

Nexus Dialogue on Water Infrastructure Solutions



CENTRAL ASIA

Workshop Report

Nexus Dialogue Workshop Report

Istanbul, Turkey, 15-17 July 2014



Triggering Cooperation across the Food-Water-Energy Nexus in Central Asia

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Executive Summary

Water, energy and food systems are inter-connected and have become increasingly more complex and dependent upon one another. As a result, a disturbance in one system can destabilise the others - highlighting the need for a ‘Nexus-Based Approach’. This requires the water, energy and food sectors to engage in a dialogue and deliberative analysis of river basins, looking for solutions to optimise the inter-dependencies and support the equitable and sustainable allocation of natural resources while balancing environmental, social and economic issues.

The *Nexus Dialogue on Water Infrastructure Solutions* held the last in a series of four regional “Anchor” workshops (for Africa, Latin America and Asia) in Istanbul, Turkey on 15-17 July 2014 in partnership with the EastWest Institute. Participants were drawn from across Central Asia from the water, energy and food sectors. The Nexus Dialogue workshop provided an opportunity to identify the problems and solutions to secure water, energy and food security, both across and within Central Asian river basins.

The aim of the Nexus Dialogue workshop was to build on the outputs from the African, Latin American and Asian workshops and focus on the implementation of solutions for water, energy and food security in the region. Workshop participants were encouraged to identify where the barriers to implementation exist, and look at where and how these have been overcome.

The objectives of the workshop were to:

- Learn from workshop participants about their nexus challenges
- Support participants in establishing coordinated nexus roadmaps
- Understand how to scale up nexus solutions

A number of emergent themes came out of the workshop, these included:

- The need to improve nexus data, information and decision support systems
- The need to enable new and innovative nexus (clean/green/eco) technologies
- The need for improved nexus governance platforms and institutional arrangements

Participants from the Istanbul workshop were encouraged to build new coalitions and partnerships for follow-up action in technology, demonstration and investments in built and natural water infrastructure and national-level dialogues on policy and implementation.



I. Introduction

This paper is a report on *Triggering Cooperation Across the Food-Water-Energy Nexus in Central Asia*, a workshop convened by the International Union for the Conservation of Nature (IUCN), the International Water Association (IWA) and the EastWest Institute (EWI). This meeting, held on 15-17 of July 2014, in Istanbul, Turkey, brought together over 50 experts from the Central Asian region and from the international community, to discuss integrated resource challenges in the Amu Darya basin, and to develop potential solutions to address these challenges. Outcomes of the workshop included five individual “Nexus Action Plans” which addressed identified problems with fully-fledged project proposals.

The report is structured as follows: Section Two provides an overview of the countries abutting the Amu Darya River, including Afghanistan, focusing in particular on natural resource management issues within their overall development context. Section Three outlines the structure and methodology of the workshop and situates the meeting in the context of other Nexus Dialogues convened by IUCN and IWA as well as prior work by the Amu Darya Basin Network. Section Four and Five reflect the flow and outcomes of the workshop proceedings, respectively dedicated to problem identification (Day 1) and solutions (Day 2). Section Six presents the Nexus Action Plans in the form of detailed project proposals elaborated with details on funding, potential partners, and ways to move forward. This section also presents the opinions of a high-level panel, which evaluated these Nexus Action Plans and spoke on sustainability issues more broadly. The report concludes with information on next steps.



II. An Overview of the Central Asian Region and its Natural Resource Challenges

The Amu Darya River Basin

The Amu Darya is the longest river in Central Asia (2,540¹⁰ km), and is crucial to the livelihoods of the approximately 50 million people who live in its basin. Fed by glacial streams from Tajikistan, Afghanistan and Kyrgyzstan, the Amu Darya flows northwest through Uzbekistan and Turkmenistan towards the Aral Sea. Beginning in the Pamir-Alai and Hindu Kush mountains, the Amu Darya basin contains upstream mountainous ecosystems and downstream arid deserts and grasslands at lower altitudes. Once a key component of ancient Silk Road trade routes, the region continues to be of great geopolitical importance today due to a variety of factors including its rich endowment with natural gas and oil resources and its strategic positioning in the heart of Asia, in close proximity to both regional and global powers and conflict-affected states, notably Afghanistan.ⁱ

Since the collapse of the former Soviet Union, the four Central Asian riparians have experienced mixed progress in implementing gradual transitions to reform and democratization and achieved varying degrees of success in promoting inclusive social and economic development. On the Human Development Index (HDI) -- a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living -- all four republics feature in the “medium human development” category.ⁱⁱ

Additionally, the four Central Asian riparians score in the bottom rankings of Transparency International’s 2013 Corruption Perception Index.ⁱⁱⁱ Notably, both Turkmenistan and Uzbekistan tied for a spot among the ten most corrupt states, and Kyrgyzstan and Tajikistan were not far behind. A recent report by the International Crisis Group (ICG) noted that the combination of these intersecting problems, including competition over water and other resources, “contribute(s) to the overall sense of political and socioeconomic disenfranchisement and instability” in the region – and manifests in armed clashes, border disputes and worsening tensions.

Intra-regional and intra-country disparities further complicate the situation. Despite notable strides since the end of its civil war^{iv} in 1997, Tajikistan remains the poorest, with almost half of its rural population below the national poverty line.^v Additionally, Tajikistan has one of the lowest GDPs per capita among the 15 former Soviet Republics.^{vi} Kyrgyzstan, which has similarly experienced a high degree of political and social unrest, has 38 percent of its population under the national poverty line, and a quarter of its working poor earn less than \$2 per day.^{vii} Kyrgyzstan’s economy depends heavily on gold exports, and agricultural cash crops, such as tobacco and cotton, are grown almost exclusively for export.^{viii}



In contrast, Uzbekistan’s exports of copper, gold, natural gas and cotton have allowed the country to experience increased GDP growth, and its limited exposure to international financial markets have largely insulated it against the recent global economic downturn.^{ix} Similarly, Turkmenistan has experienced strong economic growth, expanding by 10.2 percent in 2013^x. The country’s main exports are gas and crude oil petrochemicals, but its economy also benefits from a thriving cotton industry.^{xi} Yet everywhere, pockets of hardship persist, though precise data is often hard to come by: about 7.5 million Uzbeks lack access to safe drinking water, as do 4.8 million Tajiks and 2 million Kyrgyz.^{xii} Calculations derived from World Bank statistics put the number of Turkmens without access at approximately 1.5 million.

Current challenges will likely be aggravated by emerging problems – in particular, climate change. Notably, the Central Asian region is warming faster than the global average, and climate change will hit the region sooner and harder.^{xiii} Upstream glaciers are already experiencing accelerating loss of ice due to warmer temperatures, and projected precipitation decreases will further aggravate conditions in the already water-stressed basin.^{xiv}



Changes in water flow could negatively affect hydropower infrastructure, impacting energy generation efficiency, reservoir management and seasonal water availability,^{xv} including for

agriculture, which is a mainstay of Central Asian economies, making up more than one fourth of the GDP of Tajikistan and about one fifth of the GDPs of Uzbekistan and Kyrgyzstan, respectively. While some areas will likely benefit from longer growing seasons (northern and eastern Kazakhstan), others (western Turkmenistan and Uzbekistan) could suffer from increased water demands for irrigation as temperatures rise.^{xvi} Cyclical flooding and droughts already plague Central Asian countries, and are likely to increase with a changing climate.^{xvii}

Additionally, population growth is skyrocketing. In the half-century spanning 1960 to 2010, the population increased from 14 million to approximately 50 million.^{xviii} The region expects to gain another twenty million by 2040, placing enormous demands on water and infrastructure,^{xix} including increasingly in urban areas.

The Food-Water-Energy Nexus in the Amu Darya River Basin

The Amu Darya River Basin today offers almost paradigmatic food-water-energy nexus dilemmas. Much of this situation is rooted in historical circumstances: Soviet era resource management in the region was centrally directed from Moscow, using water quotas and energy barter deals to capitalize on an abundance of water resources in the upstream territories and a wealth of fossil-fuel resources in the downstream territories, respectively.

Beginning in the 1960s, extensive withdrawals and pollution of Amu Darya River waters, associated with upstream agriculture, contributed to the decimation of the Aral Sea. Shrunken to 10 percent of its original size, the Aral Sea is considered among the world's worst environmental crises, with severe economic and social impacts on local populations. The entire eastern part of the basin completely dried for the first time in history in September 2014.^{xx}

Following the collapse of the Soviet Union, existing governance arrangements broke down, setting the stage for persistent regional tensions over resource use and allocation. While Central Asian countries formed the Interstate Coordinating Water Commission (ICWC) and signed the 1992 Almaty Agreement specifying water quotas, these frameworks have not effectively rallied participating countries around benefit-sharing in the face of substantial broader economic and political pressures.

This is true despite strong interdependencies among riparians. Upstream countries are rich in abundant water resources while downstream countries are major producers of fossil fuel energy and agricultural crops. Kyrgyzstan and Tajikistan rely mainly on hydropower for energy, with much potential still unutilized, and experience serious energy insecurity; Yet at a regional level, there is no shortage of primary energy resources^{xxi} with many gas and oil reserves located along the border between Turkmenistan and Uzbekistan, two countries that are net exporters of natural gas. Importantly, though a push for diversification in pursuit of food self-sufficiency has reduced



the land area used to grow cotton, the fiber continues to be a dominant driver of the political economies in Central Asian.^{xxii}

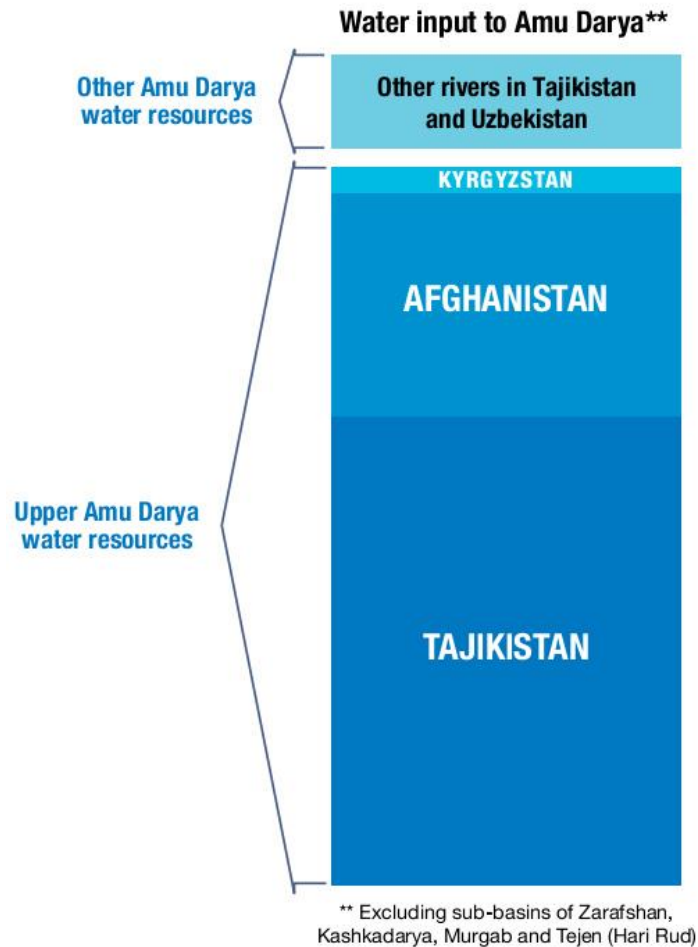
The planned the Rogun dam is a central conflict flashpoints in the region. The project's location is 70 km upstream of the Nurek hydroelectric dam, which currently provides most of Tajikistan's electricity, on the Vakhsh River, a critical tributary of the Amu Darya. If completed as envisioned by Tajik authorities, Rogun would be the world's tallest dam, producing an estimated 13.3 billion kWh of electricity annually.^{xxiii} To put that figure in perspective, Tajikistan produced a total output of 16.1 billion kWh of electricity in 2009.^{xxiv} While potentially a boon for national and regional development – with ambitions, for example, for export of excess production to Afghanistan and Pakistan, -- the project also portends to significantly alter the larger power balance among the fractious independent republics.¹

Originally conceived in Soviet times, its construction was interrupted by flooding, political upheaval and finally a civil war. Since 2012 only safety-related and maintenance activities have been carried out pending the completion of technical, economic, environmental and social assessment studies under the aegis of the World Bank, which released its report in September 2014.^{xxv} Examining possible dam height among several issues of great controversy, such as seismic risk, the anxiously awaited study concluded that the tallest design would fall within international safety norms, subject to specified design modifications and implementation of monitoring measures. The study also found that the highest dam option would have the longest project life, and therefore would guarantee low-cost energy production for the longest period of time.

