Science and Technology in Support of U.S. Policy in Central Asia

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November, 2003
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This work was performed under the auspices of the U. S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

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Science and Technology in Support of U.S. Policy in Central Asia

Proceedings from the February 2003 Workshop
Washington, DC

Edited by
Elizabeth J. Kirk, Gene DeLaTorre, Nina D. Rosenberg, and Richard B. Knapp
Preface

The current war with Iraq, international interventions in Afghanistan, and the continuous and seemingly insolvable problems in the Middle East emphasize the importance of supporting stable, healthy countries throughout the Middle East and South and Central Asia. The political alliances and foreign aid promulgated by the Cold War have been seriously strained, creating a more uncertain and unstable international environment. We must stay engaged with this part of the world. New partnerships must be forged.

Central Asia represents a mix of political systems – from totalitarian rule to nascent democracy; of economic resources from natural to human; and of cultures from ancient to modern – making it of strategic importance to U.S. national and economic security. The U.S. must remain committed and proactively engaged in the region to promote open and democratic societies attractive to outside investment and to prevent the proliferation of weapons of mass destruction and extremist groups. The U.S is admired for its science and technology and its flexibility in innovation and applying S&T to solve problems. The inherent value that S&T can contribute to advancing U.S. policy goals is the underlying assumption of this report.

Science and technology and their applications have much to contribute to social, economic, and environmental sustainability and, therefore, provide a strong foundation for helping the U.S. to implement its policies abroad. The application of concepts such as competition and peer review, open sharing of scientific information through the use of the internet and other information technologies, and the development of international scientific collaborations and networks, can make major contributions to healthy and stable societies in Central Asia. U.S. scientific and technical know-how has much to contribute to U.S. policy goals and easing regional tensions. Science and technology truly can build bridges between nations and cultures while serving the societies in them.

The editors
April 10, 2003
Table of Contents

Executive Summary .................................................................................................................................. 1
  The Strategic Importance of Central Asia .......................................................................................... 1
  U.S. Central Asia Policy Issues ........................................................................................................... 1
  Recommendations ............................................................................................................................. 2
  Prototypical Scenarios ...................................................................................................................... 4
  Next Steps ......................................................................................................................................... 4

Introduction .......................................................................................................................................... 5
  U.S. Central Asian Policy .................................................................................................................... 5
  Potential Role of Science and Technology ......................................................................................... 6
  Workshop Objectives and Structure .................................................................................................... 7

Working Group Reports ...................................................................................................................... 8
  Cross-cutting Recommendations ........................................................................................................ 8
  Agriculture ........................................................................................................................................ 8
  Basic Research and Education ........................................................................................................... 10
  Health and Biotechnology .................................................................................................................. 12
  Natural Hazards and Emergency Response .................................................................................... 14
  Resource Management: Water, Energy, and Ecology ..................................................................... 15
  Security and Soviet Legacy ............................................................................................................... 16

Prototypical S&T Scenarios ................................................................................................................ 18
  Scenario I: Establishing Earthquake Safe Schools — An Integrated S&T Approach to Education and Research ......................................................................................................................... 18
  Scenario II: Economic Development and the Market Economy ...................................................... 22
  Scenario III: Mainstreaming Weapons Complexes and Personnel .................................................. 24

Summary ............................................................................................................................................. 26

Appendix 1: Workshop Program ....................................................................................................... 27

Appendix 2: Workshop Attendees ..................................................................................................... 28
Science and Technology in Support of U.S. Policy in Central Asia: 
Executive Summary

On February 6, 2003, a workshop, cosponsored by the American Association for the Advancement of Science (AAAS) and the Center for Global Security Research (CGSR), was held to explore the linkage between U.S. policy in Central Asia and science and technology (S&T). This workshop builds on the foundation set by a November 2002 roundtable, hosted by the Brookings Institution, where representatives from the Departments of State and Defense and from the National Security Council discussed U.S. policy in Central Asia. The AAAS/CGSR workshop successfully addressed its objectives through the participation of 54 policy and S&T experts, representing 36 organizations from government agencies and non-governmental organizations (NGOs), including the private sector and academia. These participants and their organizations represent a significant and broad based capability and expertise that is available to policymakers in addressing U.S. security and development concerns in Central Asia. A major outcome of the workshop is the identification of potential S&T initiatives that support U.S. policy goals for Central Asia.

The AAAS/CGSR workshop, and the Brookings Institution workshop that preceded it, are first steps in developing coordinated strategies that better define the roles that S&T can play in supporting U.S. policies in Central Asia. The major emphasis has been to identify specific high-impact activities that also provide the infrastructure for long-term political, economic, and social stability in the region. Potentially, S&T is a powerful policy tool in Central Asia. The Soviet era S&T system remains but is deteriorating, and, yet, technically trained professionals continue to have great influence in politics and society. The strengthening of S&T infrastructures and supporting international partnerships in this region can go a long way towards serving societal needs and promoting political and economic development. Good governance, transparency, and public/private partnership serve, and are served by, S&T programs promoting the well-being of Central Asian peoples.

The Strategic Importance of Central Asia

Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) represents a mix of political systems – from totalitarian rule to nascent democracy; of economic resources from natural to human; and of cultures from ancient to modern – making it of strategic importance to U. S. national and economic security. The U.S. must remain committed and proactively engaged in the region to promote open and democratic societies attractive to outside investment and to prevent the proliferation of weapons of mass destruction and extremist groups.

U.S. Central Asia Policy Issues

Ambassador Lynn Pascoe (Deputy Assistant Secretary of State for European and Eurasian Affairs) and Dr. Norman Neureiter (Science and Technology Advisor to the Secretary of State) opened the workshop and addressed the strategic importance of Central Asia, the major U.S. policy concerns, and the potential contributions of S&T. The policy issues listed below were supplied to workshop participants as a basis for discussion.
Security - Political instabilities can lead to conflicts in the region involving militant Islamic factions, proliferation of weapons of mass destruction (WMD), civil war or interstate conflict, and denial of access to Caspian Sea energy resources.

Economic Development - There is a lack of economic growth, over-reliance on extraction industries, and high levels of poverty and unemployment.

Political Development - There is a lack of ways that citizens can express disagreement through the political process or the media. Excessive power is located in the Executive, and there is a lack of rule of law.

Social Development - Declining health care and educational infrastructures, environmental degradation, crime and corruption, drug abuse, HIV/AIDS all have a severe social impact.

Isolation - Central Asia’s geographical remoteness is reinforced by a lack of technical and financial resources to overcome it. Hence, it is isolated from global information flows and the global economy.

Intraregional Tension - The five Central Asian States have difficulties maintaining relationships with one another in order to cooperatively address regional problems such as transboundary water resources, border protection and disputes, and law enforcement.

Science and technology can play a vital role in achieving U.S. policy goals by providing the bridge-building and infrastructure needed for stimulating regional development and fostering stability. S&T can provide solutions to local problems, solutions that are devoid of any ethnic, ideological, or religious bias.

Recommendations

Breakout sessions followed the policy presentations to explore the S&T – policy linkage in six critical thematic areas: agriculture, basic research and education, health and biotechnology, resource management, natural hazards and emergency response, and security and the Soviet legacy. Summaries of the breakout session discussions were presented to an Executive Panel for consideration and comment.

