

PROTECTION AND MODERNIZATION OF CRITICAL INFRASTRUCTURE – KEY TO PROSPERITY AND SECURITY

BY CASPIAN POLICY CENTER

ABOUT US

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ABOUT THE AUTHORS



Robert F. Cekuta
Board Member, Caspian Policy Center

Ambassador to the Republic of Azerbaijan (2015 – 2018), Robert Cekuta has long and extensive experience as a top level U.S. diplomat. Deeply engaged in advancing high-profile international energy projects, trade policy initiatives and agreements, commercial sales, and other complex international security matters, Amb. Cekuta's positions in the State Department included Principal Deputy Assistant Secretary for Energy Resources as well as Deputy Assistant Secretary for Energy, Sanctions, and Commodities. His overseas postings included the U.S. Embassies in Berlin and Tokyo where he oversaw the full range of economic, commercial, nonproliferation, and scientific relations. In addition, he was Deputy Chief of Mission in Albania and held positions in Vienna, Baghdad, Kabul, Johannesburg, and Sana'a, Yemen. He set up the Economic Policy Analysis and Public Diplomacy Office in the State Department's Bureau for Economic and Business Affairs, and served on the boards of the Extractive Industries Transparency Initiative (EITI) and the International Energy Agency (IEA), where he also chaired the IEA Board's Standing Group on Long-term Cooperation charged with anticipating global energy developments. During his career with the State Department Amb. Cekuta received nine Senior Foreign Service Performance Awards, four Superior Honor Awards, five Meritorious Honor Awards, and the Career Achievement Award. He graduated Georgetown University's School of Foreign Service, the Thunderbird School of Global Management, and the National War College.



Kristen Cheriegate
Program Manager, Caspian Policy Center

Kristen Cheriegate is currently the Program Manager for the Caspian Policy Center. She holds a Master's degree in Security Policy and National Security Law from the George Washington University. Formerly, she was a Guest Lecturer at College of the Canyons in Southern California and was on the Board of Directors for the United Nations Association of the National Capital Area. She has also conducted research and analysis for both the Center for Cyber and Homeland Security and the Center for European Policy Analysis.

ABOUT THE AUTHORS



Elizabeth (Nickie) Deahl
Research Intern, Caspian Policy Center

Elizabeth (Nickie) Deahl was a research intern at the Caspian Policy Center in 2018, where she focused on energy-related topics in the region. She received her B.A. from George Mason University in Government and International Politics and a minor in Chinese. She is currently pursuing an M.A. in International Security, also from George Mason University.



Yueyi Chen
Research Intern, Caspian Policy Center

Yueyi Chen is a graduate student at the Center for Eurasian, Russian and East European Studies, School of Foreign Service, Georgetown University. She currently works as an Open Source Intelligence Analyst Intern for Prevalent Inc. Previously she worked as a research intern at Caspian Policy Center and focused on energy issues and geopolitical risks of foreign investments in Russia and Central Asia. She holds a B.A. Degree in Russian Languages and Culture at Fudan University in Shanghai, China and has the experience of studying abroad in Moscow, Russia.

PROTECTION AND MODERNIZATION OF CRITICAL INFRASTRUCTURE – KEY TO PROSPERITY AND SECURITY

The protection and modernization of existing infrastructure systems can be just as essential as their construction. Moreover, governments and the private sector must work together on protecting critical infrastructure systems, just as they should on their inception. The Greater Caspian Region's growing importance in connecting East and South Asia with Western Europe and the Mediterranean basin increases this need and makes it an important factor as well in U.S. engagement in the region.

Critical infrastructure systems, for example electrical grids or internet/telecommunications networks, are essential for the safety, security, and well-being of a country's citizens. Citizens also hold governments and companies responsible for any failures of these systems, whether breaches of their integrity or a shut-down in services.

These systems are often interconnected and mutually dependent, thus efforts to protect them require attention to these linkages. A breakdown in a country or region's communication system may disrupt road or rail transport. A power outage can shut down water supplies or health care facilities.

Disruptions can be accidental or be caused by the planned efforts of malicious individuals or hostile governments. They can result from storms, earthquakes, or other natural events as well as be man-made.

Threats can be built into systems, as was recently discovered in the case of a microchip not much bigger than a grain of rice illicitly nested in motherboards built in China; this provided stealth access to computers in government and corporate use around the world.

Attacks on critical infrastructure have been an element in hybrid warfare.

The countries of the Greater Caspian Region countries cannot ignore these realities as the July 2018 country-wide power failure in Azerbaijan and other events show.

The evolving political and economic/commercial realities in the Greater Caspian Region may add to the situation's complexity, but they also may make it easier to put protective systems in place. As the Caspian region's countries look to attract international business and to grow economically, more robust critical infrastructure systems will remain key to their success in doing so. At the same time, China and other countries outside the region show interest in building and utilizing new systems across the Caucasus and Central Asia to boost trade and communications. New surface links can improve access to Afghanistan. Infrastructure systems enable the region's oil and gas to be developed and exported.

Addressing the challenges of building and maintaining secure critical infrastructures requires the private and public sectors to foster an atmosphere of greater cooperation and trust. Improving business environments and developing greater on-going communication among stakeholders are essential for governments and private entities to identify threats and weaknesses, as well as for them to implement solutions and defensive measures.

Areas of engagement may include upgrading power grids to meet growing demand for electricity, developing and installing software to prevent hacking, improving the integrity of the Internet and communications systems, and ensuring the safe, efficient operations of the new surface routes across the region. Governments can draw on the experiences of others, including the United States and the European Union (EU) and its Member States, as well as on the know-how of foreign and domestic corporations operating in their territories. There is no question that successful business, academic, and government action on this front will benefit the region's governments and people, while simultaneously increasing connectivity across Eurasia.

CHAPTER I: TARGETED EXAMINATION OF CRITICAL INFRASTRUCTURE IN THE REGION

Maintaining critical infrastructure the facilities and systems essential for a country's economy, government, and society to function—is key to a modern state's security, prosperity, and well-being. However, there is often a tendency to focus more on building new critical infrastructure elements (e.g., constructing a new power plant or opening a new transport system), than on ensuring adequate on-going maintenance, modernization, and protection of existing systems.

Recent incidences of infrastructure failure and breaches in the United States, Western and Central Europe, and the Greater Caspian Region, highlight the dangers of postponing or neglecting protective measures.

Recent events, ranging from public threats by hostile states towards new major infrastructure projects, nationwide blackouts, large-scale hacking of computer systems, and malware attacks against utilities, police stations, and hospitals, demonstrate the necessity of focused and on-going preventative action. The hacking of companies and governments to obtain and misuse their data, including the personal data of their citizens, arouse public outrage and produce urgent calls for action on the part of governments and companies alike. Attacks on Ukraine's electrical systems as well as Wannacry and other ransomware attacks put untold numbers at risk. Accidents and natural disasters knock out power, water, and other systems, producing life-threatening situations.