In addition, the impact assessment found that a dam built at any of the three proposed heights at the Rogun site *could* be operated in a way that made no changes to historical flows^{xxvi}, though flows would likely be reduced during the construction and filling period, which could take up to 16 years. Additionally, resettlement of households near the dam site or in the reservoir area would result in both physical and economic displacement, and would be a major impact of the dam's construction.^{xxvii}

The pervasive lack of trust between Tajikistan and Uzbekistan is likely to contribute to continuing controversy around the dam's construction, and the findings of the World Bank's assessment are likely to be contested and challenged in the coming months. The results of the assessment raise additional questions that must be addressed prior to the dam's construction. For example, the issue of financing the project (the dam is projected to cost about 50% of Tajikistan's GDP^{xxviii}), must be resolved before further steps are taken.

¹ Currently in planning stages, the Central Asia South Asia Electricity Transmission and Trade Project (CASA-1000) will build more than 1,200 kilometers of electricity transmission lines and associated sub-stations to transmit excess summer hydropower energy from existing power generation stations in Tajikistan and the Kyrgyz Republic to Pakistan and Afghanistan.



Afghanistan

More than one fifth of the Amu Darya’s flow originates from mountain streams in northern Afghanistan^{xxix}, yet its resource utilization is nowhere near commensurate with its contribution. This is not surprising after decades of violent conflict that have ravaged the country’s social fabric, economic infrastructure and institutions. Even today, as international forces in Afghanistan transition to Afghan forces, its future lies in the balance and much of its population remains extremely vulnerable.

Afghanistan consistently ranks in the bottom of global development and humanitarian rankings.^{xxx} Lack of resources and poor governance in the public sector result in large gaps in the provision of basic services. Only 10-15 percent of the Afghan population has access to electricity.



^{xxxii} Millions of people are seasonally or chronically food–insecure, and widespread poverty is exacerbated by frequent natural disasters, such as flooding and landslides, which strain the already fragile coping capacity.^{xxxii} Not only has the conflict produced massive internal displacement of people, Afghanistan also has a large number of returning refugees as the situation appears to improve. As of 2013, 5.7 million people had returned to the country.^{xxxiii}

Assuming a stable political dispensation can be found, a massive economic reconstruction and development effort will of necessity focus on rebuilding the country’s agricultural system. Prior to the wars Afghanistan was mostly self-sufficient in its food supply and was renowned for its almonds, pomegranates, pistachios, raisins and apricots. However the agricultural sector and the accompanying irrigation systems in Afghanistan have suffered from nearly a quarter century of debilitating conflict and unrest – agricultural production grew at a rate of only 0.2 percent per year during the conflict period (1978-2001), compared to 2.2 percent in the pre-conflict period (1961-1978). Currently, wheat is by far the most important crop, grown by 77 percent of households farming on irrigated land. The domestic cereal supply in Afghanistan is nonetheless usually unable to meet demand even in good harvesting years, rendering Afghanistan dependent on wheat imports from neighboring countries to meet its food security needs.

Today, the agricultural sector contributes about fifty percent of GDP, and eighty percent of Afghanistan’s population depends on agriculture for their livelihoods. In the face of man-made but also natural disasters – a semi-arid country, Afghanistan has experienced cyclical drought in eight of the past eleven years – the government has plans to undertake major upgrades of dilapidated irrigation networks to ensure reliable access to water for farmers. The rural development strategy relies on private investment and public sector support to transform agriculture in some prioritized zones where conditions are most favorable and high value-added commercial agricultural activities can flourish. Five of these agricultural growth zones are located in northern Afghanistan, near the Amu Darya River.

Irrigation is already the largest water-consuming sector in Afghanistan (93 percent of the country’s total water use). The rehabilitation of Northern Afghanistan’s irrigation systems, along with their necessary expansion, has the potential to triple withdrawals from the Amu Darya from 2.1 bcm to 6 bcm^{xxxiv}. Experts believe that substantial increases will however not occur for at least two decades, and that these are hence not likely to immediately aggravate already competitive pressures in the basin.^{xxxv}

The long-term trend does nonetheless crystallize the importance of integrating Afghanistan into regional resource dialogues for development and security purposes. Water and agriculture – but also energy, with substantial recent discoveries of oil and gas that have drawn the interest of outside investors² as well as its largely unrealized hydro-generation potential (estimates exceed 23,000 MW through large, medium and small hydropower projects^{xxxvi})-- are central to a

² International interested in gas and oil tenders in Afghanistan has increased since oil and gas production began in the country. In 2011, China National Petroleum Corporation (CNPC) and Watan Oil and Gas were awarded three contracts for hydrocarbon exploration and production projects, and in 2012, a consortium consisting of Dragon Oil,



successful post-conflict transition in the country, directly pointing to a greater role of Afghanistan in the future development of the Amu Darya's resources. At this stage, however, there are no working channels for the systematic integration of Afghanistan into regional water management dialogue.³

About Nexus Dialogues

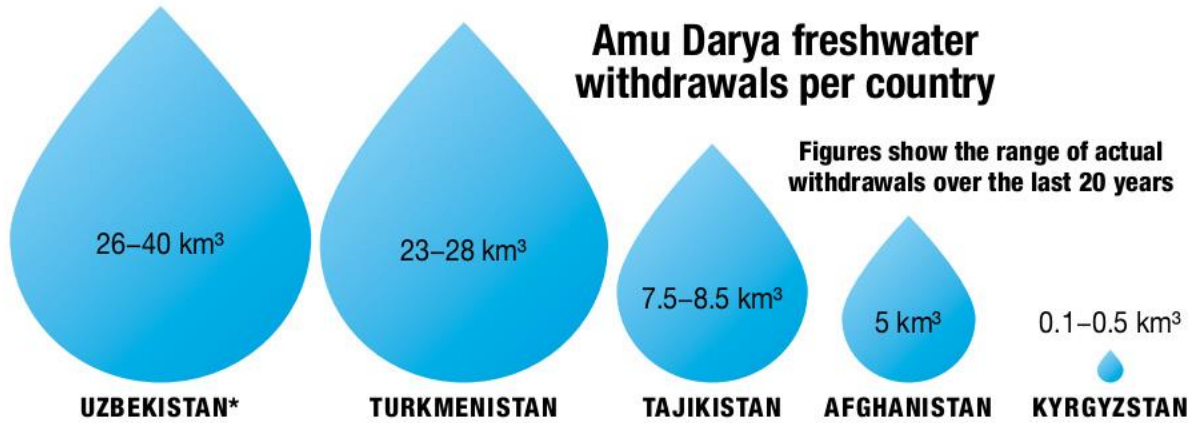
The International Union for Conservation of Nature (IUCN) and the International Water Association (IWA) are collaborating on a two-year joint initiative to address competing water demands in river basins: The *Nexus Dialogue on Water Infrastructure Solutions* is a call to action to those leading transformations in water infrastructure planning, financing and operation, facilitating new engagements across sectors to deal with the interconnected challenges around water, energy and food/fiber production.

The Central Asia nexus workshop, co-convened with EWI, was one of a series of regional meetings dedicated to fostering an exchange among water, energy and agricultural resource managers and policy experts. It also built on the membership and experience of the *Amu Darya Basin Network* – an EWI-initiated platform linking over 75 local and international experts to support collaborative research, policy development, and knowledge transfer to improve water management in the region.

The outcomes of this workshop, as well as three earlier ones held in Africa, Latin America and Asia, respectively, will feed into the 2014 Nexus Dialogues Symposium in Beijing China, on November 11th-13th.

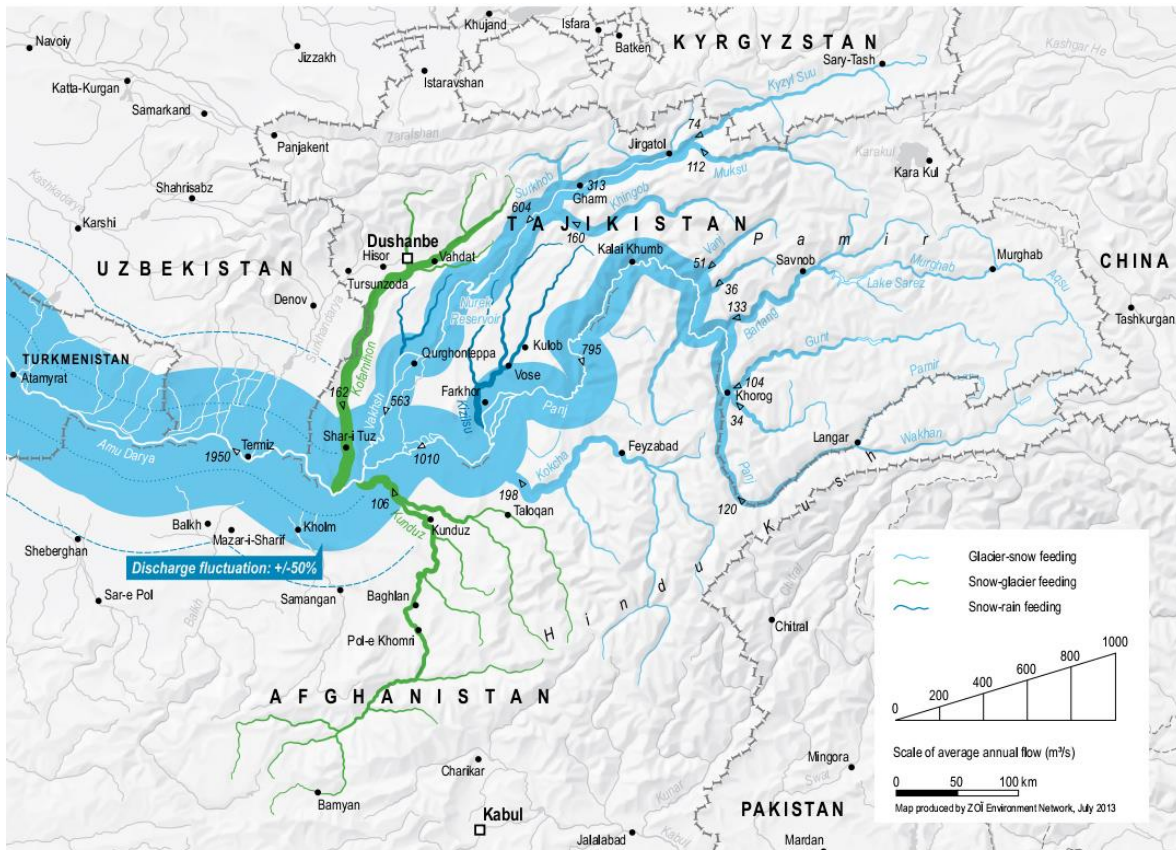
TPAL and Ghazanfar Investment Ltd. were awarded two projects in the Afghan-Tajik basin.² While the development of these valuable resources risks potentially increased conflict and corruption instead of development, they could also provide the much needed impetus for economic recovery.

³ Though approximately 20 percent of the Amu Darya's flows originate in Afghan territory, the country is not a member of the institutional frameworks established following the collapse of the Soviet Union (the 1992 Almaty Agreement, the International Fund for Saving the Aral Sea [IFAS], and the Interstate Commission for Water Coordination of Central Asia [ICWC]). Although a 1946 Agreement with the Soviet Union did allow Afghanistan to use up to 9 km³ of water per year, this agreement was not integrated into the current water-sharing framework, and due to conflict, Afghanistan has since been unable to participate in any agreements on water in the Amu Darya basin.