Workshop recommendations from the Executive Panel and Working Groups fall into two categories. The first are broad in scope, cut across all areas, and are germane to integrated development. The second are specifically focused S&T oriented initiatives that also have the potential for broader impact once successfully implemented. The most action-oriented ones are presented here. A complete list is found in the body of the report.

Cross-Cutting Recommendations

- Assure that S&T initiatives are developed and executed with the leadership and participation of Central Asian regional experts and institutions.
- Establish a U.S. S&T review team in the region to work with regional/national leaders to help prioritize and direct U.S. efforts and also consult with other international agency representatives. The State Department regional offices, S&T staff in embassies, and NGOs should be involved.
- Establish an interagency panel in the U.S. to coordinate strategic planning and programs. Include NGO representatives on this panel.
• Establish regional S&T centers focusing in the following areas: natural resource management (water and energy); ecology; agriculture; seismology; and economic development. Use these centers to foster capacity building via programs of institutional exchanges, training, and information sharing among scientists and their institutions in the region and their counterparts in the U.S.

• Promote the concepts of competitiveness and peer review in all aspects of S&T activities. These concepts promote social and political development and standards of excellence which attract both domestic and foreign investments.

• Improve the telecommunications infrastructure to provide access to global information systems. This is essential for integration with the global S&T community.

Agriculture

• Develop a Regional Agricultural Research Center. This would be used to develop local and regional S&T programs for scientific research, training, and exchanges. It would also support professional associations and conferences thereby increasing human resource development in agriculture on a regional basis.

• Assess current agricultural practices for economic (marketability) and environmental sustainability.

• Develop agricultural extension service systems appropriate for the needs of the region.

Basic Research and Education

• Develop science literacy at all levels of education by strengthening locally based science curriculums in secular schools for a healthy education system.

• Integrate universities and research institutes to promote science-based education and research interests at primary, secondary, and higher educational levels.

• Develop programs that promote women’s science education and career development.

• Develop indigenous capabilities in social sciences in such areas as socio-metrics, economic development, conflict resolution, etc.

Health and Biotechnology

• Establish international research collaborations with scientists on human and animal diseases endemic to their region, taking advantage of the grant programs now available to foreign scientists through the National Institutes of Health, the Human Frontier Science Program, and other bodies.

• Establish public-private partnerships for developing vaccines and other pharmaceuticals. Encourage an economic climate that attracts foreign investment by working to promote the protection of intellectual property rights, integrity and transparency in developing technology transfer, and commercialization potentials, and other means.

• Support training for younger scientists in research and health care delivery and education with a focus on disease prevention and healthy lifestyle promotion.
Natural Hazards and Emergency Response

- Establish a Regional Seismology Research Center and collaboration network in Central Asia that builds on past and current programs and is a showcase for seismic monitoring, hazard assessment, engineering, education, standardization, and emergency response. Consider including cooperation on projects with Russia and the Caucasus.
- Focus primarily on primary schools to begin seismic vulnerability analysis and rebuilding or retrofiting these to survive earthquakes and protect inhabitants.
- Develop emergency response measures that can cover both natural (earthquake) and man-made (oil spills) disasters.

Resource Management: Water, Energy and Ecology

- Establish regional centers of water, energy, and ecology that focus on relevant research and policy issues. Use these centers as focal points for international scientific collaborations. Build on existing projects (e.g., NATO study on resource availability) and regional knowledge and desires. Include local S&T expertise in project design and needs identification. Use the centers as a venue for science/policy interfaces on trans-boundary water, energy, and environmental issues.

Security and Soviet Legacy

- Apply the technical expertise and equipment used to monitor and secure WMD materials to cross-border trafficking in WMD, drugs, women, terrorists, conventional weapons, and other illicit activity. Promote regional production of technical monitoring equipment to alleviate problems with corrupt border guards and improve the economy.
- Integrate WMD experts more fully into civilian research and teaching at universities to solve related problems – vaccine development, safe pesticides, environmental remediation, etc.
- Enhance environmental security of existing oil and gas resources in the region.

Prototypical Scenarios

Taking these recommendations into account, the editors developed three prototypical scenarios which integrate the results of the workshop into models for actions in three arenas – seismology, technology transfer and economic development, and weapons facilities and scientists. These can be found in the body of the report and serve to stimulate developments of further scenarios that integrate the S&T recommendations with U.S. policy goals.

Next Steps

It is the intent of the workshop organizers to continue the dialogue among contributors to the U.S. Central Asia policy community, decision-makers, and the U.S. S&T enterprise to formulate an S&T response to the policy goals. The first step will be to identify programs, objectives, and activities of U.S. and non-U.S (bilateral and multilateral) activities in the region and consult with their respective leadership to avoid duplication. The second step is to begin to actively engage regional representatives in the dialogue on how S&T can enhance US policy interests in the region.

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Introduction

The strategic importance of Central Asia became apparent after the events of 11 September 2001. Central Asia shares borders with Afghanistan, Iran, Pakistan, Russia, and China and quickly became our ally in the war on terrorism. But the region remains a nexus through which weapons of mass destruction (WMD), drugs, and illicit arms can flow. In addition, Central Asia has large oil reserves but they are landlocked and their transportation to the world market is complicated. Finally, these emerging states have weak economies, have difficulties sustaining mutually beneficial relationships with each other, and share, to varying degrees, internal instability.

U.S. Central Asian Policy

In response to this changed perspective on Central Asia, the Brookings Institution sponsored a roundtable in November 2002 that featured a panel of policy-makers from the Department of State, the Department of Defense, and the National Security Council. The panel provided an overview of the changes in United States policy toward Central Asia and of recent developments in the region. The U.S. has been active in the region — in terms of foreign aid, military-to-military engagement programs, and energy resource development — since 1992. However, after September 11th, it became clear that there was a security vacuum in the region that posed a serious threat to U.S. national interests and had to be addressed directly. Consequently, security issues have taken priority in U.S. policy approaches toward the region, but the U.S. is still very much concerned with interrelated factors of accelerating economic growth, fostering political development, and facilitating international integration in Central Asia.

Security
The Problem: Political instabilities can lead to conflicts in the region involving militant Islamic factions, proliferation of weapons of mass destruction, civil war or interstate conflict, and denial of access to Caspian Sea energy resources.
U.S. Policy Approach: U.S. commitment to help the region undertake defense reform leading to smaller, more mobile, and more integrated force structures. Major role would be to provide a first line of defense against proliferation of WMD and reduce illicit drug trafficking through Central Asia.

Economic Development
The Problem: There is a lack of economic growth, an over-reliance on extraction industries, and high levels of poverty and unemployment.
U.S. Policy Approach: A market-based economy can be developed by supporting macro- and micro-economic reforms, small business growth, community-level projects that create employment, and economic hope.

Political Development
The Problem: There is a lack of ways that citizens can express disagreement through the political process or the media. Excessive power is located in the Executive, and there is a lack of rule of law.
U.S. Policy Approach: Democratic institutions and grassroots organizations need to be strengthened to enhance the role of NGOs, an open press, and legislative structures.
Social Development
The Problem: Declining health care and educational infrastructures, environmental degradation, crime and corruption, drug abuse, HIV/AIDS all have a severe social impact.
U.S. Policy Approach: Repair the social infrastructure through humanitarian medical assistance, training, health care reform, environmental remediation, and improved resource management.