These instances show too that a partnership among businesses, governments, and others is critical to the systems' maintenance and integrity. The effect of breakdowns in these systems can range from inconvenience, public annoyance, and economic losses, to threats to a country's core national security. The expenses of maintaining and protecting such systems, the sense that "it can't happen here," and the tendency to postpone actions or leave them for other administrations to handle, however, are all frequent factors that postpone the steps needed to maintain a country's critical infrastructure. Authorities may be able to coast due to a lack of public demand for action, but public anger with authorities can be quite vociferous when an infrastructure breakdown or near breakdown occurs.

Four particular types of critical infrastructure in the Caspian region are telling examples of the need for greater attention to maintenance and security: Internet and other communications networks, electrical generation and transmission grids, oil and gas production and pipeline systems, and the surface transportation linkages being built as the region realizes the vision of a new Silk Road.

The Expanding Internet and Other Important Communications Infrastructure

Nearly every aspect of modern life relies upon information and communication technologies (ICT). Each time someone uses a mobile phone, logs on to the Internet, travels by plane, or turns on the radio, they are depending upon these technologies. It follows that access to such communications systems is essential for both life and economies. Ongoing advances in ICT infrastructure, including the development of the Internet of Things (IoT), show dependence on these technologies – and the degree to which they are interwoven with other critical technologies – will continue to grow.

The infrastructure that supports virtually each interaction we have on a day-to-day basis can be shut down in a blink of an eye. An accident within this sector is often evidence that a country, or region, is ill prepared for an emergency. Azerbaijan faced its countrywide blackout this past summer, resulting from a power station's explosion in Mingachevir. Azerenergy, the largest electrical power producer in the country, had stated that it was due to the heavy use of air conditioning which led to the power surge and eventual collapse. The result, in any case, was a nationwide breakdown of systems, including transportation and water supply.

The reality is a modern overall economy relies upon the flawless operation of ICTs; therefore, there are four areas which require immediate attention.

Accidents

There has been an increase in focus on software development and e-commerce in the region over the years; however, the information technologies (IT) systems cannot work without a solid modern backbone of hardware. While governments in the region often provide critical project financing, private sector involvement is particularly important today in the development and maintenance of IT and telecommunications sector infrastructure. Still, governments can have a great impact on the scope and direction of this private sector involvement, for example through establishing or modernizing the regulatory environment essential to a well-functioning communications system, including facilitating its ability to adapt to and bring onboard new systems to meet users' demands.

Pirated and Outdated Software

Another problem affecting the security of telecommunications systems – and other critical infrastructure—is the prevalence of pirated software. Computer software and related companies frequently cite numerous instances where even government agencies use pirated software. One related issue is the continued use of outdated software by individuals, companies, academics, or governments in the Greater Caspian Region.

Microsoft CIS recently noted that the most common pirated build of Windows OS contains 63 different keyloggers, trojans, and backdoors. These problems leave users, whether individuals, companies, academics, or governments, vulnerable to hackers, malware, ransomware, and system failures. Government use of pirated software endangers national cyber security and directly hampers the protection of private business' intellectual property.

Table 1: Rates of Overall Unlicensed Software Installation

| | 2017 | 2015 | 2013 | 2011 |
|-------------------|------|------|------|------|
| Armenia | 85% | 86% | 86% | 88% |
| Azerbaijan | 81% | 84% | 85% | 87% |
| Georgia | 81% | 84% | 90% | 91% |
| Kazakhstan | 74% | 73% | 74% | 76% |
| Russia | 62% | 64% | 62% | 63% |
| U.S. | 15% | 17% | 18% | 19% |

The Software Alliance (BSA) released data in 2018 showing that the Caucasian and Central Asian countries have some of the highest rates of unlicensed software installation in the world (Table 1). According to the Microsoft Cyber Crime Center, cyber-criminal attacks affect up to 80 percent of Eastern European countries. This situation not only deters international investors and undercuts domestic business development, but also poses serious cyber security risks and endangers other critical infrastructure systems.

However, there have been positive actions to reduce the prevalence of unlicensed software installations. In 2015, Microsoft and Georgia entered an agreement that gave Georgia access to legitimate licensed Microsoft products. Since this initial step was taken, use of unlicensed Microsoft software fell six percent in Georgia—accounting for part of the percentage drop in the table above.

Network Readiness

At this time, there are more IoT devices in the world than human beings on the planet. Strong ICT is no panacea, and there are a multitude of opportune areas that call for policy change. Network readiness requires attention to a plethora of variables, from government vs. individual usage to affordability, infrastructure, regulatory environments, and more. It follows that governments should have a clear implementation plan for utilizing ICTs.

There is a reason for individual governments and corporations to push for parallel growth between one another, as well as regional neighbors. Kazakhstan holds the highest networked readiness ranking in the Greater Caspian Region, according to the World Economic Forum’s 2016 report of 139 countries. The lowest ranking within the region is Tajikistan at 114; the average ranking at 66.

Caspian countries may eventually find that they are not likely to dramatically increase their individual ranking. One country’s gain in network readiness will be burdened by weak international infrastructure—something the Caspian region has been focusing on improving over time.

ICT Development (IDI)

The ICT Development Index (IDI) has been published annually for eight years, through the International Telecommunication Union (ITU). The ITU gauges a country's IDI by measuring its ICT access, ICT use, and ICT skills. In 2017, their publication ranked 176 participating countries, with a majority of the Caspian region dropping in rank (Table 2).

IDI 2017 Regional Rank: CIS

| | IDI 2017 Rank | Economy | IDI 2017 Value | IDI 2016 Rank | IDI 2016 Value | Rank Change |
|----|---------------|--------------------|----------------|---------------|----------------|-------------|
| 1 | 32 | Belarus | 7.55 | 32 | 7.29 | — |
| 2 | 45 | Russian Federation | 7.07 | 43 | 6.91 | ↓ |
| 3 | 52 | Kazakhstan | 6.79 | 51 | 6.72 | ↓ |
| 4 | 59 | Moldova | 6.45 | 63 | 6.21 | ↑ |
| 5 | 65 | Azerbaijan | 6.20 | 60 | 6.25 | ↓ |
| 6 | 74 | Georgia | 5.79 | 73 | 5.59 | ↓ |
| 7 | 75 | Armenia | 5.76 | 74 | 5.56 | ↓ |
| 8 | 79 | Ukraine | 5.62 | 78 | 5.31 | ↓ |
| 9 | 95 | Uzbekistan | 4.90 | 103 | 4.48 | ↑ |
| 10 | 109 | Kyrgyzstan | 4.37 | 110 | 4.06 | ↑ |

Electrical Grids

The electrical grids in most Caspian countries date back to the Soviet period and were constructed as part of an integrated system across the region. One significant example is the Mingachevir Dam in Azerbaijan, which was one of the world's largest hydroelectric projects when it was built in 1953. Electrification was a highly visible sign of modernity and improvement in living standards in the USSR, just as it was in the United States. However, its reach beyond urban areas and larger towns was not always complete.