*Including sub-basins of Zarafshan and Kashkadarya

Source: CA Water Info (→ www.cawater-info.net)





III. Workshop Objectives, Structure and Methodology

A first-of-its-kind meeting, *Triggering Cooperation Across the Food-Water-Energy Nexus in Central Asia* brought together experts from all three key sectors to exchange knowledge, prioritize problem areas and jointly identify solutions, taking into account existing institutional frameworks and initiatives, as well as innovations pioneered globally and in the region and the particular operational realities in Central Asia. Fifty participants from government, international and regional organizations, academia, civil society and the private sector, informed the proceedings with technical, policy and financial expertise.

The overall purpose was to develop “Nexus Action Plans” for strategic investments in integrative solutions for water, food and energy security. More specifically, the workshop aimed to support participants in:

- (1) Gaining an understanding of how to combine and apply best practices on water-energy-food nexus approaches for solutions in river basins.
- (2) Motivating participants to take practical steps toward implementing water, energy and food nexus planning and practices in the Amu Darya River Basin.
- (3) Exploring new avenues for advancing hydro-diplomacy in Central Asia, including in light of the profound transition in Afghanistan, whose agricultural and hydrocarbon resources will play a key role in post-2014 economic reconstruction efforts.



IV. The Nexus Realities: From Global Paradigm to Action in Amu Darya River Basin

“The river is probably the most important economic asset in this entire region, and we don’t treat it as an asset. We treat it as a resource that has no value assigned to it.”

Gary Lawrence, Chief Sustainability Officer, AECOM

The Amu Darya is a key lifeline for the peoples and economies of Central Asia, and sustainably leveraging the region’s rich natural resource base is crucial to the economic and social renewal of the states of Central Asia and Afghanistan. Necessary progress in the collaborative management of these resources has been inhibited by enduring challenges in the energy, water and agricultural sectors. The first day of the proceedings were dedicated to building a common understanding of the emerging nexus concept and its various implications and applications, as well as to jointly identify high-priority nexus problems in the specific context of the Amu Darya basin.

The workshop began with the Basin Challenge Game⁴, an online exercise simulating the development over the course of fifty years of a theoretical river basin shared by two neighboring sovereigns. Posing a series of land use and infrastructure choices and visually illustrating the profound impacts of these on the long-term sustainability of both riparians, the game highlighted the interrelationships within and across sectors and geographic boundaries. In the game – as in real life – clear and consistent communication emerged as essential to maximize co-benefits and minimize trade-offs: “We should have at the beginning benefitted from talking to our neighbors,” reflected one participant whose group found it had to reassess its entire development strategy once it realized that its initial investment choices, heavily driven by short-run profit maximization criteria, left a legacy of environmental and social problems in later decades.

Moving from the virtual sphere to the day-to-day realities in Central Asia, a series of presentations provided an up-to-date picture of the dynamics, and institutional frameworks shaping the production, use, and governance of essential resources in the Amu Darya basin. Regional and international experts identified regional trends, highlighted persistent challenges and commented on possible opportunities for cooperation across the nexus.

⁴ Developed by Nathaniel Matthews in coordination with King’s College, <http://thebasinchallenge.com/playgame.php>



PRESENTATION HIGHLIGHT: Munira Aminova, Assistant Professor at Vrije Universiteit in Brussels, highlighted political, economic, and social changes that took place in Central Asian countries after the Soviet Union collapsed. Poverty and unemployment remain significant, and bound up with nexus-related issues: for example, while Tajikistan aims to reduce poverty to 41.5% by 2015, this goal might be too ambitious, considering winter energy shortages, increasing unemployment, deterioration of sanitation, and the prevalence of malnutrition. Additionally, Aminova touched on differences in demographics and types of governance, including levels of political stability, voice and accountability, between Central Asian countries as a way to explain discrepancies in their respective development agendas and actions.

Building on the presentations, which provided a macro-level overview, participants subsequently worked in small groups, using the PESTLE framework (policy, economic, social, technical, legal and environmental problems), to identify concrete nexus challenges in the upper and lower part of the Amu Darya Basin as well as from a wider regional perspective. A broad sweep of issues emerged ranging from land degradation and a recurrent energy crisis in the Upper Amu Darya to insufficient investment in key resource infrastructure and management capacity as well as political barriers in the Lower Amu Darya.



PRESENTATION HIGHLIGHT: Victor Novikov, Project Manager at Zoi Environmental Network, highlighted some of the most acute nexus problems in the Amu Darya River Basin today. The Golden Age Lake project aims to carry agricultural runoff from irrigated fields in Turkmenistan to a remote desert location. Supporters believe that this will reduce runoff that is contaminated with fertilizers and pesticides, flowing back into the Amu Darya, thereby contributing to improving the health of the river. Opponents maintain that the arid desert climate will cause most of the water, already contaminated with pesticides and fertilizers, to evaporate before reaching the lake, leaving behind a toxic combination of chemicals. Others worry that additional flows will be diverted from the Amu Darya to fill the lake, a prospect which raises objections from other riparians.

Chronic energy deficits and recurring food crises are serious problems in Tajikistan. Novikov pointed specifically to the compound crisis beginning in winter of 2007-2008, when extremely cold temperatures led to widespread blackouts. The severity of the temperatures (-15° C in towns and -25° C in the countryside) caused great damage to the water and electricity system in a country which receives about 98 percent of their energy from hydropower^{xxxvii}. This reduced the country's resilience to locusts and droughts in the following months, which killed crops and livestock, and in turn contributed to a national food crisis, with two million Tajiks unable to access food either because of shortage of supplies or because of high food prices.^{xxxviii}

Tajikistan's government has proposed the construction of the Rogun dam, a project originally conceived of by the Soviet Union. The dam would be the highest dam in existence, and would almost double Tajikistan's current energy generation, at the cost of at least \$3.6 billion USD. This project has raised strong objections from downstream countries on the grounds that the dam would further limit their ability to control their water resources, and could upset downstream agricultural systems – especially during the dam's construction phase, projected to take a decade or longer.

From among the dozens of problem areas flagged, four overarching themes can be discerned as recurring consistently across all working groups:

Data Availability and Lack of Trust

Lack of trust between riparian countries is a major problem in the region. Specifically, the lack of progress on data exchange has prevented the establishment of a comprehensive hydro-meteorological system, without which rational allocation of resources cannot be achieved. While many different networks for data exchange exist (see UNECE publication for a complete list of ongoing data initiatives^{xxxix}), reliable information about the environment, and in particular water resources is not currently available in a consolidated and credible platform. Problems with the current data systems include: low capacity for collecting and managing high-quality data, deteriorating monitoring networks, lack of political will to enable regular information exchange, insufficient budgets for maintaining data networks, regional data is perceived to be politically biased, and information sources have no incentive to provide outside organizations with improved data.^{xl} Particularly, lack of trust in data collected regionally, as opposed to national data, has aggravated these problems.



Low Water-Use Efficiency

Lack of reliable and consistent data exchange and other drivers such as poor irrigation infrastructure practices and a lack of investment in new agricultural and irrigation practices and technologies that has led to low water use efficiency in riparian countries. The region's irrigation networks were largely built between the 1950s-1980s without any significant upgrading or upkeep since, with income generated by large-scale agriculture allocated to other national investments as a form of cross-subsidy.^{xli} Because of problems ranging from deteriorating irrigation networks, to changing evaporative rates due to a changing climate, more than 50 percent of irrigation water is lost before it even reaches the fields.^{xlii}

Pointing to some of the root causes and emerging threats affecting resource security in the region, **Rieks Bosch, Consultant with EcoCoast Consultancy**, argued that Central Asia suffers from a lack of water use efficiency, rather than scarcity. In a comparison with other water stressed areas Bosch noted that water use per capita in Central Asia is twenty times greater than, for example, in Israel. Water efficiency is worst in the agricultural sector, largely due to neglected irrigation infrastructure, outdated technology, and inadequate monitoring and data, exacerbated by fragmented institutional mandates for water management and low levels of trust between riparian states. In terms of solutions, the move towards better resource management can be achieved through data and information exchange and transparent communications. Practical management of resources is needed beyond politics.

Climate Change

Water availability will be affected by climate change, which threatens to decrease flows as average temperatures increase and upstream glaciers retreat. Additionally, increased uncertainty and frequency of extreme events due to climate change could create further pressures on an already fragile system, and flooding or drought due to climate change could negatively impact agricultural productivity, hydropower production, and the availability of water resources in the region. For example, the particularly dry summer of 2008 led to rising food prices in Tajikistan, creating a humanitarian emergency affecting two million people and forcing the country to significantly increase grain imports from Russia and Kazakhstan.^{xliii} While the international community provided food aid to alleviate the immediate problem, chronic food shortages are likely to continue to plague the region, as a result of increasingly frequent and severe droughts.



Incorporating Afghanistan

The inclusion of Afghanistan – beyond current bilateral efforts involving Tajikistan -- in transboundary discussions on resource management is highly desirable. Though approximately 20 percent of the Amu Darya’s flows originate in Afghan territory, the country is not a member of the institutional frameworks established following the collapse of the Soviet Union (the 1992 Almaty Agreement, the International Fund for Saving the Aral Sea [IFAS], and the Interstate Commission for Water Coordination of Central Asia [ICWC]). Yet water, agriculture and energy are central to a successful post-conflict transition in the country, pointing to a greater role of Afghanistan in the future development of the Amu Darya’s resources.

PRESENTATION HIGHLIGHT: Spotlighting the particular circumstances of Afghanistan, **John Shroder, a Professor at University of Nebraska at Omaha**, highlighted the importance of including the country in regional resource-use agreements given that twenty-one percent of the Amu Darya’s flow originates from the country’s mountain streams.^{xliv} The major international treaty governing water withdrawals on the Amu Darya is based on a Soviet era division, which did not include Afghanistan. Afghanistan today only diverts about 2 bcm annually^{xlv} from the Amu Darya River, but as more than three-quarters of the Afghan people live in rural areas where agriculture is the primary activity, rehabilitation of old and dilapidated irrigation systems, as well as planning and building of new irrigation infrastructure are national priorities.^{xlvi} Nonetheless, Shroder stressed that, despite any geographic advantage as an upstream riparian that Afghanistan may hold, in practice the longstanding conflict has vitiated its capacity to actively participate in the governance of water resources in the basin and effectively leaves it with little control.



V. Mapping Nexus Solutions for the Amu Darya River Basin

“The nexus is still in early stages in the region. It is time to develop dynamic and concise, local level, solution oriented tools and instruments for the food-water-energy nexus.”

Iskandar Abdullaev, Executive Director, The Regional Environmental Center for Central Asia (CAREC)

Many ongoing initiatives exist to address enduring nexus challenges in Central Asia, and any effort to mobilize solutions needs to take account of this rich experience. Lessons learned from other parts of the world can also provide ideas and insights, if appropriately modified to fit the particular regional context. The proceedings on Day 2 were thus devoted to highlighting different types of initiatives and solutions promulgated by a wide variety of actors, both locally and globally, in order to inform the subsequent process of collaboratively crafting nexus solutions. Key supporting documentation for this exercise included a recent report from the World Business Council on Sustainable Development (WBCSD), *Co-optimizing Solutions: water and energy for food, feed and fiber*, as well as a compilation of relevant existing institutional activities and frameworks for cooperation (see Appendix XX).

The United Nations Economic Commission for Europe (UNECE) has undertaken another important initiative which addresses natural resource management in Central Asia. **Annukka Lipponen, Environmental Affairs Officer of the UNECE**, argued that UNECE work on the nexus in the Syr Darya basin could be incorporated into the existing National Policy Dialogues (NPD) framework. This approach would use participatory workshops and indicator based analysis to generate a nexus assessment report, which could be incorporated into the NPD framework, in order to discuss results at the national level among the different stakeholders. These types of regional initiatives offered examples to workshop participants during the project proposal sessions.