Isolation
The Problem: Central Asia’s geographical remoteness is reinforced by a lack of technical and financial resources to overcome it. Hence, it is isolated from global information flows and the global economy.
U.S. Policy Approach: Reduce the isolation through exchanges, training programs in the US, and development and use of the internet and other information technologies.

Intraregional Tension
The Problem: The five Central Asian States are unable to maintain relationships with one another in order to cooperatively address regional problems such as transboundary water resources, border protection and disputes, and law enforcement.
U.S. Policy Approach: Contribute to many of the assistance oriented approaches listed above that would help to decrease poverty and thereby decrease group tensions across borders.

The primary objective of U.S. policy in the region is long-term stability, but this will not be achievable without significant internal reform in each of the five Central Asian republics. As a result, the United States is pursuing its policy objectives in Central Asia through a combination of diplomacy, relationship building, and foreign assistance.

Potential Role of Science and Technology
The Soviet legacy of emphasizing science and technology may offer one way to achieve these policy issues. Central Asia shared in the advanced level of Soviet S&T and still has the basic S&T infrastructure required for a modern economy. However, the infrastructure is in a state of decay because of insufficient funding, a lack of ingenuity on its utilization, and a deterioration of the supporting educational system that produced highly trained scientists and engineers. Despite this, scientists and engineers still have great influence at high levels of government and society throughout the region. Moreover, there is a common recognition that solutions to many of the problems that beset Central Asia have a technical component to them.

The utilization of science and technology as a policy tool in the moderate Islamic states of Central Asia may also offer opportunities in the greater Islamic world. A recent poll (Zogby International, The Ten Nation Impressions of America Poll, April 2002) emphasizes the overwhelmingly high regard Arab and other Muslim countries have for U.S. science and technology. This level of prestige and the benign impact of S&T activities could become additional means of achieving policy goals at a much larger scale. S&T could be a particularly effective engagement tool in countries such as Syria and Iran.

While U.S. policy continues to emphasize regional stability, the development of a civil society, rule of law, and economic development based on market principles, many of the issues underlying these goals have important S&T components. Economic development demands a healthy labor force and environment in which to live, work, and invest. Market economies based on current extraction and agricultural industries need to be reformed and modernized along with the development of other industries based on modern technologies that will attract foreign and domestic investments.
**Workshop Objectives and Structure**

It is with this foundation that the AAAS/CGSR workshop was conducted with two main objectives:

- explore the linkage between U.S. policy in Central Asia and science and technology (S&T), and
- develop the role of S&T in achieving U.S. security and development objectives in the region.

To achieve these objectives, the workshop established a dialogue among the 53 policy and S&T experts, who represent 36 organizations from government and non-government entities (NGOs), including the private sector and academia. These S&T representatives and organizations form a significant and broad based capability and expertise that is available to the policy decision-makers addressing U.S. security and development concerns in the Central Asia region.

Six major S&T arenas of particular importance in Central Asia were identified and formed into working groups: agriculture, basic research and education, health and biotechnology, resource management, natural hazards and emergency response, and security and Soviet legacy issues. Each working group explored how specific activities in their particular S&T arena would support and promote to each of the six U.S. Central Asia policy objectives. The emphasis was on thinking from the policy perspective. The results of these discussions and the reactions and comments from members of the Executive Panel that orally reviewed these results are summarized in the following sections.

The editors then took the recommendations and developed three prototypical scenarios for assistance and cooperative projects in the areas of seismology, economic development, and weapons facilities and scientists. These can be used to stimulate further thinking in developing S&T responses to U.S. policy goals.
Working Group Reports

These reports describe in greater detail the specific working group discussions and the recommendations from the working groups and comments made by Executive Panel members. The cross-cutting recommendations are those mentioned in several working groups.

Cross-cutting Recommendations

- Assure that S&T initiatives are developed and executed with the leadership and participation of Central Asian regional experts and institutions.
- Establish a U.S. S&T review team in the region to work with regional/national leaders to help prioritize and direct U.S. efforts, identify existing information and data in U.S. agencies that can be shared, and also consult with other international agency representatives. The State Department regional offices, S&T staff in embassies, and NGOs should be involved.
- Establish an interagency panel in the U.S. to coordinate strategic planning and programs. Include NGO representatives on this panel.
- Establish regional S&T centers, each focusing on the following areas: natural resource management (water and energy); ecology; agriculture; seismology; and economic development. Use these centers to foster capacity building via programs of institutional exchanges, training, community based research, and information sharing among scientists and their institutions in the region and their counterparts in the U.S.
- Promote the concepts of competitiveness and peer review in all aspects of S&T activities.
- Improve the telecommunications infrastructure to provide access to global information systems. This is essential for integration with the global S&T community.
- Build and support S&T-based NGOs to bridge the S&T-policy gap and promote civil involvement.
- Incorporate the commercial sector into S&T endeavors.
- Develop the mechanism and the supporting legal structure for establishing intellectual property rights and technology transfers. This may be a precondition for investments by the global community.
- Innovation systems, including those related to S&T, play a key role in the economy. Promote the local development of innovation systems wherever possible.

Agriculture

Background

Agriculture was selected as a workshop thematic area because of its key role in the region. From the Soviet era and before, Central Asia has been the breadbasket and primary source of cotton for Eurasia. This strong agricultural tradition permeates many aspects of life throughout the region. It impacts the economy and the sociopolitical values while reducing its geographic isolation through product exports. Agriculture has direct impact on intra-regional tensions and regional security through its massive use of the region’s scarce water resources for irrigation. This has amplified friction between upstream water-suppliers and downstream water-users.

Agriculture is an ideal medium to blend science and technology into U.S. Central Asia policy objectives. In the following discussion, the results of the working group exchanges on the explicit link between S&T and policy are presented and include some specific recommendations for potential endeavors in the agricultural arena. The primary policy issues are regional security,
economic growth, political and social development, intra-regional tensions, and geographic isolation.

Discussion

Agriculture provides the mainstay for economic stability and food security in Central Asia. Therefore, sustainable agriculture is a critical factor in maintaining the overall security of the region. However, the breakup of the Soviet Union has resulted in disparate agricultural systems that are heavily reliant on irrigation, lacking in crop diversification, and not linked to market-driven agricultural economies. This precarious situation is in critical need of reform – including the policy and science and technology spheres.

S&T has considerable potential for contributions to improve the agricultural stability of the region, including reversing the “brain drain” through training, exchanges, and research collaborations; developing market-based agricultural capabilities; and developing market-driven agricultural research and applications.

Transforming the Central Asia agricultural system to a market-based/market-driven system is critical to sustaining the region and encouraging overall economic stability and growth. There is tremendous growth potential for the region, however, policy reform at the local, national, and regional levels is greatly needed along with restoration and improvement of the agricultural S&T infrastructure and with development of human resources in order to fulfill that potential.

Agriculture is woven throughout the social structure of the region from the ubiquitous backyard garden to the remnants of the large cooperative farms. There are a number of critical issues to be addressed, including land ownership and reforms, the impact of intensive, irrigated agriculture on the environment, and the opportunities for jobs in the agricultural sector. In addition, S&T could contribute to social development through the revitalization of agricultural training, collaborative research, human resource development, and capacity building.