The Soviet electrical infrastructure remains, but it is aging and often poorly maintained. Moreover, demand from commercial and individual consumers has grown while the systems supplying the electricity to meet that demand have not kept pace. This situation has resulted in frequent failures in the electrical systems as well as a problem of inadequate reach. In addition, the links between local infrastructure and Russia's own system can be the source of further problems while at the same time highlighting the need for new infrastructure.

Cross-border trade in electricity supplies suffered following the breakup of the Soviet Union when the newly independent states took control of the systems within their countries. Political decisions sometimes resulted in countries monopolizing power resources to protect domestic interests, moves which heightened nationalist tensions in the region. These decisions, however, came at the cost of efficiency and adequate preparation for future economic growth.



Map of CASA-1000. (c) Project website

Ongoing Projects in Central Asia

There are several ongoing projects among the Central Asian countries to improve electrical grids, boost supplies, and secure cross-border electricity transfers. Most of these projects aim to fix the problems that arose from the Soviet-era Central Asia Power System (CAPS).

The Central Asia-South Asia Electricity Transmission and Trade Project (CASA-1000) was initiated in March 2014. Led by the World Bank and other partners, including the European Investment Bank, USAID, the International Development Association, and others, CASA-1000 will allow Kyrgyzstan and Tajikistan to export excess energy to Afghanistan and Pakistan. The Central Asian countries will benefit from returns on the increased trade in electricity, which will enable them to make the infrastructural investments necessary to generate sufficient electricity during the months. Completion of CASA-1000 is projected for June 2020.

The Central Asia Regional Economic Cooperation (CAREC) Program is a framework to facilitate cooperation between eight of the Central Asian countries and six multilateral institutions. The Asian Development Bank manages the secretariat. The CAREC developed a transport strategy for the region that identifies the best routes for both transportation and transit, as well as working on grid cooperation, security, and development.

The Regional Cooperation on Renewable Energy Integration to the Grid will support Afghanistan, Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, Pakistan, and Uzbekistan in stabilizing renewable energy generation (solar and wind). The project will train transmission grid operators on new, modernized control techniques to solve intermittent supply outages. The initiative also looks to analyze options for regional cooperation arrangements.

The Energy Supply Improvement Investment Program, Tranche 2 project involves expanding power imports from Turkmenistan through an interconnection, unifying Afghanistan's power grid, and extending its reach into the central part of the country.

Ongoing Projects in the South Caucasus

While these countries experience many of the same problems as Central Asia, including blackouts and brownouts caused by aging infrastructure and poor maintenance, funding for improvement and maintenance projects in the South Caucasus often comes from the European Union, World Bank, and the German Development Bank (KfW). The Caucasus Transmission Network, a multi-phase project financed by KfW, the European Commission, and others, aims to strengthen interconnections to facilitate energy exchange and transit between the South Caucasus countries, eventually linking Armenia to the EU's European Network of Transmission System Operations for Electricity power grid via Georgia. Armenia will export energy to Georgia during the winter and import energy from Georgia in the summer.

The Kazbegi Interconnection Project headed by Georgian State Electrosystem (GSE) aims at improving the Georgian transmission grid and promoting large-scale wholesale trade in electricity between Georgia and its neighboring countries. It will be the main line linking the power systems of Georgia, Russia, Armenia, and Iran. Etel (Finland) signed a contract worth €21.6M with the Georgian State Electrosystem in a consortium with EMC Ltd (India). At first, the transmission line will operate on 110 kV voltage serving to integrate the power generated by existing hydropower plants and those being built located in the Mtskheta-Mtianeti region into the power system of Georgia. The second phase will connect the transmission line to the Russian electrical grid. Accordingly, a 500/110 kV substation will be established near Stepantsminda. It will operate on 500 kV voltage with the transmission capacity of 1100 MW.

Project Financing

Foreign assistance has long played a role in developing electricity supplies and infrastructure elsewhere in the region as well. The U.S. Agency for International Development (USAID) and the U.S. Army Corps of Engineers have been involved in maintaining Afghanistan's Kajaki Dam for years. The dam is an important source of electricity as well as for supplying water for agriculture. International financial institutions such as the ADB play a role in financing the construction, maintenance, management, and modernization of electrical grids in the region. Aid donors and multilateral institutions have also worked to help integrate and reintegrate electricity systems across borders to boost supplies in more efficient, cost-effective ways.

Nevertheless, there are numerous cases in which infrastructure that was once adequate ages and falls into disrepair. Increasing public demand and expectations for better, more reliable service have led to dissatisfaction with existing utility structures and their management. Electricity demand is expected to grow over the coming years, not just due to rising consumer demand, but also because of industrial use and infrastructure involving water supplies and sewage treatment. In some cases, as with Azerbaijan, upgrading the electrical system is integral to eventually privatizing the infrastructure and attracting future investment. Greater attention to water supplies – including addressing issues of cross-border water access – will become increasingly important in maintaining, let alone boosting, hydroelectric power supplies. Boosting energy efficiency and diversifying sources for generating electrical power with natural gas, other hydroelectric resources (including those on a micro scale), and wind and solar power, will also increase electricity supplies. Integrating or reintegrating grids will help meet demand and modernize infrastructure. All these actions require substantial financial outlays as well as on-going attention and commitment by the relevant national authorities.



Map of BTC, Northern Route, Baku-Supsa, BTE

The Oil and Gas Sector

Secure, ongoing access to oil and gas supplies and safe production and transport of these commodities to industrial and private sector customers are core to a country's national security. Disruptions to these systems can — and have — come from natural disasters, boycotts, and other political decisions including blockades. They can be vulnerable to the failure of electrical or other infrastructure systems essential to the production, distribution, or sale of crude oil, its refined products, or to supplies of natural gas.

Azerbaijan has two major fields in its upstream sector: the Azeri-Chirag-Gunashli (ACG) oil field complex and the Shah Deniz natural gas field. The downstream sector includes two major oil refineries with a joint capacity of 120,000 barrels per day. Azerbaijan's government plans to modernize these facilities in the future.