Presentations on Day Two highlighted specific, innovative and potentially scalable solutions addressing the interconnected water, energy and food challenges in a variety of ways and contexts.

PRESENTATION HIGHLIGHT: Pilot programs are currently being carried out by the International Water Management Institute (IWMI) in the Ferghana Valley. Although these projects focus on water management on the Syr Darya River, **Jusipbek Kazbekov, a researcher at IWMI**, argued that lessons learned from these pilot projects on small transboundary streams (STTs) can be used to generate river-wide institutional arrangements.

Kazbekov emphasized that local context and flexibility to adapt to local conditions were extremely important in ensuring initial project success. Promoting long-term and systemic cooperation, rather than a “one-off” agreement, was another key to success. With these learning experiences in mind, Kazbekov advocated for solutions linked to existing regional frameworks, and argued that solutions should be grounded in local contexts and equipped with flexible adaptation mechanisms. Finally, Kazbekov spoke strongly that donor-funded projects are valuable, but need to be better coordinated to prevent both overlap and oversight.

Experts from the public and private sectors, specializing in large-scale infrastructure design, energy and fiber/food production respectively, provided examples of successful initiatives and highlighted enabling conditions as well as barriers encountered in their execution. Technological and institutional shifts were emphasized, including with respect to the potential of organic cotton and irrigation, as were specific models of cooperation, at both the local and basin levels in initiatives presented by representatives from research and intergovernmental organizations. Both new and ongoing programs were among the case studies introduced.



PRESENTATION HIGHLIGHT: Said Yakhyoev, Program Assistant with the

Organization for Security and Cooperation in Europe (OSCE), presented a case study of Rasht Valley, a poor rural area in Tajikistan, to argue for a bottom-up approach to solving energy problems. National level projects, as well as international development banks, have promoted the development of small-scale hydropower, as a way to reduce reliance on fossil fuels. While providing electricity in a sustainable manner is an important international goal, Yakhyoev argued that these small-scale hydropower projects tend to suffer from poor efficiency and large expense, and that they fail to address a basic need in impoverished areas of Tajikistan: winter heating. 60-80 percent of electricity in rural Tajikistan is used for heating purposes in the cold winter months. Tajikistan famously suffers huge energy deficits in these months, and often experiences complete blackouts in rural areas for weeks at a time, and even daily blackouts in urban areas. Rivers supplying the hydroelectric plants, the country's main source of electricity, often freeze solid in the extreme temperatures. Since most of the energy is produced in the summer, when hydropower facilities are working, and most of the energy need is in the winter, Tajikistan's seasonal energy supply and demand are unevenly matched.

Yakhyoev proposed the use of readily-available coal to meet household heating needs. This solution, Yakhyoev argued, would satisfy critical needs in the short-term, thereby enabling the economic development that could allow for more sustainable solutions in the long-term. A representative of the energy sector, **Nikolai Sviridov**, Deputy Director of Mezhregionsoyuzenergo (Inter-regional Energo-Union"), agreed with Said, and argued that to increase the standard of living in Central Asia, energy security must be addressed, especially for Tajikistan.

Moving from problem identification on Day 1 to the prioritization of problems and then the matching of these with potential solutions, participants worked in the same small-group configurations (upper basin, lower basin and regional groupings) to jointly crystallize the most acute problems areas, and then to brainstorm a comprehensive menu of more than 80 suggested interventions that would address different aspects of the nexus conundrum as it manifests itself in the Central Asian context. Not surprisingly, the same themes that dominated on Day 1 reemerged in deliberations on the solution space in Day 2:

Data Availability and Lack of Trust

Prominent among proposed solutions was the creation of some sort of information-sharing mechanism or platform, or the rehabilitation of an existing data-sharing network. Additionally, workshop participants agreed that establishing regional guidelines for the monitoring and assessment of water quality and water governance was necessary in order to harmonize approaches between different information-collecting bodies. One group added that additional standards on glacial retreat, glacial melt, and precipitation were necessary to improve data availability and analyses. Building data-collecting capacity, through increased installation, RS data and analysis was also proposed as a way to improve the quality of data available.



PRESENTATION HIGHLIGHT: Many promising regional initiatives exist to improve the use of water resources in Central Asia. **Giovanni Munoz, Land and Water Engineer at the Food and Agriculture Organization of the United Nations (FAO)** argued that an ongoing initiative, entitled *Scenario Thinking to Enhance Water Cooperation in the Aral Sea Basin*, has helped participants to agree that investments in water resources infrastructure alone are not enough to significantly increase agricultural output and water productivity. Additionally, this initiative and the use of scenario thinking has enabled experts to come to similar conclusions on climate change, agricultural trade, and population growth, suggesting that joint discovery to reach a “communality of views” is an important outcome in itself. This act of mutual discovery can bring actors together in their understanding of a particular issue, and therefore provides a means by which they might start to move past zero-sum thinking in order to make better decisions.

Low Water-Use Efficiency

Training centers and information networks were another area of focus in order to improve knowledge surrounding high water-efficiency technologies, techniques and practices. Increased investment in rehabilitating water infrastructure was proposed; specifically investment that focused on small, local-level projects was prioritized. Incorporating rehabilitation costs into infrastructure projects early-on, rather than rehabilitating projects ad hoc, would also go a long way in improving the life of a project. Empowering farmers and water users by strengthening extension services for irrigation and horticultural practices would also provide incentives for small-scale farmers to use water more efficiently.



Climate Change

In order to combat the potentially devastating effects of climate change, groups proposed projects that would restore mountain ecosystems through afforestation schemes and energy diversification aimed at reducing deforestation and regulating water resources upstream. Furthermore, improved communication and education of the impacts of climate change on states and the private sector would incentivize mitigation and adaptation. Finally, integrating climate impacts, including water and energy-related ones, in development plans and project proposals would reduce climate vulnerability of public and private undertakings.

Incorporating Afghanistan

In order to include Afghanistan in future dialogues, groups proposed regional and donor assistance program promoting increased communication between Central Asian countries and Afghanistan as well as potentially capacity building for Afghan water managers at various levels. Other groups incorporated mechanisms into their proposals that would involve Afghanistan in the project steps, allowing for Afghanistan's increased involvement as economic reconstruction took place.

PRESENTATION HIGHLIGHT: In outlining options for moving towards sustainable cotton production, citing trends and case studies **Liesl Truscott, Farm Engagement Director of TextileExchange**, addressed a host of complex issues surrounding one of Central Asia’s most significant crops. Production has decreased somewhat in the region since the era of the “cotton basket” of the Soviet Union, as countries have diversified through increased wheat production. Cotton nonetheless remains a primary export in Central Asia, with Uzbekistan, Turkmenistan, and Tajikistan among the world’s top twenty producers. In Tajikistan, Turkmenistan, Kyrgyzstan and Uzbekistan, over 40 percent of the labor force is in the agricultural sector.^{xlvii} As the agricultural sectors of Turkmenistan and Uzbekistan mainly consist of cotton, much of the population is employed in the cotton sector.

Truscott pointed to excessive use of agrochemicals and pesticides, as well as high water consumption and contamination, as key problem in much cotton production, but also asserted that organic cotton is achievable in Central Asia and could be a mechanism for improving well-being and economic development. As a heat-loving and rather drought resistant cash-crop, cotton could be a well-suited crop in Central Asia’s arid climate. Additionally, cotton represents a foreign currency earner, and an industry in which individual farmers could add-value to their products by expanding their processing activities (such as cutting, packing, cleaning, boiling, pulping and drying). Transitioning from conventionally to sustainably-produced cotton is another way for farmers to increase the value of their products. Truscott presented a case study from Tajikistan, in which TextileExchange, with support from Helvetas, created a cooperative for organic cotton production that brought organic farmers earnings equivalent to nearly seven times the average salary of agricultural workers in Tajikistan.





V: Nexus Action Plans: Mobilizing Nexus Solutions for the Amu Darya River Basin

“Your banker is not your adversary, you work together to make the project successful, because then both parties will benefit.”

-Delcho Vitchev, Director, Renaissance Finance International Ltd.

Starting from the broad menu of options from Day 2, a voting exercise narrowed the field to a small number of solutions collectively deemed potentially most viable and catalytic. It was these potentially high-impact interventions that participants developed into five different “Nexus Action Plans,” moving through Day 3 from the kernel of an idea to the elaboration of as much detail as possible in the design of realistic and economically viable projects.

Participants were guided in this endeavor by a presentation by **Delcho Vitchev, Director of Renaissance Finance International Ltd.**, who summarized the key parameters and characteristics of successful project proposals, based on a resource guide published by his organization. Components of the Nexus Action Plans included details on key steps, including the mobilization of stakeholders and resources, as well as potential barriers and obstacles. Additionally, participants examined potential risks and benefits of their projects, possible funding sources and partners in order to encourage the long-term viability of these projects.

The five final Nexus Action Plans – summarized in the following pages -- incorporated: knowledge of the interconnected problems between water, energy and food/fiber production; an extensive and far-reaching menu of solutions from which to draw upon; lessons-learned from previous and currently ongoing regional initiatives and from both upper and lower basin perspectives; and funding conditions required for long-term project success.

Group One: Payment for Ecosystem Services

Upstream decisions can impact the quality and quantity of water resources. This proposal would require downstream countries to participate financially in protecting upstream water sources. This plan would require upstream and downstream countries to share costs, and in effect, would create a system of payment in exchange for ecosystem service provision.

Initially each country in the Amu Darya basin will have a pilot project in a defined sub-basin. The pilot project will focus on developing a Payment for Ecosystem Services scheme in the middle and downstream areas of the basin. The funds from pollution payments will be invested locally to improve agricultural technology and practices in each sub-basin. Indicators will include measuring salinization in the downstream part of the basin and sediment load in the upstream area. The funds will also be used to monitor water and identify major polluters.

I. Problem Addressed

Limited cooperation between upstream and downstream riparian countries, upstream decisions impact the quality and quantity of downstream water resources

II. Solution

By 2030, ensure that downstream users participate financially in protecting upstream water resources through cost-sharing and/or payment for ecosystem services

III. Timeline – Long term vision

By 2020:

- 1) Compile existing international experience
- 2) Training on PES approaches
- 3) Define each country's demand for water
- 4) Development of scenarios which shows costs of no action
- 5) Pilot projects: adopt water quality standards, estimate costs, determined willingness to pay, identify basin indicators for monitoring

By 2025:

- 1) Development of water funds
- 2) Pilot activities in sub-basin: Select smaller rivers to introduce concept
- 3) Separate projects for upstream, midstream and downstream parts of the basin
- 4) Demonstrate benefits (through pilot activities) of investing in ecosystem services
- 5) Dialogue on willingness to pay

- 6) Development of monitoring system, including laboratories and satellite imagery, plus community monitoring

By 2030:

- 1) Scaling up= negotiation across countries involving all stakeholders
- 2) Regional Amu Darya Strategy (includes benefits, possible future scenarios)
- 3) Matrix of actions across water, energy and food
- 4) Identify separate projects for investment at the transboundary level

Timeline for pilot projects:

Year 1- 2:

- Adoption of water quality standards by sector (acc. EU, UNECE, FAO)
- Estimate costs of achieving quality standards
- Determine willingness to pay
- Incorporate existing systems of polluter pays into the project
- Identify basin indicators for monitoring

Year 3-4:

- Restoring of water cadaster on national levels
- Development of monitoring system, incl. laboratories and satellite imagery, plus community monitoring
- Pilot activities in sub-basins in each country

Year 5:

- Extend monitoring beyond the pilot activities so to be able to extend beyond the project lifetime

IV. Estimated Funding Requirement

- €3,670,000 per country
 - €900,000 training with information system
 - €1 million for monitoring
 - €400,000 social mobilization
 - €300,000 demonstration projects
 - 40% overheads

V. Obstacles

- No documents to guide transboundary water use
- Lack of trust between countries and institutions
- Centralized decision making

VI. Partners

- WUAs, drinking water communities
- Water utilities
- Agricultural water users

- National agencies responsible for water quality
- BVO Amu Darya or national IFAS branches
- Industrial water users
- Group with Center for Excellence (group three)

VII. Benefits

- Improved water quality for different uses
- Downstream users save cost of drinking water treatment
- Life extension of reservoirs because of reduced sedimentation
- Improved energy production
- Polluters have access to loans if they are part of the scheme

VIII. Risks

- Project adds burden on farmers as they may have to adjust farming practices to reduce contamination of water bodies
- Targeted spending of money – funds go to state
- Bureaucracy, long time needs for procedures
- State is forcing farmers to farm on land that results in pollution





Group Two: Building an Integrated Basin-Wide Information System

In order improve cooperation between upstream and downstream countries, a system is to be created for strengthening information exchange and cooperation at the regional and national levels. The ultimate goal of this program would be to achieve a fully transparent, harmonized and up-to-date integrated basin-wide information system on natural resource use, including Afghanistan, by 2030.