Sustainable agriculture could improve intra-regional tensions through improved trade, diversification of products, and developing complementary niche markets for outlets in surrounding countries. The water resource sector, upon which Central Asian agriculture is dependent, is an area of tension that could benefit from S&T through collaborative research and resource management. The Fergana Valley, shared by three Central Asia countries is a key area where a wide variety of S&T applied research collaborations, exchanges, and capacity building could result in confidence building and improved relations.

Agriculture is an excellent vehicle through which international and cross-border exchanges, scientific collaborations, training programs in the US on such topics as effective irrigation techniques and applications of fertilizers and pesticides, and the development and use of the internet and other telecommunications technologies could be applied. Establishing agricultural exchanges could result in noticeable improvements in indigenous capabilities, human resources, trade, and economic stability within the region and awareness and understanding of Central Asia’s capabilities outside of the region.

Recommendations

- Develop a Regional Agricultural Research Center. This would be used to develop local and regional S&T programs for scientific research, training, and exchanges. It would also support professional associations and conferences thereby increasing human resource development in agriculture on a regional basis.

- Assess current agricultural practices for economic (marketability) and environmental sustainability.
• Develop agricultural extension service systems appropriate for the needs of the region
• Promote and develop a market-driven agricultural system.
• Diversify crops and include high-value, water-conserving, niche crops such as organic and horticultural products.
• Stabilize and restore the agricultural research sectors, including forestry and range-land research and economic analysis.
• Investigate the use of biotechnology research and development, applicable for the region.
• Provide agricultural representation and participation in S&T steering committees and consultative groups. Include existing entities such as the International Center for Research in the Dry Areas (ICARDA) in Tashkent.

Basic Research and Education

Background

Central Asia has a rich history of S&T research and a highly educated public, including a significant number of weapons scientists. This structure is weakening, and there is both internal and external brain drain in science and engineering. It is up to the region and individual countries to decide the direction S&T should take to develop a science and education infrastructure that promotes economic development and political stability.

Discussion:

Education. There is a role for S&T in education and education in S&T. Efforts should be made to assure quality science, mathematics, and engineering education at all levels. A strong foundation in science literacy that encourages critical thinking and an understanding of the scientific method can provide a basis for countering extremist ideologies and partisan interests. It can also create the internal capacity required for solving health, agriculture, environmental, natural resource management, and natural disaster problems facing the region. Primary, secondary, and tertiary systems all need to be strengthened to assure a steady flow of teachers, practitioners, and researchers in the future. Locally driven curricula that address the needs of the region could help to create bridges in such areas as earthquake research, water use and management, resource extraction, and sustainable agriculture.

Research. Research capacity could be strengthened by promoting international research collaborations. This is achieved by encouraging regionally based research involving scientists from both inside and outside the region. Much of this work can be accomplished under existing U.S. government programs using a model that promotes international partnerships, competition, and the integration of research institutes with universities. The Central Asia mapping project at the U.S. Environmental Protection Agency and the IRIS seismology project provide models on which to develop future projects. Selection of research projects based on competition and peer review should be promoted. Peer review process promotes democratic principles as well as scientific excellence.
International Security. Cooperative research and development programs enhance regional and international security by:

- continuing arms control and non-proliferation goals through university research on materials control and border security; promoting the area of conflict resolution studies to ease intraregional tensions and promote equitable law enforcement;
- providing access to valuable sources of information readily available in the West regarding current materials control regimes, international peacekeeping efforts, and clean-up methods; and
- promoting the openness of information to reflect international viewpoints especially in areas such as non-proliferation of weapons of mass destruction. Research agendas need to be established to direct human and other resources toward the most pressing issues. In this vein some fundamental assumptions need to be questioned. For example, should research and development projects focus on making water distribution more efficient for irrigation or should they be directed toward agricultural products and other industries more suitable to the environment (e.g. not heavily dependent on irrigation)?

Finally, research projects should be undertaken which have high impact for a small investment. The problems associated with the Aral Sea are vast and their resolutions very expensive. It will take a very long, expensive, and concerted international effort to resolve them. US initial investments in research should focus on smaller, more doable areas that will have a positive impact on the population in a short period of time, while international efforts deal with the larger problems over the long term.

Economic Development. The education and basic research communities can contribute to economic development by providing the skilled indigenous labor force necessary for its basic needs in areas like geology, engineering, resource management, etc. It also needs to develop further capacities in innovation, economics, psychology, and other social science arenas to develop a cultural outlook that fosters a market-based economy and transparency, and makes the region attractive to domestic and foreign investment.

Political Development. The development of and support for indigenous non-governmental scientific societies, NGOs, and other open, civilian, science-based groups add to the pluralism needed to promote an open and democratic society. One place to begin might be an alumni association for scientists who have studied in the West. Granting based on peer review and competition, and which promote international collaboration provide an independent S&T community with access to and contributions to the body of international research and literature while instilling a sense of the democratic process. Agencies like NSF and NIH can provide training in proposal writing, peer review, project management, and general writing. U.S. NGOs can help to build and promote non-governmental associations in the region. The same can be said for educational associations from teachers to PTAs. Community-based research projects also provide the bases for creating constituents for promoting environment, health, economic, and human development policies. A basic education is a corner-stone of any democracy.

Social Development. Both the educational and research communities could be used to support the education and advancement of women. Access to and use of socio-metric analyses like the Index of Human Development by the United Nation Development Program can help to prioritize social development goals and the approaches to achieve them. Again, indigenous social scientists are needed to help promote research and the S&T-policy interface in these areas.
Isolation. The development of communications networks in schools and universities with internet access will do much to alleviate the isolation of the science and education communities. These networks can be used to promote cooperative research projects on common problems such as earthquakes and water resource management. S&T meetings can be convened in these countries and data and findings can be shared. Regional centers (e.g. on water, energy, and seismology) can all be used as bridge-building efforts among Central Asian states and with the global scientific community.

Recommendations:
- Develop science literacy at all levels of education by strengthening science-based learning modules in secular schools.
- Integrate universities and research institutes to promote science-based education and research interests at primary, secondary, and higher educational levels.
- Develop programs that promote women’s science education and career development.
- Develop indigenous capabilities in social sciences in such areas as socio-metrics, economic development, conflict resolution, etc.
- Promote competition and excellence through peer-review of grants and journals. Help to establish science funding agencies based on peer-review.
- Promote non-governmental S&T institutions.
- Hold international scientific meetings on relevant topics and rotate these among cities in the region.
- Provide internet access and promote use of global information networks and databases.

Health and Biotechnology

Background

Over the past decade, the international community has increasingly challenged the dogmatic view that increased wealth leads to increased health of populations. Today, we understand that investments in the health of individuals and communities lead to more productive workforces as well as political and social stability. In Central Asia, there are a number of major health challenges that, when effectively addressed, would strengthen economic and political stability and improve the quality of life of its people.

While the overall rate of HIV/AIDS is relatively low, Central Asian states have some of the highest rates of increase in cases in the world. In addition, tuberculosis, in particular multi-drug resistant strains, is an increasing problem often associated with prison populations. Cheap low-grade heroin is readily available, and the countries have a significant and increasing drug abuse problem, exacerbating the spread of both HIV and TB.

Environmental contamination as a result of the weapons facilities and land-use strategies during the Soviet era poses significant health problems throughout the region, particularly for children. Access to clean water and remediation of contaminated soil are two areas of particular concern. These issues, coupled with high tobacco use and a deteriorating health care system, have resulted in decreased life expectancy and increased infant mortality rates.