The main existing oil export vectors are the Baku-Tbilisi-Ceyhan (BTC) pipeline, the Baku-Novorossiysk pipeline (the Northern Route), and the Baku-Supsa pipeline. The major existing gas export pipelines include the Baku-Tbilisi-Erzurum (BTE) pipeline, the South Caucasus pipeline, the Hajiqabul-Mozdok pipeline, and the Iran-Nakhchivan pipeline.

Kazakhstan's three major oil export pipelines include the Caspian Pipeline Consortium, the Kazakhstan-China pipeline, and the Uzen-Atyrau-Samara pipeline. Major gas pipelines include the Central Asia-Center pipeline, and the Bukhara-Tashkent-Bishkek-Almaty pipeline. Some sections of the Central Asia Center pipeline, mainly in the western branch, have not been updated in over 35 years, leading to periodic complications.

Ongoing projects in the region include the Southern Gas Corridor project which encompasses the Trans-Adriatic Pipeline (TAP), the Trans-Anatolian Pipeline (TANAP), and the extension of the South Caucasus pipeline.



Map of TAP, TANAP, and SCP

Governments' Roles in Protecting Critical Infrastructure

Governments also have an important role in the protection of these systems. Coast guard and naval forces patrol the waters around drilling platforms and rescue workers in emergencies. Police and other security personnel can act in the event of illicit actions directed against on-shore production facilities, collection points, refineries, and pipelines. Militaries have also engaged, for example, in protecting facilities in Iraq or protecting workers rebuilding pipelines and other installations damaged by terrorists. The United States Department of Energy has made its expertise in protecting the infrastructure connected with oil and gas systems available to other countries, including those in the Greater Caspian Region. Governments have learned as well from incidents, such as the gasoline shortage that New Jersey and other parts of the northeastern U.S. suffered as a result of Hurricane Sandy, including power failures that prevented pumps at gas stations from running.

The region's oil and gas sectors make the state of these infrastructure features especially important. Distance from markets, whether in East or South Asia or in Central/Western Europe and the Mediterranean basin, necessitates long and expensive pipelines along with compressor and pumping stations and other related facilities. The geopolitics related to Iran, Russia, and China have an impact as well. Western governments must create systems to extract oil and gas from the Greater Caspian Region and move it west without crossing through either Russia or Iran. At the same time, China has looked to develop new links to the region to decrease its reliance on oil and gas moving through the Straits of Malacca and other potential chokepoints.

A Growing Surface Transport Network

Completion of the Baku-Tbilisi-Kars (BTK) rail link, and the construction of new ferry and other port facilities at Alat in Azerbaijan with links to Aktau in Kazakhstan and Turkmenbashi in Turkmenistan, are important recent steps in the realization of the New Silk Road.

Interestingly, this project is not funded by China. However, many of the port, rail, and road projects involved in the New Silk Road enterprise are. With Chinese funding often come contracts, rules, and procedures which put the Chinese side at an advantage in settling disputes. Construction projects executed by Chinese firms often use expatriate Chinese labor despite the availability of a local domestic workforce.

Many Central Asian countries lack both rail and road infrastructure to execute fully efficient trade, travel, and transit. The Central Asia Regional Economic Cooperation Program (CAREC) leads many projects addressing these issues. The Qaisar-Dari Bum Road Project is dedicated to helping the Government of Afghanistan facilitate economic and social development, as well as reduce poverty, by reconstructing the main road network, which was destroyed during the past two decades of conflict. The CAREC Corridor 2 (Pap-Namangan-Andijan) Railway Electrification Project will promote development of the Fergana Valley by electrifying the 145.1km of non-electrified track that links large cities in the Fergana Valley with Tashkent. The project aims to promote regional connectivity and development.

The Transport Corridor Europe-Caucasus-Asia (TRACECA) program promotes stronger economic relations, and trade and transport communication in the Black Sea Basin, South Caucasus, and Central Asia. In the past, the countries in the region cooperated on projects that focused on road construction, maritime routes, railway expansion, and more. There are currently no major ongoing projects, but the framework of TRACECA is important to regional cooperation. The TRACECA will be integrated into the Belt and Road Initiative (BRI), which will likely facilitate many upgrades in infrastructure, such as railway electrification, improved roads, and renovating power supply facilities.

Many in the region regard the BTK and Alat project as a highly attractive new surface link between Western and Central Europe and East and South Asia. Central European governments, including those in Ukraine and Poland, are interested in the project's potential as an alternative land transport route giving their truckers access to Central Asian markets via a route that bypasses Russia and Iran. Events have underlined the importance of such alternatives: Moscow imposed restrictive measures on the country's trucks following the international sanctions applied to Russia after its annexation of Crimea and actions in Ukraine. Additionally, the project further helps realize the Turkish government's ambitions to advance the country as a global transport hub. The new route could also be an important access point to Afghanistan, thus reducing dependence on the Khybur Pass and Torkum Gate routes through Pakistan. Azerbaijan and other governments in the region also see the route as a stimulus for new enterprises, products, and services.

The new surface route, like the Northern Distribution Network to Afghanistan, the air route that preceded it, is another example of the strategic importance of good infrastructure. However, routes used for legitimate trade can be used for illicit activities as well, including smuggling, trafficking in narcotics and human beings, and even the movement in goods or technologies that could be used to develop weapons of mass destruction.

The European Union and the U.S. have provided technologies to help governments develop up-to-date customs and other systems along these new transport corridors; consequently these systems help to oversee what is occurring, collect customs or other revenues without unduly slowing the flow of trains, trucks, or goods, and act against illicit activities. There is considerable attention to developing customs and other systems which will monitor goods and other traffic on the route. In helping governments in the region manage this new surface infrastructure, western governments and other institutions may wish to help push back against illicit trade moving further into the global system more broadly.

CHAPTER II: U.S. INTERESTS IN AND COMMITMENT TO THE REGION

The United States has repeatedly stated its continuing interest in the security, prosperity, and development of the Greater Caspian Region. The U.S. has realized threats, both natural and manmade, to American critical infrastructure that can take place outside the U.S. and the value of working with friendly governments to upgrade and protect key infrastructure systems within their own countries. The U.S. government has taken high-profile actions to support the Caspian region's development of oil and gas production and pipeline systems, and noted the potential threats from hostile governments, natural disasters, terrorists, or other actors. However, the U.S. has not engaged their governments in a systematic or effective manner in defending infrastructure. Given the United States' active role in ensuring global stability, as well as the scope of American economic interests in the region, it is necessary for Washington to do so. The development of the New Silk Road transportation network, and other regional infrastructure systems gives the United States the opportunity to look at and reap the benefits of such broader engagement. In doing so, it is important to recognize that American interests in energy, transportation, and other existing and emerging critical infrastructure in the Greater Caspian Region are not confined to the U.S. government, but extend as well to American companies.