I. Problem Addressed

Limited cooperation between upstream and downstream riparian countries, upstream decisions impact the quality of downstream water resources

II. Solution

By 2030, strengthen information exchange and cooperation mechanisms at regional and national level to achieve a fully transparent, harmonized, up-to-date, integrated, basin-wide information system on natural resource use, including Afghanistan

III. Steps/Timeline:

By 2015:

- 1) Develop a consensus on the goals of the program, on the concept of information systems, and on the requirements by country

By 2017:

- 1) Scope of data and methodology established
- 2) Build national and sectoral systems in compatible way (env't agreement hydromat)
- 3) Establishment of network

By 2020:

- 1) To degree necessary, harmonization of data systems
- 2) Delivery of harmonized capacity building packages

By 2025:

- 1) National hub system is in place
- 2) Capacity building ongoing

By 2030:

- 1) Public accessibility
- 2) Capacity for updating
- 3) Transparency and usefulness of data
- 4) High quality data, linked with global data systems

The program would establish hubs and networks for ongoing information exchange, building on current negotiations hosted by ICSD and ICWC, to agree upon the scope and methodology for data collection, management and dissemination. Additionally this program would aim to harmonize data systems and capacity building packages. The final end-product would provide public accessibility with capacity for updating, and would make available high-quality data required for effective resource allocation and use decisions.

IV. Estimated Funding Requirement:

- Setup phase (2015-2020) costs per year
 - One hub per country plus six regional hubs, \$1.2 million
 - Data transfer and communications costs \$300,000
 - Capacity building technical partners \$1 million
 - Capacity building social partners \$500,000
 - Building institutional interest and ownership \$300,000
- Execution Phase (2020-2030)
 - Operation costs \$150,000 per country/per year
 - \$1 million at national level and \$300,000 at regional level
 - Ongoing capacity building \$250,000/year minimum

V. Obstacles:

- 2 draft negotiation texts on a regional data system (ICSD and ICWC) need to be merged/unified
- Sustainable funding
- Institutional competition
- Hesitation about data provision/compliance
- Mobilization of int'l and national resources
- Technical and management capacity
- Info availability at national/sub-national level
- Intra-governmental coordination
- Key data not publically available
- Language

VI. Partners:

- Riparian states
- EC-IFAS, ICWC, SIC-ICWC
- BWO (Amu Darya & Syr Darya)

- CAREC
- GWP
- Regional Hydrological Center
- USGS, NASA, European Space Agency
- World Bank, SDC, GIZ, EU
- UNDP, IHP-UNESCO, FAO, UNECE, UNEP
- NGOs and Civil Society

VII. Benefits:

- Improved coordination of resource use
- Improved forecasting ability and disaster risk reduction capability
- Associated financial savings from damage prevention

VIII. Risks:

- Political commitment and low institutional capacity
- Shortage of data to be fed into the regional system
- Incompatibility of different national information systems
- Requirements for supportive national regulatory frameworks must be put in place



Group Three: Strengthening Regional Economic Integration

This program would promote the benefits of cooperation in the region, by strengthening regional economic integration. This project would advance in three phases. First it would promote the benefits of cooperation based on evidence from local examples. The second phase would attempt to establish a common energy market, which would lead to the third phase in which free trade between Central Asian countries would be established.

I. Problem Addressed

Limited Cooperation between Riparian Countries, a lack of an agro-trade agreement, and frequent border disputes

II. Solution

By 2030, promote the benefits of cooperation in the region by strengthening economic integration and development – with a view to improve natural resource management as well as human rights standard

III. Steps/Timeline:

By 2018:

- 1) Identify mechanisms for cooperation
- 2) Assess risks/benefits
- 3) Feasibility study
- 4) Formulate recommendations with possible benefit scenarios
- 5) Workshops/exercises for integration at micro-level ex local food markets and energy sharing

By 2021:

- 1) Agreement on trade
- 2) First energy market consensus

By 2026:

- 1) Implementation, integrated grid
- 2) Coordination in practice
- 3) Creation of new institutions with special energy and food trade

By 2030:

This project would simultaneously advance at a high political level and the local level through economic integration of border regions. Lessons learned and experiences on the local level would theoretically serve as evidence for the political track, at which political will around economic integration would be generated. To pursue these two goals, the proposal would assess benefits and costs, carry out a feasibility study, and formulate recommendations from working groups and workshops.

- 1) Expand agreement to common tariffs

IV. Estimated Funding Requirement:

- Startup costs (2015-2018)
 - Year one: \$750,000 USD
 - Year two: \$1.25 million USD
 - Year three: \$ 1 million USD

V. Obstacles:

- How to incorporate Afghanistan into framework
- Lack of political will
- Third party interests are not necessarily aligned with individual country priorities
- Disparities in Economic Development
- Corruption
- Previous bilateral agreements in the region may be an obstacle for new negotiations that aim to address the same issues but in a broader context and integrating new countries.
- Who will be the project champion?
- Who will create incentives for implementation?
- Power dynamics/political will
- Economic sustainability of institutions (funds)

VI. Partners:

- National Government
- Foreign governments
- Local governments
- Community



B.

- CBO

VII. Benefits:

- Improving regional cooperation
- Improving trade between countries
- Improving energy efficiency through competition and updated grid management

VIII. Risks:

- Disagreements on implementation lead to further disintegration of cross-border relationships
- Too high reaching, not feasible
- Lack of government approval
- Resistance to change
- Energy market creates negative competition between countries



Group Four: A Network of Training Centers for Improved Irrigation Capacity Building and Service Provision

High land degradation due to inappropriate irrigation techniques represents a huge problem to upstream and downstream riparians. This project aims to raise the professional skills of water specialists, farmers, and water user associations through the establishment of professional training centers. These centers would work to develop educational curriculum and instruction on appropriate practice and technology of irrigation to reduce water and energy demand, and to reduce land degradation and erosion. The professional training centers would both equip water professionals and users, and promote further technological innovation on irrigation techniques.

Additionally, training centers would eventually become service providers, for which farmers and other water users could pay, which would contribute to continuing operations. These centers could improve knowledge on the use of water in the basin, and equip water users to continue re-evaluating water use practices, to synchronize efficient water-use across borders, as well as to develop innovative techniques regarding water use for agriculture in the region.

I. Problem Addressed

High degree of land degradation, largely due to inappropriate irrigation techniques

II. Solution

By 2030, significantly raise the professional skills of water specialists, farmers and water user associations, through professional training centers

III. Steps/Timeline:

By 2020:

- 1) Create steering committees with regional representatives
- 2) Identify possible funding sources
- 3) Conduct a scoping study, identify trainers and specialists
- 4) Create training modules/ curriculum, develop pilot program
- 5) Conduct risk analysis

By 2025:

- 1) Become centers of excellence
- 2) Maintenance and Evaluation, including self-sufficiency of centers
- 3) Risk analysis and Iterative process, lessons learned

IV. Estimated Funding Requirement:

- \$1 million USD to open the training centers
- 20% of initial costs invested yearly for maintenance and continuation
- Future farmer fees collected for training services

V. Obstacles:

- Availability of funding
- Bureaucracy/political approval
- Long-term political and financial commitment
- Keeping control
- Lack of Innovation
- Impact of climate change on water supply
- Tensions between urban and rural areas

VI. Partners:

- Other Research and Development Institutes
- Ministries and other State Agencies
- Melioration stations
- Ministry of Energy (of each government)



VII. Benefits:

- Long-term competitiveness through reduced soil erosion and resource use
- Reduced liability to national government
- Improved Environment
- Farmers save on energy costs
- Fosters competition between farmers for best practices
- Reducing cross-border water disputes by conserving water

VIII. Risks:

- Lack/loss of governmental approval
- Corruption and mismanagement of allocated resources
- Unaffordable for farmers
- Promotion of locally inappropriate technologies

Group Five: Network of Nexus Knowledge & Innovation Centers

In order to move towards regional food security, this project would improve irrigation and agricultural practices through the creation of a network of knowledge and innovation centers. This would improve working knowledge on nexus issues, and would create cooperation on the nexus at regional and national levels. Through capacity building, demonstration and improved reporting procedures, this project would first define each country's water demand, and would verify existing data on water use and water needs. Additionally, this project would work to survey the already available irrigation and agronomic options and technology.

In the second stage the project would work with farmers, Water User Associations, and investors to develop activities in the upper basin on agricultural and horticultural improvements, and improve food storage and food processing in the supply chain. Additionally, the knowledge and innovation centers would work to study, and design improvements to current approaches to pest management and soil conservation. Finally, the program would leverage the interests of the private sector,

in order to develop a network of academic institutions, such as research organizations and educational programs promoting advanced agricultural practices.

I. Problem Addressed

In Tajikistan, 56% of the population is malnourished. Food security is needed in upstream countries.

II. Solution

By 2030, establish a network of knowledge and innovation centers to improve cooperation on the water-energy-food nexus at regional and national levels

III. Steps/Timeline:

By 2020:

- 1) Capacity building + reporting procedures
- 2) Define each country's demand for water
- 3) Verify existing data for irrigation, energy demand, water needs etc
- 4) Incentivise regional "ownership" of capacity building
- 5) Feasibility study for regional energy market
- 6) Accounting of available irrigation, agronomic options + technology

By 2025:

- 1) Invest in upper watershed integrated agricultural improvements
- 2) Improve food storage + processing entire supply chain
- 3) Implement customary practices to support buy-in to new technologies and approaches
- 4) Improve/new approaches to Pest management, soil management, varieties, agronomy, water



By 2030:

- 1) Leverage private sector support
- 2) Extend to Academia, research organizations and schools

IV. Estimated Funding Requirement:

- By 2020 – US \$2 million in total across 5 activities
- By 2025 US \$25 million

V. Obstacles:

- Willingness to provide data
- Prevent brain drain resulting from capacity building
- Infrastructure
- Regulations
- Legal framework
- Technologies
- Resistance to change
- Political instability
- Lack of incentive, “Nobody cares”

VI. Partners:

- Governmental institutions
- Research and Training Centers
- Practitioners, Professional Communities
- Universities
- Regional organizations
- Rural advisory centers
- Private sector

VII. Benefits:

- Improved use of water and energy
- Improved irrigation techniques
- Increased awareness of cross-sectoral interdependencies
- Improved environmental conditions
- Increased cooperation and integration at the regional level
- Improved flow of information
- Trust building (bottom-up)
- Improved livelihood of regional population

VIII. Risks:

- Outcome will not reach end user
- Resistance to change
- Lack of incentives
- Lack of sustainability
- Inappropriate technologies chosen
- Governmental approval
- Short term commercial interests prevail



In the final workshop session on Day 3, a panel of private and public sector experts vetted and critiqued the Nexus Action Plans and drew connections to broader sustainability issues. The panel was composed of a mix of workshop participants representing a diversity of institutional interests: **Iskandar Abdullaev, Executive Director of the Regional Environmental Center for Central Asia (CAREC), Gary Lawrence, Chief Sustainability Officer of AECOM and Jenniver Sehring, Environmental Affairs Adviser for the Organization on Security and Cooperation in Europe (OSCE).** They were joined by two Istanbul-based business leaders: **Mustafa Baltaci, General Secretary of the Federation of Euro-Asian Stock Exchanges, and Mehmet Tiryakioğlu, Board Member of Tiryaki Agro Foods Industry Co.**

Panel members highlighted the quality of in-depth analysis of many of the project proposals, and particularly commended participants for recognizing the most intractable problems that plague the region, and for creatively addressing these problems with their Nexus Action Plans.

