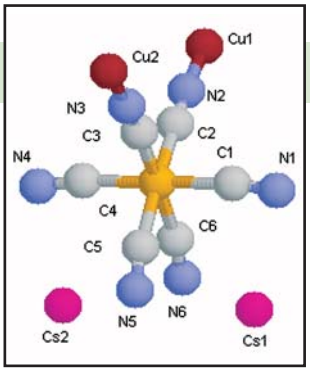
Pyrolytic Processing and Radionuclide Separation is a technology for processing combustible materials contaminated with radionuclides which was developed by the Research Institute of Mechanics of Quick-Proceeding Processes in Kyiv. The developed method of pyrolytic processing is based on the gasification of solid fuels under superadiabatic combustion. Carbon oxide, hydrogen and combustible tars are the by-product of the pyrolysis of the organic components of the initial fuel. Produced powdered radioactive ash is vitrified directly in the gasification zone and then safely buried.

Now, this team is extending the technology of pyrolytic processing and is supplementing it by the function of separation of the radionuclides with a short half-life period of around 30 years, from the radionuclides with a long half-life period of more than 100 years. According to the relevant regulations, the first group of radionuclides (including Sr and Cs) is allowed to be buried in a near-surface shelter for 300 years. The second group (U, Pu, Am) must be buried deeply in geological structures which is a much more costly procedure. During the currently active project, the existing unit for pyrolityc waste processing will be upgraded to include the function of radionuclide separation. It allows for a decrease in the volume of radioactive wastes with a long half-life period before disposal.

STCU Projects 651, 3029

The release of radioactive substances, their re-suspension, and the secondary contamination of the territories in the Chernobyl zone during forest fires were studied by a team from the Ukrainian Institute of Agricultural Radiology in Kyiv. Re-suspension parameters were studied for different forms of radioactive aerosols. The models of radioactive release from the sources distributed on the ground and further migration into the atmosphere were developed. Project results are used for the development of recommendations on forest protection activities in the contaminated territories.

STCU Project 1992



Bonding of radionuclides by modified clays (Project 1706)

Sorption Materials

Selective adsorption of radionuclides and heavy metals from liquid radioactive waste was improved due to the modification of the sorption properties of adsorbents and changes in the acid-alkaline state of treated liquids by the team from the Inter-Agency R&D Center Shelter in Chornobyl and the "Sorbtion" Scientific and Industrial Center in Kyiv.

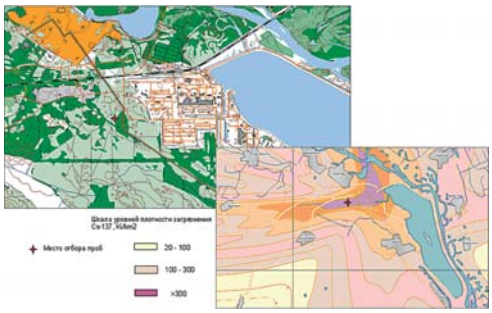
STCU Project 1437

Sorption-barrier materials are being developed by the team from the National University "Lvivska Politechnica", Institute for Condensed Matter Physics in Lviv, and the State Enterprise "Technocentre" in Kyiv. Cheap, effective ferrocyanide sorption-barrier materials are produced from carbonate-containing bentonite clays, which are the waste of industrial manufacturing, in particular obtained from the sulfur open-cast mining at the Yaziv deposit in the Lviv region. Using the developed technology, the sorption properties of initial clays are strongly improved using chemical modification. Ecologically dangerous industrial wastes, aqueous solutions of the Fe(III), Cu(II) chlorides, can be successfully utilized for modifying the bentonite clays. The produced sorption-barrier materials can be used as radioecological protective barriers to prevent the migration of radionuclides into water-bearing layers from contaminated areas.

STCU Project 1706

Sorbing-active composites, in the form of loose powder, combining the advantages of powder and fibrous sorbents are being developed by the team from the Yuzhnoe State Design Office in Dnipropetrovsk. These materials are designed for the localization and neutralization of emergency ejections of chlorine, ammonium, hydrogen fluoride, and inorganic acids.

STCU Project 3322



The 30 km Chornobyl Nuclear Power Plant exclusion zone (Project 1706)

The KPK–1 device used to measure radioactive activity (Project 1706)

Performing sorption purification process in static conditions (Project 1706)

MODELING

Hazardous Flood Risk Reduction

Teams from the Institute of Cybernetics, Institute of Mathematical Machine and System Problems in Kyiv as well as Tbilisi State University in Georgia are jointly developing a prototype computer system for flood risk reduction. This system is to optimize the allocation of investments and insurance coverage in the areas, exposed to the risk of hazardous flooding.