The entire region has a high literacy rate and a good scientific knowledge base, which is a positive consequence of the Soviet legacy. There are a number of academies and former Soviet bio-weapons laboratories in the region. While there are experts in all areas of science and health within the region, strengths in mathematical sciences, biophysics and other social sciences are noteworthy. Thus, basic knowledge is good. However, schools, training, and research
academies have all suffered from a decade of few or no new resources. Equipment is out of date and in many cases in need of significant maintenance. Knowledge of cutting edge techniques is being lost.

**Discussion**

From the foreign policy and international security points of view, much can be done to develop cooperative international projects with former bio-weapons scientists to support new work in areas of health and biotechnology. This would engage them in civilian research and education sectors and help revitalize the scientific infrastructure that would benefit the Central Asian States in the long-term. Helping the States to develop profit-making enterprises in biotechnology would also help develop a more diverse local economy, where applicable.

Increased attention should also be brought to bear by Ministers of Finance and Ministers of Development on health and health research issues. The West cannot shoulder the burden of support fully for revitalizing the Central Asian health research and health care delivery base; tough decisions should be made by appropriate officials in the region, including consideration of health research and delivery in loan applications to international lending agencies.

More should also be done to encourage young scientists to stay in their fields and the region by promoting international research and education projects which train scientists on cutting edge research using modern technologies and equipment. These young scientists should be brought fully into the global scientific community and appreciate the shared values that constitute what has been coined the “global culture of science.” Such values include shared understanding of international norms concerning ethical issues in human subjects research, strong peer-review of research proposals as opposed to politically driven support for projects, overcoming isolation of scientists through the use of modern information technologies, and the open sharing of research data, information and tools.

**Recommendations:**

- Establish international research collaborations with scientists on human and animal diseases endemic to their region, taking advantage of the grant programs now available to foreign scientists through the National Institutes of Health, the Human Frontier Science Program and other bodies.
- Establish public-private partnerships for developing vaccines and other pharmaceuticals. Encourage economic climate to attract private investment by working to promote the protection of intellectual property rights, integrity and transparency in developing technology transfer, commercialization potentials and other means.
- Support training for younger scientists in research and health care delivery and education, with a focus on disease prevention and healthy lifestyle promotion.
- Strengthen local expertise in key biotechnologies that would lead toward the development of new generation vaccines of import to the region and perhaps globally, for example plague.
- Identify health topics of regional interest, and topics of interest involving key partners such as China and Russia, and organize forums to consider multilateral and bilateral efforts as appropriate to tackle shared concerns.
- Establish networks of scientists in the region to share resources, expertise and experiences.
• Build international partnerships on strengths of the region, including in the fields of biophysics and mathematics.
• Encourage the U.S. Department of State and its embassies to articulate with their counterparts in the diplomatic community, including those in Ministries of Finance, Health, and Development, the priority on health research and health delivery as key to improving economic and social stability.
• Support programs promoting access of scientific information, including the internet and journals.
• Overcome isolation of the scientists in the region by establishment of networks, including potentially alumni networks of young scientists who have trained in Western Europe or in the United States.
• Encourage through all appropriate mechanisms inclusion of support for health research facilities and delivery systems as part of favorable international lending programs.

Natural Hazards and Emergency Response

Background

Much of Central Asia, including most of its major cities, lies in active seismic zones with an earthquake hazard that is far greater than that in the US. Earthquakes have already struck in major regions throughout the last century with severe damage to buildings, transportation structures, pipelines for oil and water, and other infrastructures. One Soviet legacy is inadequate building construction – especially housing units and schools – that contributes to vulnerability. Mitigating earthquake hazards is a regional problem that requires cooperation and standardization as seismic activity knows no political boundaries.

The secondary results of seismic activities include landslides which in turn cause additional damage to dams and other large structures. Landslides are also common in the mountainous areas during the snowmelt and rainy seasons. Health problems also are exacerbated by natural catastrophes.

There are man-made hazards such as oil-spills and Vozrozhdeniye Island — now a peninsula — where many tons of biological warfare agents are buried, which can result in incidents requiring emergency response.

Discussion

Science and technology provide an important basis on many levels for being able to respond to natural hazards. The first is the contribution that regional and international cooperation in seismic research can make to openness, transparency, and regional confidence-building. Sharing new instrumentation, data, and educational opportunities can build the trust needed for regional cooperation to emergency response and natural hazards. Similar approaches in the Middle East and South Asia have proven to be successful.

Economic development plans should include the construction of future municipal infrastructures that can survive earthquakes. Property rights, insurance, and other issues to protect citizens are also associated with natural hazards issues. Inability to respond to an emergency can also contribute to political unrest and instability. Thus, developing a sturdy physical infrastructure and emergency response measures contribute in many ways to social development. Emergency response is a good means to involve military forces in a positive way and to build regional cooperation networks The U.S. military Central Command (CENTCOM) is currently emphasizing this as one of their main means to engage Central Asia.
From an educational standpoint, regional research programs involving young scientists help to keep scientists in their fields, in their countries, and engaged the building of their nation. Modern instrumentation and monitoring techniques, regional data collection and management, interactions between universities, academy institutes, and government agencies, and international programs will all add to an investment in a future scientific infrastructure in a very salient area for Central Asia.

**Recommendations:**

- Establish a Regional Seismology Research Center and collaboration network in Central Asia that builds on past and current programs and is a showcase for seismic monitoring, hazard assessment, engineering, education, standardization, and emergency response. Consider including cooperation on projects with Russia and the Caucasus.
- Focus primarily on primary schools to begin seismic vulnerability analysis and rebuilding or retrofitting these to survive earthquakes and protect inhabitants.
- Develop emergency response measures that can cover both natural (earthquake) and man-made (oil spills) disasters.
- Identify common seismic problems and promote regional planning for seismology research, technology applications, and emergency response.
- Provide the telecommunications, science education, scientific instrumentation, standardization, and emergency response infrastructures needed to promote regional seismic planning requirements.

**Resource Management: Water, Energy, and Ecology**

**Background**

Historically, natural resources have been an important economic and political force in Central Asia, which has mineral and fossil fuel resources that are in high global demand. Central Asia is also ecologically diverse. This semiarid to arid region spans glacial mountain ranges, fertile steppes, and barren deserts. Water from seasonally melting glaciers connects terrain, people, and their destiny.

However, competition for water is increasing in Central Asia at an alarming rate, adding tension to an already uneasy region. Agriculture is the mainstay of the region’s economy, and crops such as cotton and rice require intensive irrigation. Water use has increased rapidly since the Central Asian states became independent in 1991 and is now at an unsustainable level. Irrigation systems have decayed so severely that half of all water never reaches crops, and several years of drought have cut available water by 20% even as demand continues to grow.

The problems of increasing water demand and declining water supplies have been compounded by the failure of the region’s nations to work together. Also, the uneven distribution of energy and water resources in the region has led to linked water and energy issues that have been second only to Islamic extremism as a source of tension in recent years.