The panel highlighted how the proposed initiative of strengthening regional economic integration (Group 3)—envisions action at both the political and local level, citing that action pushing change simultaneously from above and below have a greater chance of success. Capacity building is key for institutional change and the proposed approach of establishing a network of training centers would improve irrigation and agricultural practices and would provide training services. The lack of institutional capacity is a key barrier to private sector engagement in the region, and that improving institutional capacity in Central Asia and Afghanistan could increase private sector involvement as both a solution provider and an investment catalyst.

Implementing payments for ecosystems services in a basin (Group 1) needs to show clear incentives. For this to be implemented at a transboundary level, there would need to be a regional compact for protecting water quality. Starting at smaller scale is more manageable and there are initiatives in place (e.g. CAREC). For policy makers to be on board, there does need to be evidence through pilot initiatives, and a clear mechanism to guide them in how to take pilots to scale at the national and regional levels.

PRESENTATION HIGHLIGHT: **Iskandar Abdullaev, Executive Director of the Regional Environmental Center for Central Asia (CAREC),** emphasized institutional and political barriers. Following the collapse of the Soviet Union, newly independent Central Asian nations prioritized domestic food, water and energy security to the detriment of basin wide resource management. Even at the national level, management of water, energy and agriculture remains almost exclusively sector based. Consequently, the nexus can be used as a tool for conflict resolution as well at development.

Abdullaev argued for the need to adopt bottom-up, local level solutions advanced by local champions. Abdullaev noted that while the nexus approach has been broadly promoted by international organizations, the lack of specific nexus projects and concrete solutions on the local level has the potential to hamper progress. There are institutions that exist to champion action especially at the local level, for example recognizing what exists such as expanding drip irrigation to save energy.



Sharing of information is a constant challenge, which could be addressed through the proposed Integrated Basin Wide Information system (Group 2). However, political commitment needs to be in place as well as trust on how data is used. This could be enhanced through the creation of a network of knowledge centers focused on sharing best agricultural and irrigation practices (Group 4&5) would be valuable, but securing funding for this type of project is typically difficult, especially as analogous efforts already exist but are not necessarily successful. In general, projects should build on existing programs and initiatives, rather than re-inventing the wheel.

Duplication of efforts emerged as a common risk factor to implementation across the presentations of the Nexus Action Plans and the reflections by the Panel. Multiple regional and national initiatives already tend to create policy fragmentation, and competing mandates make projects difficult to manage. Lack of funding also emerged as a key theme. Here panel members challenged a reflexive reliance on traditional donors, and recommended a much stronger involvement of the private sector, where relevant.

Disparities in economic development between countries were also highlighted as an obstacle to cooperation between governments, pointing to the advisability of scaling back very ambitious schemes. The proposed creation of a regional energy market (Group 3), could improve economic cooperation, although the reality is that this type of undertaking is not likely feasible at present due to regional sensitivities and political vested interests. A more manageable approach could focus on small-scale energy cooperation, or small-scale grid integration projects, although participants were reminded of the difficulty in achieving this using an example from Rasht Valley in Tajikistan, where donor efforts to move from dependency on coal to a renewable future was both intermittent in delivering electricity, costly, and questionably sustainable. Small-scale projects could be complimented by setting the foundations for a regional agricultural commodities market.

Finally, a lack of political commitment to improving regional resource management was an overriding concern. The origins of the European Union lay in a willingness by former adversaries to lay aside a difficult history in favor of a better future.



PRESENTATION HIGHLIGHT: Gary Lawrence, Chief Sustainability Officer of AECOM, emphasized that a fundamental shift in mind-set and approach will be required to safeguard the security of the region. He laid out three criteria for solutions to gain traction: they must be technically feasible, economically viable, and politically acceptable.

Elaborating on these, he emphasized the importance of local knowledge and contexts in developing potential solutions, and warned against what he termed the “tyranny of experts” identified as people who resist change in the face of evolving scientific understanding and innovation. Lawrence noted local knowledge can complement and improve technical and scientific assessments and help devise solutions that are adapted to and consistent with local needs, traditions and history, in order to encourage more rapid change. Without “permission” from society, he said, potential solutions are unlikely to take root.



VI Next Steps

Actions Plans and outcomes from the discussion will be further reviewed in terms of their geographic coverage and national prioritization, together with regional relevance and complementarity with regional development strategies. Initial discussions with donors will take place to assess their interest, and link the action plan owners to those interested in future discussions and possible support by the end of 2014.

Discussions from the workshop will also be taken into the global nexus dialogue on water infrastructure solutions in Beijing in November 2014, and in South Korea at the 7th World Water forum in April 2015.



Appendices

1. List of participants

Last Name	First Name	Affiliation
Abdullaev	Iskandar	Regional Environment Center for Central Asia (CAREC)
Aminova	Munira	Verje University of Brussels and Executive Director of Central Asian Research and Development Network (CADN)
Beltaci	Mustafa	Federation of Euro-Asian Stock Exchange (FEAS)
Bosch	Rieks	EcoCoast Consultancy
Çalkıvık	Konca	Business Council for Sustainable Development (BCSD) Turkey
Collinsworth	Allen	EWI Fellow
Cowan	Joel	Earnest Scheller, Jr. College of Business at Georgia Tech, USA/EWI Board Member
Creighton	James	EastWest Institute
Cross	Katharine	IWA
Dalton	James	IUCN
Djanibekov	Nodir	Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Germany
Eagan	Isaac	Spirit of America, Washington, D.C., USA
Ferenz	Michele	EWI
Gritsenko	Natalya Vladimirovna	Kazakh Scientific Research Institute of Water Economy
Ibatullin	Saghit	UN Economic Commission for Europe (UNECE) Water Convention
Jones	Barbara	U.S. Department of State
Kamalov	Yusup	Global Water Partnership Central Asia; Head of Union for the Defense of the Aral Sea & Amudarya
Kazbekov	Jusipbek	Central Asia, International Water Management Institute (IWMI)
Kholmatov	Anatoliy	UNDP, Tajikistan
Kholmatov	Daler	Ministry of Energy and Water Resources, Tajikistan
Kryc	Kelly	U.S. Department of State
Kurt	Zuhal	Kurt Holding Group/EWI Board Member
Latorre	Carolina	IWA
Lawrence	Gary	AECOM
Lipponen	Annuka	United Nations Economic Commission for Europe (UNECE)



Matthews	Nate	CGIAR Research Program on Water, Land and Ecosystems (WLE)
Mirdadayev	Mirobit Salimovich	Kazakh Scientific Research Institute of Water Economy
Mosello	Beatrice	Overseas Development Institute, UK
Munoz	Giovanni	Food and Agriculture Organization of the UN
Novikov	Victor	Zoi Environment Network
Nurmuhamedova	Guljamal	Economic Society Ynanch-Vepa (NGO, Turkmenistan)
Oskarsson	Katerina	Institute for the Analysis of Global Security (IAGS), Department of Political Science/International Studies - Old Dominion University
Paradise	David	Embassy of US, Kazakhstan, US State Department
Park	Allen	International Food Policy Research Institute (IFPRI)
Pulatov	Yarash	Tajik Research Institute of Hydraulic Engineering and Land Reclamation
Rahimova	Shahlo	HELVETAS Swiss Intercooperation -- Tajikistan office
Sanchez	Juan	IUCN, Environmental Law Center
Sehring	Jenniver	Organization for Security and Cooperation in Europe (OSCE) Vienna, Austria
Schaitkin	Hope	EWI
Shobair	Sayed Sharif	Water Resources Expert, Afghanistan
Shokhrukh-Mirzo	Jalilov	Aalto University, Esbo Finland
Shroder	Jack	University of Nebraska at Omaha
Sokolov	Vadim	Global Water Partnership (GWP)
Sviridov	Nikolai	Mezhregionsoyuzenergo (Inter-regional Energo-Union")
Tiryakioglu	Mehmet	Tiryaki Agro
Truscott	Liesl	Textile Exchange, HQ in U.S. with operations in eight countries
Turok	Joseph	International Centre for Agricultural Research in Dry Areas (ICARDA)
Vitchev	Deltcho	Renaissance Finance International ltd.
Yakhyoev	Said	Organization for Security and Cooperation in Europe (OSCE), Tajikistan
Yu	Hongyuan	Institute for International Studies/Center for International Energy Strategy Studies, Renmin University of China, Shanghai
Ziganshina	Dinara	Scientific Information Center - Interstate Coordination Water Commission (SIC ICWC)

2. Workshop Agenda

DAY 1: Tuesday 15 July 2014, The Nexus Realities: From Global Paradigm to Action in Amu Darya River Basin

Time	Session	Summary
8:30-9:00	Arrival & Registration	-Welcome desk located on the first floor of the DoubleTree, outside Daphne conference room
9:00-9:30	Opening Session	Welcome & Introduction <ul style="list-style-type: none"> • Welcoming Addresses by IUCN/IWA/EWI • Participant Introductions • Agenda review (objectives, structure, expectations)
9:30-10:00	The Nexus Dialogue	Outline overall purpose of the Nexus Dialogue on Water Infrastructure and key findings to date (IUCN/IWA)
10:00-10:30	BREAK	
10:30-12:30	The Water Challenge Game	Facilitated Interactive Exercise <ul style="list-style-type: none"> • Illustrates economic/political/social/environmental costs of uncoordinated development paths • Basis for discussion on opportunities/challenges and requirements for integrated approach in ADRB
12:30-13:30	LUNCH	
13:30-15:30	Status of the Nexus in Central Asia	<u>Presentations</u> providing up-to-date overview of nexus challenges and national & international efforts to address them, including success stories. <ul style="list-style-type: none"> • Dr. Iskandar Abdullaev, Executive Director, Regional Environmental Center for Central Asia (CAREC) • Mr. Rieks Bosch, Consultant, EcoCoast Consultancy



		<ul style="list-style-type: none"> • Dr. Jusipbek Kazbekov, Researcher – Water Management Specialist, Central Asia Office, International Water Management Institute (IWMI) • Dr. Annukka Lipponen, Environmental Affairs Officer, United Nations Economic Commission for Europe (UNECE) • Mr. Victor Novikov, Project Manager, Zoï Environmental Network <p>Plenary Discussion: Questions & Answers, Comments & Additions</p>
15:30-16:00	BREAK	
16:00-17:00	Towards ADBR Action Plan 2030: Identifying Specific Nexus Problem/ Opportunity Areas	<p><u>Group Work:</u> Participants will work in Upper Basin and Lower Basin groups to conduct deeper analysis of policy, economic, social, technical, legal and environmental problems (PESTLE) in relation to water-food-energy interactions.</p>
17:00-17:40	Spotlight on Afghanistan	<p>Presentation and discussion providing overview of nexus challenges in Afghanistan, and national efforts to address them:</p> <ul style="list-style-type: none"> • Dr. John F. Shroder, Senior Research Scholar, Center for Afghanistan Studies, Emeritus Professor of Geography and Geology, University of Nebraska at Omaha (via remote access)
17:40	Day 1 Close	
19:15	Depart from hotel at 19:15 for Kebap dinner, generously hosted by EWI Board Member Zuhail Kurt, Chief Executive Officer of Kurt Group.	