The most widely accepted approach for mitigating floods is the use of reliable flood forecasting systems. In the developed countries, the legislative and economic tools — zoning of economic activities in the flood impacted areas, different rates of insurance in dependence from flood risks — are of great importance. In the newly independent states of the former Soviet Union, including Ukraine and Georgia, insurance-based tools for flood mitigation have yet to be established. The project is creating the background for such tools.

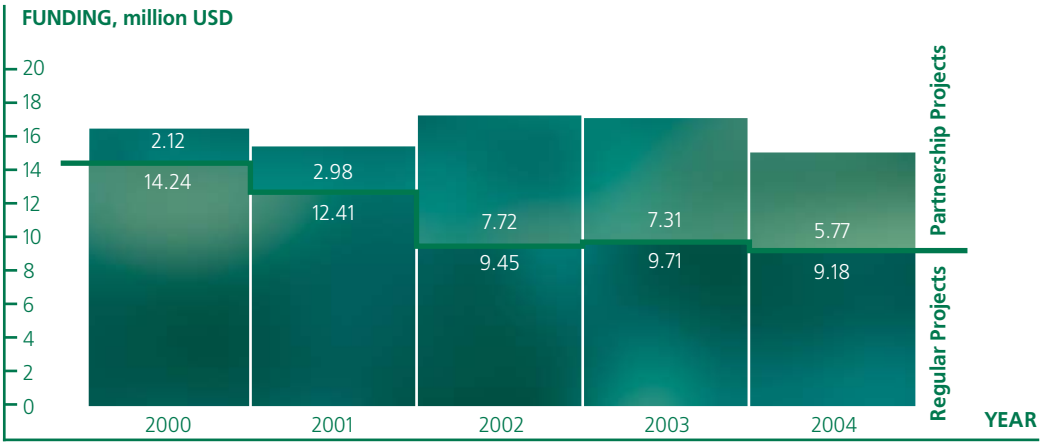
Flood damage assessment is provided on the basis of flood mapping, i.e., definition of the areas inundated by the high floods, taking into account either the definition of the upper boundary of the flood or the assessment of current velocities and the residence time of water remaining on different levels. Insurance decreases profitability, but reduces risks. Selection of a rational plan of investments and insurance coverage is a nontrivial multicriteria stochastic optimization problem. To choose an optimal plan, the developed system presents specific indexes as the surface in the "profit-risk space". Final choice, a trade-off between profit and risk, is left for an investor while the developed system provides the data necessary to make an appropriate choice.

The developed methods and software will be tested on the watersheds of the Ukrainian part of the Tisza River and the Rioni River in Georgia. Regional and national authorities will be provided with the possibilities of mapping hazardous floods, promoting future investment activities, and the development of an insurance coverage system. Upon successful testing the system will be applicable in other regions exposed to the risk of hazardous flooding.

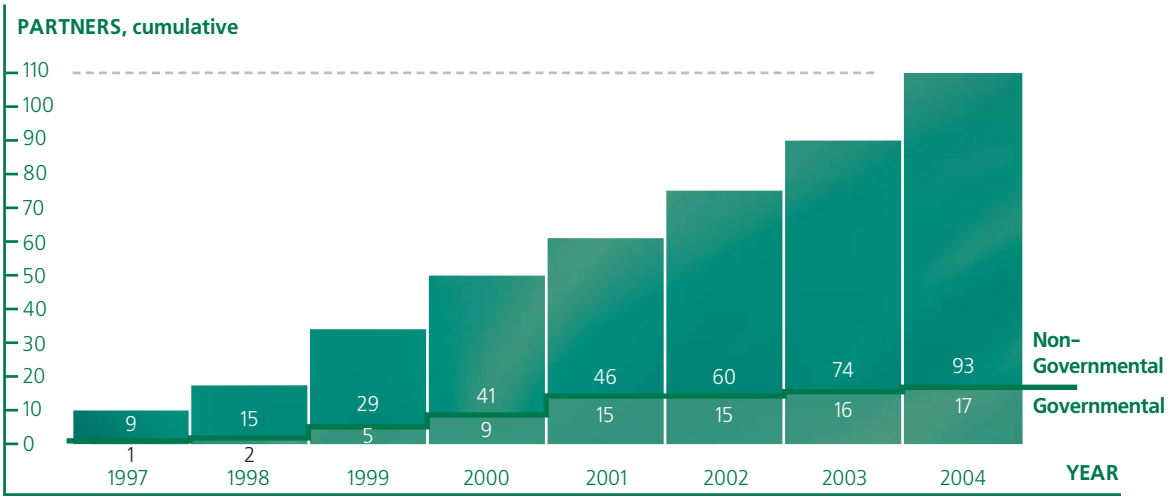
STCU Project 3127

STCU FINANCIAL ACTIVITY

STCU Project Activity, 2000–2004



STCU Partners, 1997–2004



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