Then Deputy Secretary of State Bill Burns spoke at the Asia Society September 23, 2014, noting, "[N]ow is the moment to work together to restore this region to its historic role as a vital hub. [...] The region," he went on to say, "is critical to global security. It is a region full of economic opportunity and human potential." He said the United States would support efforts to build a regional energy market, facilitate trade and transport, ease customs and border procedures, and promote people-to-people ties in order for the region to realize its full potential. Specific projects he cited included the Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline and the CASA-1000 electricity line along with the Cross-Border Transport Agreement among Kyrgyzstan, Tajikistan, and Afghanistan.

His successor, Deputy Secretary Tony Blinken, made the following remarks in a subsequent policy address:

"Our security is tied to a stable Central Asia, and at the same time we see a region of enormous potential that could act as an economic bridge from Istanbul to Shanghai and provide opportunities for our own businesses, technologies and innovations ... a region that could offer goods and energy to the booming economies of South and East Asia, and a region that could serve as a stabilizing force for Afghanistan's transition and an indispensable partner in the fight against narco-trafficking, terrorism, and extremism."

Deputy Secretary Blinken continued saying that these objectives can be best realized if the region's countries are "sovereign and independent," "fully capable of securing their borders, connected with each other and with the emerging economies of Asia."

The Trump Administration's National Security Strategy published in December 2017, referred to Russia and China as global competitors, "[A]ttempting to erode American security and prosperity [...] determined to make economies less free and fair." The Vice President's October, 2018 speech further showed apprehension regarding Chinese actions in the world. The National Security Statement puts Iran in the same category as North Korea – as "determined to destabilize regions, threaten Americans and our allies, and brutalize their own people." The Statement also flags "transnational threat groups, from jihadist terrorists to transnational criminal organizations" as "actively trying to harm Americans." All these governments and entities are deeply involved in the Greater Caspian Region and need to be taken into account when talking about the region's existing and developing critical infrastructure, its utilization and defense.

There are signs from which one can extrapolate a certain sense of an overall policy towards the Greater Caspian Region. The Trump Administration did state a broad concept for linkages with the Indo-Pacific region and on specific issues such as the security and future of Afghanistan, evolving relations with Turkey, and the fight against extremism. It has continued some previous initiatives, such as the C5+1 format for engaging with the five Central Asian countries. The Trump Administration has also made numerous statements welcoming continued progress on the Southern Gas Corridor and engaged in on-going diplomacy in support of the project to develop the Shah Deniz II natural gas deposits in the Caspian. There have also been some visits by top Trump Administration officials to the region: Vice President Pence to Georgia in 2017, Commerce Secretary Ross to Uzbekistan and Kazakhstan, and National Security Advisor Bolton in October 2018.

One can argue, however, that despite high-level policy statements and visits, much of the U.S. effort on the ground still tends to focus on the Southern Gas Corridor and certain other specific projects and initiatives. Electrification and other actions to boost Afghanistan's economy and development, including the CASA-1000 electricity line to bring surplus hydro-electricity from Kyrgyzstan and Tajikistan to Afghanistan and Pakistan where 80 million lacked access to electricity, were important. (U.S. officials frequently noted there are 1.6 billion consumers in South Asia needing improved access to energy.) The State Department worked hard to realize the Southern Gas Corridor project and bring natural gas from newly discovered deposits in the Caspian from Azerbaijan through Georgia and Turkey to Western Europe. Just as this route is the only one to move hydrocarbons west from the Caspian in a way that avoids crossing Russia or Iran, the Northern Distribution Network has been important for providing NATO access to Afghanistan. The subsequent development of the BTK rail network officially opened in October 2017, and the new port Azerbaijan is building at Alat with surface connections to Kazakhstan, Turkmenistan, and China; Afghanistan could also be attractive to the West for similar geopolitical reasons.

There are two other vectors for U.S. engagement in the region that are important for the development and integrity of its critical infrastructure systems: the international financial institutions such as the World Bank and Asian Development Bank, and the European Bank for Reconstruction and Development. The second is the private sector. The American private sector can also realize opportunities, including for consulting and management firms as well as companies engaged in manufacturing, construction, equipment supply, extraction, and data and systems management.

The Commerce and State Departments have worked with U.S. companies in the region to identify and act upon opportunities as well as to resolve problems that have occurred. Other U.S. government institutions, such as the U.S. Trade and Development Agency (USTDA), the Export Import Bank (EXIM), and the Overseas Private Investment Corporation (OPIC) have been involved in helping governments develop plans and in supporting American companies win contracts in connection with the development, construction, and maintenance of critical infrastructure in the region. In addition to helping U.S. firms win contracts and support exports to the region, these agencies also play a role in establishing commercial and other relevant legal codes, the terms for contracts, and the mechanisms for dispute settlement. The China-sponsored Asian International Investment Bank (AIIB), the establishment of which the U.S. initially opposed, has raised concerns among U.S. experts that the volume of Chinese investment and other contractual arrangements will lower the region's standards and reduce U.S. influence.

CHAPTER III: EXAMPLES FROM HOW OTHERS ADDRESS CRITICAL INFRASTRUCTURE PROTECTION

The evolving threats to critical infrastructure, as well as the evolution of technologies for protecting it, are commanding attention in government offices and boardrooms world-wide. Private and public sector experiences can be useful to authorities and companies in the Greater Caspian Region. International companies may be able to provide guidance on best practices to the region as well as support in areas where assistance and other support from governments may be unavailable.

The 1994 Oklahoma City bombings provided an impetus for the United States to address the need for critical infrastructure protection. The 9/11 attacks and other events such as the 2004 Madrid bombings provided additional impetus for government action in the United States and elsewhere. Natural disasters have also reinforced the need for attention to critical infrastructure systems and crisis procedures. Public expectations for the government to take necessary preventative and protective measures against attacks and disasters have energized efforts to protect critical infrastructure. Attacks on corporate systems also generate public outcry and provide momentum for actions to defend systems, to have plans in place in case of breakdown, and to have programs ready to restore operations quickly.

The U.S. Department of Homeland Security lists a total of 16 sectors as critical infrastructure (i.e., those whose “assets, systems, and networks, whether physical or virtual), are considered so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof.” As set out in Presidential Policy Directive 21 (PPD-21), issued February 12, 2013 and remaining in force, these sectors are: the chemical sector; commercial facilities; communications; the critical manufactures; dams; the defense industrial base sector; emergency services; energy; the financial services sector; food and agriculture; government facilities; healthcare; information technology; the nuclear reactors, materials, and waste sector; transportation systems; and water and waste water. A specific U.S. cabinet agency, often the Department of Homeland Security, is responsible for ensuring the integrity of each particular sector. These sixteen sectors demonstrate the scope of the areas of economic activity that are key to a country’s national security. However, each country needs to identify its own list based on its own conditions.