DAY 2: Wednesday 16 July 2014, Mapping Nexus Solutions for Amu Darya River Basin

Time	Session	Summary
9:00-9:15	Introduction to Day 2	Brief recap of Day 1 and overview of Day 2 activities
09:15-10:30	A Focus on Nexus Solutions	<p><u>Presentations</u> on innovative and potentially scalable solutions to interconnected WEF challenges, followed by plenary discussion.</p> <ul style="list-style-type: none"> • Mr. Gary Lawrence, Chief Sustainability Officer, AECOM Technology Corporation • Dr. Giovanni Munoz, Land and Water Development Engineer, Investment Centre Division, Food and Agriculture Organization of the United Nations (FAO) • Mr. Nikolai Sviridov, Deputy Director, Mezhregionsoyuzenergo • Ms. Liesl Truscott, European & Farm Engagement Director, TextileExchange
10:30-11:00	BREAK	
11:00-12:30	Plenary Discussion: Questions & Answers, Comments & Additions	
12:30-13:30	LUNCH	
13:30-14:30	Towards ADBR Action Plan 2030: Identifying Nexus solutions	<u>Group Work:</u> Based on menu of solutions presented, Participants identify solutions that could enable ADRB countries to reach the Nexus 2030 Vision
14:30-15:15	Towards ADBR Action Plan 2030: Prioritizing Nexus solutions	<u>Group Work:</u> All participants assess the solutions developed and vote on the ones considered viable and catalytic
15:15-15:30	BREAK	



15:30-17:30	Towards ADBR Action Plan 2030: Developing an Action Plan for Implementation of Priority Nexus Solutions	<u>Group work:</u> The groups will develop a more detailed action plan to implement the different solutions to 2030, identifying objectives, requirements & enabling conditions, and key stakeholders
17:30	Day 2 Close	
18:15	A sunset reception and Iftar dinner, generously hosted by Kiler Holding Company, will be held at the top of the Sapphire building.	

DAY 3: Thursday 17 July 2014, Mobilizing Nexus Solutions for the Amu Darya River Basin

Time	Session	Summary
09:00-09:15	Introduction to Day 3	Brief recap of Day 2 and overview of Day 3 activities
09:15-09:30	Designing Investment Grade Project Proposals	Presentation by Mr. Deltcho Vitchev, Director of Renaissance Finance International on main considerations and elements related to financing of water and green energy projects.
9:30-9:45	Presentation on Energy Finance in Tajikistan	Presentation by Mr. Said Yakhoev, Programme Assistant with OSCE Office in Tajikistan.
09:40-13:00	Towards ADBR Action Plan 2030: Refining Nexus Proposals	<u>Group Work:</u> Transform solutions into investment grade project proposals, including key milestones, partnerships and timelines.
13:00-14:00	LUNCH	
14:00-16:30	A Vision for a Sustainable Future - Solutions for Central Asia in a Global Context	Presentations and Q&A of project proposals to panel of high-level experts <ul style="list-style-type: none"> • Mr. Mehmet Tiryakioglu, Board Member, Tiryaki Agro • Mr. Mustafa Baltaci, Secretary General, Federation of Euro-Asian Stock Exchanges (FEAS) • Dr. Jenniver Sehring, Environmental Affairs Adviser, OSCE • Mr. Gary Lawrence, Chief Sustainability Officer, AECOM • Dr. Iskandar Abdullaev, Executive Director, Regional Environmental Center for Central Asia (CAREC)
16:30-17:00	Closing Remarks from EWI and IUCN/IWA – Workshop Close	

3. WBCSD Report

business solutions for a sustainable world



CO-OPTIMIZING SOLUTIONS: WATER AND ENERGY FOR FOOD, FEED AND FIBER Executive Summary





Co-optimizing Solutions: Water and energy for food, feed and fiber is a unique solutions-based document that examines some of the most promising, innovative and scalable solutions to the world's interconnected water, energy, and food, feed, and fiber challenges. Highlighting ways solutions can be integrated to reinforce each other, the report reveals how the world's growing demand for nutrition and agricultural products can be met while minimizing environmental impact. It is based on a combination of the most advanced research with a sophisticated quantitative analysis of global linkages and case studies of techniques that forward-thinking companies are using. The private sector is an important part of the solution, and the report introduces some of the cutting-edge techniques already implemented around the world.

Increasing demand for food and other agricultural products will put great strains on land, water, energy and other resources in the coming years, and also heavily impact greenhouse gas emissions and climate change. Food demand is expected to rise by 60% by 2050 due to population growth and increased consumption. Fiber demand for wood panels and paper is predicted to increase by 80-95%.¹ A threefold increase is expected in the demand for biofuels at a time of increasing pressure on water quality and quantity.

Add these projected increases to a world where agriculture is already the world's largest water user, consuming 70% of total water each year. And energy consumption in agriculture is anticipated to increase by 84% in 2050² in a business-as-usual scenario. Additionally, climate change will impact food production in several ways. The disturbing result could be increased greenhouse gas emissions, compounded water requirements, decreased yields, and a potential increase in pests and weeds.

Fortunately, an array of "smart" solutions exist and are being developed to usher us towards agricultural production that is knowledge-intensive, more precise and less wasteful, and which utilizes such innovations as smart seeds, clever crop agronomy, zero-energy farms and integrated logistical systems. These solutions are already available and can be implemented with multiple benefits on yields, energy, water, climate change, land and resource use.

According to the report, many of these solutions can be "co-optimized" to reinforce each other and deliver multiple synchronized benefits of energy and water savings while increasing yields and creating better quality products. Imagine enzymes that help crops grow faster but also aid in the uptake of fertilizer, saving energy and pollution. Or biodegradable plastic mulch that prevents water loss through evaporation, increases soil temperature and accelerates natural nitrogen fixation.

Changing behavior at the retailer and consumer levels to control food waste would also significantly reduce demand for water and energy embedded in products that never reach an end-user.

Co-optimization solutions can go a long way towards addressing climate change mitigation and adaptation. Several solutions do not just improve the productivity of scarce water and energy but also reduce greenhouse gas emissions. Prime examples are the new methods of growing rice that keep methane emissions much lower. Reduced energy consumption in agriculture also immediately affects CO₂ emissions. Meanwhile, better use of water can improve water storage and improve adaptation of climate change fluctuation, and green soil water management adds to improved climate resilience as well.

The prognosis for the future is hopeful with these types of innovations. Business is a key player with its power to innovate toward sustainable harvests, drive change and partnerships, make long-term investments and achieve scale while strengthening supply systems and product sourcing, and reducing waste. There is also great opportunity for businesses to work together all along the value chain – connecting input suppliers, producers, commodity traders, processors and retailers. The private sector is playing a strong role in developing the tools that are key to mitigating water risk not only to their own operations but in the communities they operate in as well.

Companies, as the case studies from BASF, Dow Chemical, DuPont, Evonik, ITC, Jain Irrigation, Monsanto, Novozymes, Pepsico, and Syngenta demonstrate, are leading the way.

Here is a closer look at some of the most promising solution areas. Within each is the possibility of a myriad of more specific innovations adapted to different conditions.

¹FAO 2012, ²Pimentel and Pimentel 2008



SMART VARIETIES

Although the gains in yields of the world's major crops (wheat, rice, and maize) are slowing down, it is estimated that a 50-100% increase over current maximum yields could still be achieved through genetic engineering and crop selection – including hybrids, pest-smart varieties, and resource smart varieties that are more resource efficient and adapted to a wider range of climatic and soil conditions (drought and saline tolerant, nitrogen efficient).

Corn

BA SF and Monsanto pioneered drought-tolerant corn, which yields 6-10% more than conventional hybrids in drought-prone areas. DuPont and Syngenta, in cooperation with the International Maize and Wheat Improvement Centre, also made strides in breeding corn that can yield 15% more than conventional

hybrids in water-stressed conditions. DuPont is testing the combination of drought tolerance with nitrogen-use efficiency due to the traits' synergistic relationship.

Rice

With more than 34 million hectares of land being affected by salinity, DuPont Pioneer developed salinity-tolerant rice hybrids to allow rice-shrimp farming in Southeast Asia without compromising rice yields due to salt water use.

Alternative crops

The potential of a diversity of traditional crops, such as a range of cereals native to Africa and Ethiopia's unique Arabica coffee varieties, remain largely untapped despite hardiness, resilience to extreme environments and high nutritional value.



SMART CROP MANAGEMENT AND EFFICIENT FERTILIZER PRODUCTION

Fertilizers

Most of the increased agricultural production over the coming decades is expected to come from agricultural intensification, bringing with it more extensive use of fertilizer. Particularly in sub-Saharan Africa, the world's major agricultural frontier, a system of sustainable intensification could double productivity on the continent. In areas of the world where fertilizer is overused, including parts of China, India, North America and Europe, using fertilizer more efficiently would reduce agricultural energy consumption, groundwater pollution, eutrophication (reduced oxygen in water that causes species extinction), land degradation, soil acidification, and nitrous oxide emissions – the most active greenhouse gas.

Solutions include more precise application of fertilizer in terms of timing, quantity and type. Real-time crop sensors for the application of nitrogen represent a technological breakthrough in this area. Field tests carried out by DuPont show increased income and 50% higher nitrogen-use efficiency with the use of sensor treatments. Similarly, smart fertilizers, which incorporate a mechanism controlling nitrogen release based on crop requirements, and chemigation, which incorporates chemicals such as fertilizer or insecticides into irrigation water, also allow for more precise application of chemicals, thereby reducing energy use and increasing yields. Using rock dust as a bio-fertilizer, an ancient technique, offers promise in Africa, where there are no fertilizer plants but quarries providing source minerals.

Production of fertilizer also represents an energy drain, about 1.2% of global energy consumption. Overhauling less-efficient plants, closing down poorly performing ones and moving towards natural gas-fired facilities, rather than coal-based plants, could reduce energy consumption by 10-25%.



Bio-stimulants, improved disease control and nanotech pesticides

Although not widely used on a global scale, fungi-based compounds and micronutrients, such as zinc and boron, offer promising ways to stimulate plant growth, leading to increased yields of 10% or higher. With global pesticide use of 2.5 million tonnes every year and their associated health hazards and damage to the environment, "smart" solutions for disease control make good sense.

Integrated pest management, using practices such as pest-resistant crops, rotations, and intercropping have been successful at reducing pesticide use up to 90% in some cases. Nanotech pesticides, although still in the experimental stage, may one day offer pesticides that release their active ingredient *only when inhaled by an insect*.



MIXED FARMING SYSTEMS

Some researchers call mixed cropping a new agricultural frontier due to its many benefits: pest control, increased biodiversity, improved nitrogen use and nutrient uptake, increased soil fertility and resilience in resource-limited environments, among others. Intercropping of cereal and legumes, for instance, makes it possible to use significantly less water without impacting yields. Similarly, when trees are incorporated in the cropping system, helping soil moisture and nutrients and reducing pests, yields can be 20-60% higher than monocultures.



BLUE AND GREEN WATER MANAGEMENT

With little renewable untapped water left, higher blue water (surface or groundwater) productivity will be critical in achieving desired outcomes that are conducive with sustainable agriculture. Precision irrigation, such as root zone irrigation and micro-sprinklers, offer promising alternatives. Studies on corn show water savings of up to 40% when using subsurface drip irrigation, one of the most advanced field irrigation technologies available.

Irrigation is the largest water consumer (70% of the world's freshwater withdrawals), and rice paddy fields are the largest single user. One ambitious research project is experimenting with growing rice like wheat, rather than the traditional flooding technique, saving water and reducing methane gas emissions. PepsiCo has been working with farmers in India in "direct" (dry) seeding efforts. Syngenta has also been active in providing such farmers with products and services to increase productivity.

Rainfed (green water) systems produce 58% of global food, and by 2050 the area is expected to increase some 70 million hectares.

Conservation agriculture, utilizing reduced plowing, diversified crop rotations, and keeping a vegetative cover on bare land, offer multiple benefits such as a 60-90% decrease in soil erosion and 40-69% less runoff.

Also promising in terms of water management is biodegradable plastic mulching applied as a thin foil over the soil surface to reduce evaporation, control weeds, protect from erosion and stimulate nitrogen enhancing microbial activity, leading to substantial water savings of 26-50%.