The Soviet era disregard for the environment has left its legacy in Central Asia. Radioactivity threatens to contaminate scarce water resources; the Caspian Sea is polluted to the extent that the fishing industry has declined; and the Aral Sea is mostly desiccated -- changing lives and climate. The degradation of the environment directly impacts the health and livelihoods of people, threatens their ability to advance economically, and can be either a medium for regional cooperation or a divisive force. It is an important arena for S&T to make a significant impact.
Discussion

Water is a scarce resource in this region as agriculture is an economic mainstay and irrigation is intensive. Competition between the Central Asian states for water is increasing. Better management of water and energy resources is essential for economic development. S&T can support better management of water and energy resources. Collaborative multilateral design and execution of pilot-scale experiments to improve irrigation practices and reduce soil salinization could both address a major technical problem and promote regional cooperation and stability. Remediation of acute environmental problems can have a direct positive benefit to human health and perceptions of the U.S. Potential target problems include those associated with desiccation of the Aral Sea and the many uranium mill tailings in and around major water bodies and population centers.

The Mailuu-Suu, Kyrgyzstan uranium mill tailings are precariously poised on the Mailuu-Suu River, 20 km from Uzbekistan and the Fergana Valley. Mailuu-Suu is recognized throughout the region as a potential catastrophe for contaminating the Fergana Valley. Forming a collaborative multilateral team approach to develop, fund, and execute a remediation plan would be a highly visible means to simultaneously forge cooperation and solve a real problem.

There is growing recognition that a lack of water of acceptable quality is an emerging global problem, especially in the Islamic world. Central Asia shares this problem, as the Aral Sea situation shows. The S&T aspects of the global water issues are good forums to integrate Central Asia into the global community.

Recommendations

- Establish regional centers of water, energy, and ecology that focus on relevant research and policy issues. Use these centers as focal points for international scientific collaborations. Build on existing projects (e.g., NATO study on resource availability) and regional knowledge and desires. Include local S&T expertise in project design and needs identification. Use the centers as a venue for science/policy interfaces on trans-boundary water, energy, and environmental issues.

- Recognize existing S&T capabilities in Central Asia and the limited impact of these capabilities because of insufficient links between S&T and policy-making and the absence of a supportive political environment.

- Recognize successes of S&T-based NGOs in Russia, Ukraine, and Eastern Europe in bridging the S&T-policy gap. Encourage and support these NGOs and other S&T based organizations to transfer this success to Central Asia.

- Recognize that the S&T role is multi-dimensional including time, geographic, and economic components. Use a multi-dimensional matrix approach to identify and prioritize specific activities to undertake.

- Support a local evaluation of internationally supported S&T activities related to energy, water and environment in Central Asia to facilitate and improve coordination among S&T development efforts.

Security and Soviet Legacy

Background

This working group discussed the role of S&T within the context of three US policy goals in Central Asia: preventing the proliferation of weapons of mass destruction; avoiding “failed states,” and promoting regional stability. This third goal involves the development of the region.
without the domination of regional (Uzbekistan, Kazakhstan) or outside (China, Iran, or Russia) countries. The existence of human resources, facilities, and equipment that support the manufacture of chemical, biological, and nuclear weapons make this region a US security concern. The large labor pool of scientifically and technically trained experts must be more fully integrated in the non-military scientific community.

The Soviet legacy also resulted in environmental disasters (e.g. Semipalatinsk, Vozrozhdeniye Island, uranium tailings pollution) which must be remediated over the short and long term. The scale of contamination makes comprehensive action prohibitively expensive; those locales posing the greatest risk need to be identified and remediated.

Economic decline has resulted in increased poverty and under- and unemployment -- exacerbating health and other social problems. Freedom from Soviet control has also resulted in the development of totalitarian regimes in some of these countries and the development of opposing factions (families or clans) in others.

Discussion

Discussion focused on three areas: the WMD complexes and their resources, border security; and energy security. The first area involved identifying and securing the scientists, material, and facilities involved in WMD production, but this is seen only as a first step. The U.S. has been working in this arena for some time. The bigger question is how the human and other resources in these complexes can be integrated into the larger society to promote sustainable economic development.

Border security was also seen as important, both as a means of regional bridge building and also needed to support counter-terrorism activities. Ways to develop cooperation for economic development were also seen as important, since many of the transportation systems needed for trade cut through neighboring states. Having a secure border would also help to curb corruption, illegal trade in drugs and humans, and other social and economic illicit activities.

Third, energy and other natural resources security (e.g. water) was also seen as directly linked to U.S. security. Protection of oil and natural gas pipelines will provide access to energy supplies for the U.S. and its allies. Water, generated in the mountains of Kyrgyzstan and Tajikistan, is important for larger countries downstream and can become a contentious issue as it develops into a commodity for sale, thereby exacerbating regional tensions.

Recommendations:

- Apply the technical expertise and equipment used to monitor and secure WMD materials to cross-border trafficking in WMD, drugs, women, terrorists, conventional weapons, and other illicit activity. Promote regional production of technical monitoring equipment to alleviate problems with corrupt border guards and improve the economy.
- Integrate WMD experts more fully into civilian research and teaching at universities to solve related problems – vaccine development, safe pesticides, environmental remediation, etc.
- Enhance environmental security of existing oil and gas resources in the region.
- Use U.S. foreign aid in areas other than military applications. Again, border security and international collaboration projects focusing on national and regional priorities (e.g. health, water, earthquakes) were mentioned
Prototypical S&T Scenarios

This section contains three possible scenarios for further development of US and international assistance that integrates some of the concepts and recommendations discussed in the working groups and the Executive Panel. The projects outlined here integrate some of the recommendations of the workshop working groups and Executive Panel. They are regional in nature and would provide useful bridge-building functions to promote cooperation among the states and increase cooperation with the West. Europe, Russia, China, and Iran can also serve important roles in the development of S&T infrastructure and should not be excluded.

Scenario I: Establishing Earthquake Safe Schools — An Integrated S&T Approach to Education and Research

Objective
Enhance school safety, education, research, and regional cooperation.

Major Elements
The core of this prototype initiative is a major regional problem — seismic hazards — and the potential threat they pose to infrastructure, commerce, people, and political stability. It builds institutions and cooperation by requiring local ownership and cooperation among local leaders, each country’s Ministry of Education, Ministry of Science, and Academy of Sciences, and many other organizations and constituencies in each country. The projects have immediate impact, yet make a long-term investment in future generations of Central Asians.

The initiative supports U.S. foreign policy goals in the region by promoting:

- Political and social development in the region by investing in education and children’s welfare.
- Economic development by providing the science-based information needed to make sound decisions locally, nationally, and regionally and by generating jobs through school reconstruction.
- Political development through establishment of local parent-teacher groups and non-governmental scientific networks and interest groups.
- Regional cooperation helping to decrease cross-border tensions.
- Future generations of scientifically literate citizens educated in safe secular schools.

Conceptual Framework

Establishing Earthquake Safe Schools

Children are highly valued and cared for in Central Asian societies, although poverty is threatening their health and well-being. Thus, schools in zones of high seismicity present a special concern and opportunity. Central Asia is characterized by an abundance of high seismic risk zones and these include major population centers. In addition, building codes and architectural engineering date from the Soviet era; experience shows that existing structures are very vulnerable. Collapse of a school during school hours would be a catastrophe.