The U.S. National Cyber Security Strategy that the White House issued in September 2018 is also instructive regarding the range of actions a government can take to protect critical infrastructure. Recognizing the level of threats and history of malevolent actions from various sources, the U.S. strategy paper notes actions it can take—and has taken—against actors who have committed cybercrimes. These actions include publicly attributing malicious actions to the responsible parties and releasing the details of the tools and infrastructures they have employed, as well as removing software vulnerable to various security risks. Moreover, the Administration holds agency heads responsible for managing the cybersecurity risks they control while also empowering them to provide adequate security.

The European Union

The European Union has taken similar steps. The EU put in place a process for identifying and designating European critical infrastructures (ECIs) and set out an approach for improving their protection under Directive 2008/114/EC. This Directive, which went into force January 12, 2009, and which member states were required to incorporate into their national laws by January 2011, mandates that countries identify ECIs, with the Commission's help if necessary, using cross-cutting criteria (e.g., possible casualties, economic effects, impacts on the public, and sectoral criteria specific to the particular ECI).

Member States ensure under the Directive that there is an operator security plan (OSP) in place for each ECI. The process of developing the OSPs identifies the critical assets of the ECI as well as the existing critical security solutions for protecting them. In addition, EU countries ensure there is a liaison officer designated as the contact point between the owner or operator of each ECI and the concerned country authority.

The Commission set out a new approach in 2013 after a review of the Directive for implementing the European program for critical infrastructure protection. The approach aims at building common tools and methods for critical infrastructure protection and resilience in the EU, paying closer attention to the interdependencies among state actors and industries. Moreover, it notes that many infrastructures have a cross-border dimension. Measures to boost preparedness include contingency planning, stress tests, and raising awareness, as well as joint training exercises. As an EU Commission Working Document on critical infrastructure notes, "By ensuring a high degree of protection of EU infrastructures and increasing their resilience (against all threats and hazards), we can minimize the consequences of the loss of service to society as a whole."

CHAPTER IV: THE EUROPEAN UNION'S INTEREST IN AND COMMITMENT TO THE REGION

The European Union (EU) has expressed growing commitment to the stability and prosperity of the Caspian region since the European Council's adoption of The EU and Central Asia: Strategy for a New Partnership in June 2007. This strategy's primary result has been greater cooperation among EU and Central Asian states, particularly on security issues. Part of this effort has involved investments in critical infrastructure projects in the South Caucasus and Central Asia.

The Investment Facility for Central Asia (IFCA) is a component of the European Union Strategy for Central Asia. The IFCA intercedes when high priority investment projects do not have sufficient funds and are at risk of finalizing completion behind schedule. Many of the projects IFCA financed fall into the category of critical infrastructure.

The EU has signed numerous bilateral agreements that provide policy frameworks for cooperation with the Caspian states. The EU-Azerbaijan Partnership Priorities came to fruition in July 2018 marking a critical step toward strengthening EU relations with Azerbaijan in important areas. The priorities include strengthening institutions, good governance, economic and market opportunities, connectivity, energy efficiency, and mobility. Promoting good governance and market opportunities is directly related to critical infrastructure protection. As previously expressed, government cooperation with the private sector is important for the development of these projects. Companies must be attracted to the business and investment environments of a country and trust its government in order to invest there. Frameworks such as Partnership Priorities help identify the issues to be solved.

The EU has financed rural infrastructure projects in Kyrgyzstan, including the construction of a section of the Osh-Isfana road corridor, as part of an effort to create a connected surface route. The project's goal is to reduce transportation costs and increase road safety.

The EU has invested in electrical grid resiliency in Central Asia by providing funding for various projects. The European Investment Bank (EIB) is currently active in four Central Asian countries, including Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. The EIB is providing a €70 million loan to Kyrgyzstan for the CASA-1000 energy infrastructure project.

The EU and the Greater Caspian Region have strong energy relations. Azerbaijan currently supplies around 5 percent of the EU's oil demand and is key to the EU's diversification of its gas supplies, because of the Southern Gas Corridor (SGC). The EU Commission and a number of Member States have been deeply involved in the SGC's realization.

CHAPTER V: RUSSIA'S INTERESTS IN THE REGION

The overarching reality of much of the critical infrastructure in the Greater Caspian Region is that it was first established under the Russian Empire or the Soviet Union and has been further built up upon those systems. Added to this reality is Russia's interest for economic, commercial, political, and security reasons in current efforts to develop the Greater Caspian Region's critical infrastructure.

Russia puts a high priority on establishing and maintaining influence in the Caucasus and Central Asia because of the region's natural resources and potential for economic cooperation as well as for historical and strategic reasons. During the Soviet Union's existence, infrastructure in the region was tied together into one system which was dominated by the center. After the Soviet Union's breakup, many of the oil and gas pipelines wound up owned and operated by Russia. As a result, Central Asian countries initially depended heavily on access to Russian oil and gas pipelines to get their energy resources to the global market. Today, Central Asian energy resources still serve an important purpose for Russia, since Russia can sell the resources at a profitable price to third party customers. It can also influence the flow of oil and gas from Central Asia in ways that prevent those movements from undercutting its own use of oil and gas supplies as a foreign policy tool. For these reasons, the reliability and resiliency of oil and gas infrastructure in Central Asia is important to Russia. At the same time, these reasons led Azerbaijan to look for ways to export its hydrocarbons directly west—policies the United States and the European Union and its Member States have supported.

Connections remain strong with Russia in the IT/telecommunications sector as well. Russian software and other computer services are highly visible, even in such workaday matters as the number of individuals, including senior figures in the national governments in the Greater Caspian Region, who continue to hold work and personal email addresses ending in “.ru.” As with China, where data are stored on a server can matter in terms of critical infrastructure protection.

Russia has had strategic as well as commercial interest in trans-Eurasian surface transport routes since the construction of the TransSiberian railroad. While there have been assertions that Russia has tried to slow or even quash new east-west surface routes across Eurasia as unnecessarily duplicative of the Russian TransSiberian route, Russia has worked with Azerbaijan and Iran to build and modernize a rail link running from the Persian Gulf, through Baku, up to Moscow, and from there into northern and western Europe.

In the electricity sector, Russia and Uzbekistan have discussed the creation of a Central Asian energy ring that would link the energy systems of the regional states. Russia has also been exploring cooperation in the nuclear sector in Uzbekistan. The two countries have launched nuclear power plant plans in Uzbekistan that would cost approximately \$11 billion. Preliminary work began in October 2018, and construction is expected to begin in 2020. The plant will be largely financed by a loan from Russia, and create two 1,200-megawatt nuclear reactors; it is set to begin operating in 2028.

Unfortunately, cooperation among Russia and Central Asian states has declined in recent years. This situation is reflected in both trade turnover and annulled agreements on energy projects. For example, Russia was slow to implement several projects, and consequently Kyrgyzstan decided to void the agreements to construct the Verkhne-Narynsky hydropower plants and the Kambaratin-1 hydropower project. Combined Russian investments in these major projects amounted to more than \$2 billion. Furthermore, Russia has lost its monopoly on the Central Asian gas market since the breakup of the Soviet Union. Newly constructed pipelines carrying gas to China gave regional producers more leverage in negotiations with Russia which is now in an unfavorable position to dictate the terms of the gas trade as it previously did.

Competition with outside actors, notably China, has led Russia to adopt a different approach toward activity in Central Asia. Part of this approach involves linking Central Asian resources with South Asian markets. Russia has expressed interest in regional energy projects, such as the Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline and the CASA-1000 power transmission line. Additionally, Russia has offered to participate in several other projects in Afghanistan, including construction of hydropower plants, hydrocarbon reserve surveys, and increasing oil exports to fulfill the country's demand.

CHAPTER VI: CHINA'S STRATEGY FOR CRITICAL INFRASTRUCTURE IN THE GREATER CASPIAN REGION AND ITS IMPLICATIONS

Stretching from the South China Sea across the Eurasian landmass, China's Belt and Road Initiative (BRI) is the most ambitious development plan ever conceived. The BRI consists of two main components: an overland Silk Road Economic Belt (SREB) connecting China with Central Asia and beyond, and an ocean-based 21st Century Maritime Silk Road to China's south. The SREB, which encompasses several resource-rich countries in Central Asia and the Greater Caspian Region, including Iran, fits perfectly with Beijing's vision of promoting trade while securing a land-based energy supply route. The latter would help allay China's fear that the U.S. would halt oil and LNG shipments through the Strait of Malacca in the event of conflicts between China and U.S. allies in the Pacific.

Geographic considerations are regarded as one of the primary driving factors for China's interest in constructing and upgrading infrastructure in the Greater Caspian Region. So far, most of the attention in China's Belt and Road Initiative has centered on the northern rail routes through Russia and Central Asia, as well as on investments in Mediterranean and Indian Ocean seaports. However, policymakers in Beijing have long dreamt of an alternative trade route that would more closely align China's land and maritime trade strategies. This vision makes the Caspian Sea strategically important to China's grand initiative.

China hopes to boost its energy security by connecting the resource-rich Caspian region with the BRI. The Caspian Sea contains immense oil and gas reserves that are yet to be fully exploited. Some Chinese scholars argue China should take advantage of the BRI to promote the development of a "Caspian energy community" and to deepen its strategic relationship with the Caspian states. China seeks to rationalize its layout, ease the supervision of energy finance, and reduce the volatility of international oil prices to improve its position in global energy market. China also intends to use its geographical advantages and energy demand levels to open up the energy market of Central Asian countries. Establishing a long-term mechanism for communication and cooperation with Central Asian countries would aid China's transition from a land-based power to a land-sea power.

Telecommunication and Electrical Grids

China's electricity consumption in 2016 stood at 5.92 trillion kilowatt hours (kWh), making it the number one consumer of electricity worldwide. China is a potential market for Central Asian and Caspian countries to sell their excess power, with China providing technical support to their electricity and telecommunication infrastructure in return. China's State Grid, the country's top power distributor, has already expressed willingness to seek market expansion in countries involved in the BRI.

Speaking at the annual B20 China Business Council meeting in December 2017, State Grid Chairman Shu Yinbiao said power investment demand would reach 1.5 trillion U.S. dollars in Belt and Road countries in the next five years. He cited the strong demand to upgrade power facilities in Central Asia and Eastern Europe. The company would push forward power projects in Belt and Road countries, with the aim of strengthening power network connections between the countries.

Kazakhstan has 63 power plants nationwide, including five hydroelectric power stations scattered primarily along the Irtysh River in northeastern Kazakhstan. Astana is now exploring opportunities to expand its electricity export market and is already setting its sights on China to unload some of its excess power generated. Kazakhstan Electric Grid Operating Company (KEGOC) is planning to renew a majority of the firm's 25,000 kilometers of power transmission lines that were built during the Soviet period. Plans include the implementation of 15 projects, valued at \$3 billion, to modernize or build new power transmission lines and substations by 2025. At the same time, Kazakhstan's national electricity generator Samruk-Energo plans to install new power plants with the capacity of 14 gigawatts by 2030. There is huge potential for China and Kazakhstan to cooperate and integrate these projects into the BRI framework.

Oil & Gas Production and Transport Systems

In April 2017, a new strategically important natural gas pipeline running from southern Kazakhstan to China began operating. The 1,454-kilometer pipeline is jointly operated by China National Petroleum Corp (CNPC) Trans-Asia Pipeline Co. Ltd. and Kazakhstan's state KazTransGaz and will provide China with 5 billion cubic meters of natural gas each year. The CNPC said it is a key energy project within the Belt and Road Initiative as well as a significant part of the Central Asia-China Gas Pipeline, which starts at Turkmen-Uzbek border on the right bank of Amu Darya and runs through central Uzbekistan and southern Kazakhstan before reaching Khorgos in China's autonomous Xinjiang Uygur region. The Central Asia-China Gas Pipeline, together with the Turkmenistan's East-West pipeline route from Shatlyk to Belek, are an eastward extension of the possible Trans-Caspian Pipeline between Türkmenbaşy in Turkmenistan and Baku in Azerbaijan. Therefore, they will possibly provide China with the access to subsea natural gas in the Caspian Sea and further diversify China's sources of natural gas imports.

Rail and Ferry Links

The strategic importance of the Greater Caspian Region as a potential North-South and East-West transportation hub is reflected in several key BRI infrastructure construction projects. The Trans-Caspian International Transport Route (TITR) satisfies several checkboxes for China: it is less time-consuming, avoids Russian territory, and strengthens energy cooperation between China and the Caspian states. Of all the potential Belt and Road land corridors between the Europe and China, the route from Piraeus, Greece, to Khorgos, on Kazakhstan's border with China involves the smallest land element, passing through only three intermediary countries and is an alternative to Russia's Trans-Siberian Railway. The TITR is supposed to shorten the length of time it takes to transport cargo from China to Ukraine's Chornomorsk city seaport, to only 14 days. Moving containers across Georgia and Azerbaijan to the Caspian Sea may be worth the higher cost than those of a pure sea route for China and would be much cheaper and quicker than the northern Belarus-Russia or

Belarus–Russia–Mongolia routes. China has upgraded key Iranian and Uzbek railway tracks. The Tehran–Mashhad Line is one of the prioritized railway lines undergoing electrification within the BRI framework. This project is contracted to China National Machinery Imp. & Exp. Corp., MAPNA Group, Su Power Technology, and RZD International LLC, and it is financed by the Iranian government and the Export–Import Bank of China. With a length of 926 kilometers, the Tehran–Mashhad line is one Iran’s most used railways and one of the few double-track lines in the country. Completion of this project means that another alternative overland transportation route that skirts around Russian territory.