Expertise exists within the international and Central Asian seismic communities to address this risk. For example, modern techniques and dating can be applied to infer latest movement along a seismic fault and identify fault regions at greatest risk of failure. Also, the Institute of Earthquake Engineering & Seismology in Tajikistan has the capabilities to field test architectural designs and local building materials under simulated seismic loads. These and other
international and indigenous capabilities can be integrated into a program that builds regional cooperation and international good-will while making a visible and substantial improvement in the region.

**TASK I: TECHNOLOGICAL EVALUATION AND RECONSTRUCTION**

The first step of the program would be to develop the international team and assess the status of previous and on-going related activities. The technical steps are to identify the main seismic zones, analyze their probability of failure, identify the schools at greatest risk, and recommend design and construction improvements to make these structures more earthquake resistant. Emphasis would be placed on use of inexpensive local materials and development of regional expertise and commerce. Potential U.S. collaborators include Incorporated Research Institutions for Seismology (IRIS), the U.S. Geological Survey (USGS), the U.S. Department of Energy (DOE) national laboratories, and the U.S. Environmental Protection Agency (EPA).

Conduct a design and risk analysis of where vulnerabilities exist from earthquakes in cities with high population densities and where school structures are not capable of sustaining even mild seismic disturbances.

This study can be accomplished with the help of DOE, USGS, and the private sector, with possible funding for the study going through USGS or the National Science Foundation. The purpose of the study would be to identify highly vulnerable areas (this is probably already known) and possibly establish a model school design. As the area(s) are surveyed, schools would be identified for reconstruction or new construction.

Work on constructing five new schools can be begun almost immediately after all stakeholders are on board, with several more sites identified (up to 100) spread out over all five Central Asian countries. Local architects, builders, resources, and other materials can be used with western technical advice. Private/public partnerships can be encouraged with U.S. companies and NGOs.

**TASK II: EDUCATION**

The educational component of can be conducted concurrently with the technical elements of the project. Teachers can work with local and U.S. scientists and educators during the summer to develop new general science education models and integrate them into existing math, science, social studies, history, and other classes. These modules would be developed by local educators with attention to specific important issues in the community. Simple science kits and other educational materials can be developed based on local examples and needs. Some educators may participate in an exchange program with appropriate sister cities where such materials are used. The schools could also be fully integrated into international programs, like NASA’s GLOBE program. GLOBE involves K-12 students in hands-on data collection (see [http://www.globe.gov](http://www.globe.gov)); Kazakhstan and Kyrgyzstan are already part of the GLOBE network.

**TASK III: REGIONAL SEISMIC CENTER**

Working with local universities, the regional Academy of Sciences institutes, and international organizations like UNESCO, UNEP, UNDP, and FAO, a regional center for seismic monitoring, research, and development would be established. Seismology is a good focus for the initial program. Since it is a topic of obvious concern to the region. It has a global following that would allow students to readily establish contacts and relationships through the internet; the skills required prepare students well for work in other technical fields; it ties in closely with the work tied to rebuilding the school. Subsequently, regional centers in other areas, such as ecology, water resources, and sustainable agriculture, could also be established following the seismic model. These regional centers would draw on existing centers of excellence in the
region and be linked directly to one or more universities. These centers would be the focal point for international (and regional) research projects funded on the basis of internationally peer-reviewed proposals which reflect the mission of each center.

**Opportunities for Additional Integration**

The staff of the research centers would also work with the local schools to develop community-based research projects involving teachers, students, parents, and other local stakeholders. The centers would serve an outreach function into the communities much like that served by US land-grant colleges. University researchers would be actively involved in the research centers. The staff would be drawn from the best and brightest researchers and administrators throughout the region. Existing international networks in these areas would be strengthened and the development of regional networks or associations of scientists would be encouraged. This can be done by tapping local and US based scientific societies and NGOs and strengthening their organizational infrastructures to promote greater cooperation between Central Asian and U.S. groups.

NSF, USDA, NIH, and other government agencies can provide support for these and also training on grant development, program management, publishing, science writing and reporting in the mass media, etc. NIH is mentioned here because all of the areas covered in the regional centers have health implications (e.g. water born diseases, environmental pollution, overuse of pesticides and fertilizers, etc.).

**U.S. Approach**

The decentralized nature of our S&T infrastructure often promotes disjointed and sometimes duplicative international programs. Therefore, we suggest two important steps to solidify this integrated concept for education and research. First is the establishment of an interagency working group with one organization as the lead for coordination and funding. The group should also include NGO and scientific association representatives who could provide much of the support needed. The second is to set aside a line item in the budget (similar to Nunn-Lugar monies) for support of these programs to remove them from competition with other programs in each of the agencies.
Figure 1: Integrated S&T Approach to Education and Research
Scenario II: Economic Development and the Market Economy

Objective
Accelerate the economic and market development of Central Asia countries.

Major Elements
The U.S. recognizes that the leadership and stakeholders in each country must develop and implement the major development priorities, and must establish and support legal frameworks and investment partnerships essential to economic and market development. The United States and other contributing countries and organizations can facilitate and accelerate the transition process by providing information and potential partners on the market pull approach to economic and market development.

Development of market economies is an important facet of U.S. policy. Science and technology and technology commercialization provide the basis for sustainable economic development and providing the catalysts needed to develop private capital investment. The major problem is how scientists and engineers connect to the commercial sector and how regions can be made more attractive to private foreign and domestic investment.

While recognizing the legacy influencing economic decisions, a program is recommended of both short and long term cooperation directed at developing the underpinning of economic stability and to meeting the legal, scientific, technological and production capabilities to participate in a regional market economy. This scenario envisions an effort that includes the region’s young adults, who are eager for change and able to provide considerable energy when given the opportunity.

At the macro-level, a country-by-country economic profile identifying existing programs, listing domestic and foreign contributors needs to be assembled as part of the process of future rational investment in economic development in the region. U.S. technical agencies, such as the Department of Agriculture, the Department of Commerce, and the Department of Energy, foreign governments, the Asian Development Bank, the World Bank, and others have been active in the region. They can continue to participate in supporting specific interrelated objectives toward market development and economic well-being of the region but based on an integrated plan.

At the local level investments in sustainable enterprise, and in science and technology assessments and applications should be given priority to expand employment and product delivery to the marketplace.

Economics, cultural anthropology, sociology, and other social sciences coupled with the use of science and engineering for economic development need to be integrated into a strategic plan for economic development in each of the Central Asia countries development.

Conceptual Framework
The international S&T community, working with business and government, can cooperate with Central Asian leaders to provide an infrastructure conducive to attracting both domestic and foreign investments in small, medium, and large enterprises. The region’s young adults hold particular promise and should be given special emphasis; they are the future and programs emphasizing their involvement would limit out-migration to more lucrative regions and inhibit their recruitment by extremist movements.

The following types of tasks could achieve these goals:
**TASK I: ESTABLISH A CENTER OF ECONOMIC DEVELOPMENT POLICY**

A first step would be to establish a Regional Center for Economic Development Policy. This center would be responsible for bringing outside expertise together with national government, business, financial, and education leaders to develop strategic plans and infrastructures for competitive business development based on each country’s culture, resources, and needs. The center would bring together scientists and engineers, economists and business experts, local leaders, and private commercial entities to develop strategic plans and specific programs to develop industries based on market pull, not technology push. A top-down approach is required so that national and local governments provide the needed incentives and business environment for business development. Cultivation of financial backers and *business angels* in each country would be a key element to be stressed to keep capital from being invested abroad. This Center would also be the focal point for training national and sub-national centers in such areas as business plan preparation, intellectual property, marketing, technology and market assessments, and finance and accounting.