The Afghanistan–China–Kyrgyzstan–Tajikistan–Iran Rail Road Project, the so-called Five Nations Railway Corridor Project (FNRC), is a 2,100-kilometer long railway that will run through China, Tajikistan, Kyrgyzstan, Afghanistan, and Iran, connecting China with the Iranian ports of Chabahar and Bandar Abbas. In April 2017, China and Afghanistan signed a Memorandum of Understanding to integrate the project into China’s BRI. The project is seen as boosting the transportation capacity of the countries involved and energizing the growth of their national economies, expanding their trade, and promoting tourism ties. In addition, it will reduce the distance for commercial transport between the East, from China to Iran, and the West, toward Western Europe. It will also help connect member countries to the open waters of the Persian Gulf through Iran. In addition, shipping costs along this route will decrease, due to a shorter distance and time.

Implications for the Greater Caspian Region

China’s commitment to improving key energy and transportation systems in the Greater Caspian Region can help address the problems with critical infrastructure there. China has demonstrated a strong political will to boost trade and communications between China and Europe through Eurasia by reinforcing the construction of new transportation and energy links and integrating regional projects into the BRI framework.

However, the BRI-related infrastructure project loans may cause a problematic increase in certain host countries’ sovereign debt levels. China’s state-owned financial organizations are issuing huge amounts of cheap government debts to finance the infrastructure construction in Belt and Road countries. One of the major problems with the current lending mechanism is that China does not regularly report cross-border project financing in a standardized or transparent manner. The Chinese Development Bank and China Exim Bank do not disclose the terms of their loans, making it difficult, if not impossible, to assess accurately the present value of the debt owed to China by each host country.

There are concerns too that the terms of the contracts arranged under the BRI umbrella will be overly favorable to China and not track with what have been international norms. The dispute settlement clauses have been particularly flagged in this regard. Moreover, use of Chinese equipment and software in computer and telecommunications systems could give China control and oversight of these systems, posing a threat for their BRI partners.

Large-scale infrastructure projects also create opportunities for graft and rent-seeking behaviors in host countries, especially in countries where transparency is lacking and corruption is already widespread. This issue, along with the relatively low social and environmental standards of Chinese infrastructure investments, could lead to social unrest and local protests in the region.

CHAPTER VII: CONCLUSIONS AND RECOMMENDATIONS

Protection of critical infrastructure systems, like their design and construction, requires active engagement by the private as well as the public sector. The needs, threats to the various critical infrastructure systems, and the investment and commercial realities presented will vary by country. Thus, the most prosperous countries in the Greater Caspian Region (Azerbaijan, Russia, and Kazakhstan) have better infrastructure than the other states in the region, but there is still a need for modernization and improvement in their critical infrastructure systems and for ensuring their reliability and integrity. At the same time, the way these systems connect those of other parts of the world, e.g., through the BRI and the New Silk Road, or add to the security of other regions or countries, the protection of critical infrastructure systems in the Greater Caspian Region can be important to China and other neighboring states as well as to the United States and other countries further afield. The construction of the new surface transport routes, including the ways in which they supplement the Northern Distribution Network or afford needed commercial routes to Afghanistan while at the same time improving and diversifying trans-Eurasian east/west trade offers a very concrete example of this fact.

Another reality is that critical infrastructure systems are integrated. Internet and telecommunications systems exemplify how one set of critical infrastructure systems not only support but can be essential to the robust operation of others. Yet, the IT and telecommunications systems are subject to continuous hacking and other attacks. Governments, companies, and private users may be paying insufficient attention to maintaining the safety and integrity of their systems and data. And without power, the IT and telecom systems are simply not going to work.

Against this background and the realization that threats to the critical infrastructure in the Caspian or any other single region can have consequences for others, even for governments, companies, and individuals a number of time zones away, we put forward the following recommendations:

1. Recognize that critical infrastructure systems are interconnected almost by definition.

–Development of approaches to defend them need to be similarly multi-dimensional.

2. See critical infrastructure protection as an on-going process.

–Malicious actors, whether state-sponsored, extremist inspired, or single individuals will continue to develop new ways to attack; those defending any of these systems need to remain vigilant and imaginative to keep ahead of any attacker.

3. Develop trusted relations among key decision makers to facilitate needed information exchange on current and emerging threats and coordinate responses.

–The nature of critical infrastructure systems is such that it is essential to foster discussion within governments, as well as among governments, the private sector, and other key players, to identify critical infrastructure systems, the types of threats they face, and develop/implement actions to meet and counter those threats.

4. Hold a Trans-Caspian Summit that focuses on the creation of a Caspian handbook that discusses potential protocol when modernizing critical infrastructure systems that affect more than one's own system(s). The handbook should include the following:

- Measures to identify, deter, and overcome attacks or other infrastructure breakdown;
- Measures to identify gaps and opportunities for collective action;
- Measures to increase cross border engagement among governments in the region to coordinate actions against threats to existing critical infrastructure and to build newer, more robust systems.

5. Develop comprehensive national Information and Communications Technology strategies.

- Include detailed analysis on connectivity, policies/plans, and other dimensions of critical infrastructure systems, in order to understand challenges, issues, and barriers to modernizing
- Include regional neighbors in the discussion, involving opportunities to cooperate amongst one another. The national strategy should have both a short-term (3–5 years) focus, as well as a long-term (10 years).

6. Implement United Nations General Assembly Resolution 67/298

- Initiate the Eurasian Connectivity Alliance (EurACA), which was originally envisioned by TASIM. As noted in the resolution, the creation of the EurACA would highlight synergies among governments, the private sector, civil society, academia and international development institutions towards improving the development of regional telecommunications transit routes.

7. Decide to make protection of critical infrastructure an element of governments' bilateral engagement with the United States and other partners.

8. The United States, the EU, and its Member States should recognize that reaching out to the countries of the Greater Caspian Region to help them strengthen their critical infrastructure systems would also benefit the well-being of western countries.

1725 I STREET NW, WASHINGTON, DC 20006
202.349.3762
INFO@CASPIANPOLICY.ORG
CASPIANPOLICY.ORG