**TASK II: ESTABLISH NATIONAL AND SUB-NATIONAL CENTERS**

A second step would be to establish national and sub-national business development centers that would provide training and expertise in:

- intellectual property rights, patents, and licenses;
- business plan development;
- marketing;
- finding applications for technologies and appropriate markets;
- finding financing; and
- auditing and accounting services.

The U.S. has a vast infrastructure established to help people get started in private business. Local and state governments support technology development and innovation centers, small business associations, incubators, etc. Such infrastructures are in their infancy or nonexistent in Central Asia.

**TASK III: INTEGRATE EDUCATIONAL INSTITUTIONS**

A third step would be the close integration of technical universities, research institutes, and business institutes and institutions to complement the mix of talents needed to develop successful businesses. National and sub-national business development centers can fill this integration role in a bottom-up approach.

**U.S. Approach**

The U.S. government can facilitate better understanding of the elements and structures needed to develop a strong private sector. Each Central Asian country must develop its own model for development; the U.S. can provide direct support to this process. The USG and its agencies and other business and regulatory agencies and programs (for example, Small Business Innovative Research and Experimental Program to Stimulate Competitive Research) can provide experts from industry and government to serve facilitating roles along with other foreign national and international agencies and private enterprises.
Scenario III: Mainstreaming Weapons Complexes and Personnel

Objective:
Ensure safeguards, control, and security over WMD personnel and materials.

Major Elements
This initiative addresses the need to integrate WMD complexes and their current and former staffs more fully into the civilian S&T or business communities. This scenario explores how U.S. government policy and activities can promote this integration while also promoting non-proliferation, regional stability, and other US policy goals.

As stated in the Soviet Legacy Working Group summary, biological, chemical, and nuclear complexes in Central Asia consist of human resources and know-how, facilities, equipment, and materials. When the Soviet Union broke up, these resources became the property of the individual republics whose citizens often did not know about these weapons complexes in their territory and the environmental legacies they left. In an even broader perspective, these countries did not even know the resources they had to develop their own defense forces.

This scenario focuses on ways in which the U.S. government can approach Central Asian WMD complexes from both non-proliferation and environmental security perspectives in a manner to benefit security and possibly the infrastructure and economies of the affected countries.

Conceptual Framework

Task I: Identification
The first step in this process is two-fold:
1) to identify each country’s security threats and planned military responses to these threats and the role their current WMD complexes may or may not play (including, for example, the development of vaccines to counter bio-warfare) and
2) to help each country inventory the human resources, facilities, and equipment in the weapons complexes and to identify all nuclear, chemical, and biological warfare sites that threaten human health.

While some of the more obvious WMD sites are known (Semipalitinsk, Sverdlovsk, and Renaissance) in the open literature (e.g., Ken Alibek’s book, Biohazard), secondary sites and their technical capabilities may not be as well known. In addition, peaceful uses of nuclear devices in mining and other industries, have also left nuclear materials that need identifying and securing, and radioactive conditions that need securing and, possibly, rehabilitation. For example, the Lyra site in the northeast Caspian basin was the location of a handful of underground nuclear explosions that were designed to create natural gas storage cavities. These cavities are not currently being utilized but remain a potential radioactive source for groundwater percolating through them towards the Caspian Sea. The U. S. Departments of Energy and Defense, and their sub-contractors and NGOs specializing in proliferation issues can work together to catalogue these secondary resources and sites.

Task II: Risk Assessments and Remediation
The second step after the inventory would be to assess the potential and risk of the secondary sites and help rehabilitate or render inaccessible environmental hazards and materials. Potential activities include training of formal prioritized risk assessment technologies and S&T tools to predict the environmental consequences of a range of scenarios at the identified sites. Environmental regulations and their enforcement is an area that needs special attention and
requires working closely with the Ministries and the local communities, possibly through regional NGOs like ISAR or the U.S. Environmental Protection Agency.

**TASK III: MAINSTREAMING**

The third step is to help scientists and technicians become more fully integrated with the larger international scientific community. It is unclear what these workers have been doing over the past 12 years. Many ethnic Russians in Central Asian complexes have returned to Russia; many Central Asians have returned to their country of origin. The inventory will identify institutes and scientists that have been part of the WMD processes. Their expertise in biology, chemistry, and physics can readily be used to teach in universities, in contract work with domestic and foreign companies, or in civilian research institutes. The major problem is to identify these scientists and provide the right incentives and job security similar to that provided by their previous work that was well compensated.
Summary

The AAAS/CGSR workshop, and the Brookings Institution workshop that preceded it, were initial steps in developing coordinated strategies that better define the roles that S&T can play in supporting US policies in Central Asia. The major emphasis has been to identify specific activities that would have both short-term high impact and also provide the infrastructure for long-term political, economic, and social stability in the region. The strengthening of S&T infrastructures in this region can go a long way towards serving societal needs and promoting political and economic development. These can occur only within a framework of political and economic stability that allows such programs to flourish. Good governance, transparency, and public/private partnership serve and are served by S&T programs promoting the health and well-being of Central Asian peoples.
Appendix 1: Workshop Program

08:00 – Continental Breakfast

08:30 – Greetings, Remarks, and Introductions
Ron Lehman (CGSR)
Alan Leshner (AAAS)

09:00 – Key Note Addresses
Ron Lehman (CGSR) — Moderator
Strategic Importance of Central Asia and USG Central Asia Policy
Lynn Pascoe (State)
Role of S&T in USG Policy
Norman Neureiter (State)

10:00 – Around-the Table
Eileen Vergino (CGSR) — Moderator
Organization representatives make brief statements regarding their S&T interests in the region.

10:45 – Directions to Working Groups
Betty Kirk (AAAS)

10:55 – Break

11:15 – Working Group Discussions

1. Agriculture
Chair: Carol Kramer-LeBlanc (USDA)
Ass’t: David Betsill (SNL)

2. Basic R&D and Education
Chair: Thomas Wagner (NSF)
Ass’t: Stella Siegel (AAAS)

3. Health and Biotechnology
Chair: Sharon Hrynkow (NIH)
Ass’t: Earl Morgan (PNNL)

4. Natural Hazards and Emergency Response
Chair: David Simpson (IRIS)
Ass’t: Jay Zucca (LLNL)

Chair: Allan Hoffman (Winrock)
Ass’t: Nina Rosenberg (LLNL)

6. Security and Soviet Legacy
Chair: Jon Wolfsthal (CEIP)
Ass’t: Betty Kirk (AAAS)

12:15 – Working lunch available

13:45 – Break

14:15 – Reports to Executive Panel
Working group chairs present a summary of the discussions, responses to the questions, and group recommendations to the Executive Panel, consisting of:
Chair: Ron Lehman (CGSR)
Panel Members: Harold Barnes (AAAS)
Matt Bryza (NSC)
William Courtney (DynCorp)
Christian Foster (USDA)
Fiona Hill (The Brookings Institution)
Paul Siegelbaum (World Bank)

15:45 – Final Panel Remarks

16:00 – Adjourn
Betty Kirk (AAAS)
Ron Lehman (CGSR)
Appendix 2: Workshop Attendees

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