EFFICIENT FARM OPERATIONS, MECHANISATION AND BRIDGING THE YIELD GAP

Innovations in farm operations and equipment are also key to saving energy. Retrofitting and replacing energy-inefficient farm equipment, integrated planting systems utilizing tailor-made equipment, and zero-energy farms, using new generation greenhouses, offer exciting benefits.

Recently, smaller and smarter machines have been developed that can act unattended and use less fuel. Syngenta's breakthrough PLENE technology utilizes equipment that does not compact soils, uses less fuel and helps overcome labor shortages. It also allows sugar cane to be replanted more frequently, leading to 15% higher yields and lower costs.

Currently, fully energy-independent farms are experimental, but they may be the wave of the

future. For instance, greenhouses that produce energy are part of an innovative project in the Netherlands.

Role of small farmers

Care must also be given to improve the productivity of small farms and make them viable businesses in their own right. Small farmers will be responsible for a significant part of the increase in production in the future, but they are largely excluded from innovation systems and poorly linked to markets, institutions and service providers. Businesses are increasingly co-organizing extension services and making use of modern media, smart phones and agricultural television. Syngenta Foundation India, for example, holds frequent meetings, field demonstrations and presentations of latest technologies.





MAKING USE OF TRADE

International trade in agricultural commodities is expected to increase but only moderately. It appears to be “pulled” by efficiency gains more than “pushed” by land and water scarcity. Governments have a role to play by revisiting the current complexity of global farm subsidies. Governments must also support business by creating enabling policy frameworks that support innovation.



REDUCING FOOD LOSS AND WASTE

An estimated 32% of food produced globally, about 1.3 billion tonnes, is lost or wasted along the food chain every year. In developing countries, most waste (25-35%) occurs early in the food chain (at harvest, storage and processing), while in developed countries most waste (18-24%) happens at the retail and consumer level. Reducing waste could decrease demand for food by an estimated 10%, saving land, energy and water resources.

Wageningen UR Food & Biobased Research participated in the development of an innovative chip with sensors to monitor the quality of perishables from right after they are harvested until they reach the store, reducing food loss and waste.

Sustainable agriculture, water stewardship and energy production are central to achieving a vision where “the global population is not just living on the planet, but living well and within the limits of the planet.” This is the vision of the WBCSD taken one step further to the delivery of tangible outcomes through the Action2020 initiative. Action2020 sets out Societal Must-Haves in Priority Areas that require urgent attention, including the release of nutrient elements, water, climate change, and food, feed, fiber and biofuels.

For more information on *Co-optimizing Solutions: Water and energy for food, feed and fiber*, please visit the water section of www.wbcds.org and www.action2020.org



About the WBCSD

The World Business Council for Sustainable Development is a CEO-led organization of forward thinking companies that galvanizes the global business community to create a sustainable future for business, society and the environment. Together with its members, the Council applies its respected thought leadership and effective advocacy to generate constructive solutions and take shared action. Leveraging its strong relationships with stakeholders as the leading advocate for business, the Council helps drive debate and policy change in favor of sustainable development solutions.

The WBCSD provides a forum for its 200 member companies – which represent all business sectors, all continents and combined revenue of more than US\$7 trillion – to share best practices on sustainable development issues and to develop innovative tools that change the status quo. The Council also benefits from a network of 60 national and regional business councils and partner organizations, a majority of which are based in developing countries.

Acknowledgments

Written by Cecilia Borgia and Frank van Steenberghe, MetaMeta

MetaMeta provides research and consultancy services in water governance, and offers specialized communication products geared to the international resource management & development sectors. MetaMeta has also developed innovative new models for managing and monitoring complex programmes.

Nexus Model methodology prepared by Ankit Patel, Resourcematics Ltd.

Sincere gratitude and thanks to the WBCSD member companies and external experts who provided input and guidance throughout the process, in particular member companies that have provided case studies.

Water Cluster leadership group (as of May 2014)
Co-chairs: Borealis and EDF. Members: BASF, Bayer, Deloitte, DSM, DuPont, GDF Suez, Greif, Kimberly-Clark, Monsanto, Nestlé, PepsiCo, PwC, SABMiller, Schneider Electric, Shell, Suncor Energy, Unilever, Veolia.

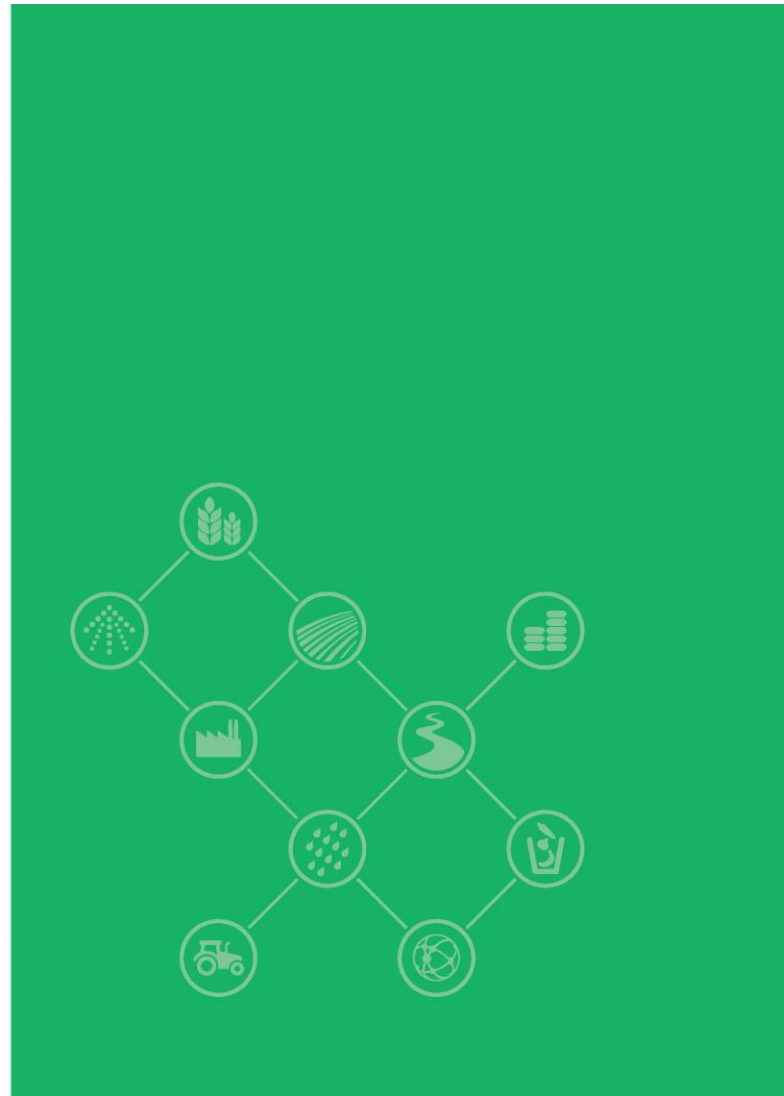
This piece of work was led by WBCSD water team
Violaine Berger, Joppe Cramwinckel, Tatiana Fedotova, Julie Oesterlé.

Disclaimer

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4. Existing Initiatives

Past and Ongoing Initiatives Addressing Food, Water and Energy Security in Central Asia

Working Compilation Resource List July 2014

Aral Sea Initiatives:

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
Third Aral Sea Basin Programme (ASBP-3)	ICWC, UNECE, Berlin Process, GIZ	2011-2015	Central Asia	Water, Sustainable Development	A regional action plan for 2011-2015 to alleviate the environmental and socio-economic consequences of the Aral Sea disaster and to facilitate progress towards integrated water resources management (IWRM) and sustainable development in the Aral Sea Basin ⁵
IWRM for Wetlands Restoration in the Aral Sea Basin (Northern part)	NATO, SIC ICWC	Completed 2009	KG, UZ	Water	The overall objective of the project was to propose a system of models, GIS and engineering tools for civil infrastructure and a pre-feasibility study answering to the principal needs for integrated water resources management in the Syrdarya Delta. ⁶
Aral Sea Basin Capacity Development Project	UNDP	1998-2001	Aral Sea Basin		The overall objective of the Project was to promote the sustainable use of land and water resources in the Aral Sea Basin for the enhancement of economic and social development of the Central Asian republics. This was to be attained through: strengthening the EC of WAS to implement and further develop the Aral Sea Basin Program; developing practical methodologies and supporting effective institutional arrangements to apply the concept of sustainable development to land and water use. ⁷

⁵ Libert, Bo and Lipponen, Annukka, UNECE, *Challenges and Opportunities for Transboundary Water Cooperation in Central Asia: Findings from UNECE's Regional Assessment and Project Work*, June 2009, <http://www.tandfonline.com/doi/abs/10.1080/07900627.2012.684527#.U8KV4vldWkQ>

⁶ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

⁷ Aral Sea Basin Capacity Development Program Water Wiki http://waterwiki.net/index.php?title=Aral_Sea_Basin_Capacity_Development_Project#Expected_Outcomes

Past:

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
Strengthening cooperation on hydrology and environment between Afghanistan and Tajikistan in the upper Amu Darya River basin	UNECE, Afghanistan: Ministry for Water and Energy, National Environmental Protection Agency, Tajikistan: Committee for Environmental Protection and Tajik Hydromet	Completed 2013	Afghanistan, Tajikistan	Water, Environment	The project aimed to facilitate the establishment of long-term cooperation between the two countries on hydrology and environment. The aim was also to improve the understanding and access to information about the water resources and environmental conditions in the upper Amu Darya basin to relevant stakeholder in the whole basin. ⁸
Integrated Water Resources Management (IWRM) in Fergana Valley	ICWC, IWMI, Swiss Agency for Development and Cooperation	Completed 2012	UZ, KG, TJ	Water	The goal of the Integrated Water Resource Management (IWRM) project was to improve and reorganize the institutional arrangements for water management in the Fergana Valley. The project mainly addressed organising water administrations, promotion and institutional build-up of Water Users' Associations (WUA), improvement of water allocation mechanisms among the users and between the three countries, and possibilities for saving water and improving agricultural productivity. ⁹
Transboundary cooperation of communities in the Fergana Valley	UNDP – Tajikistan	Completed	KG, TJ		The main goals of the project were to collect and to disseminate information and analysis of potential conflicts arising from competition over natural resources or from potential natural hazards between communities of two states of Fergana Valley

⁸ UNECE Projects in Central Asia Website <http://www.unece.org/env/water/centralasia.html>.

⁹ Swiss Agency for Development and Cooperation Projects in Central Asia Website

http://www.swiss-cooperation.admin.ch/centralasia/en/Home/Regional_Activities/Integrated_Water_Resources_Management

in an effort of sustainable development					(Tajikistan and Kyrgyzstan). Such a system of monitoring and early warning would produce substantial basis for adoption of responsible policies in maintaining secure environment. ¹⁰
Water Quality in Central Asia	UNECE, CAREC	2009-2012	Central Asia	Water	Aimed to establish common water quality parameters for the joint monitoring and subsequent exchange of information between the countries, ¹¹ as well as to develop more efficient national policies, including the standards and principles applied in the permitting of environmentally harmful activities. ¹²
Introduction of Farming with Alternative Pollinators (FAP) in Uzbekistan	Regional Program for Sustainable Agricultural Development in Central Asia and the Caucasus (CGIAR)	Completed 2013	Uzbekistan	Agriculture	Farming with Alternative Pollinators (FAP) was a new self-supporting, community-based low-cost measure to simultaneously enhance climate change resilience of agro-ecosystems and income. Improved pollination services due to habitat enhancement in the environment close to crop fields can increase income providing strong incentives for producers' motivation in habitat improvement. FAP thus realizes the TEEB approach. ¹³
Chu-Talas Commission	OSCE, UNECE, UNESCAP	2003-2011	Kyrgyzstan and Kazakhstan	Water/ Energy	Offered a mutually beneficial way for Kyrgyzstan and Kazakhstan to share responsibility for water infrastructure used by both countries. The practical outcomes of the Chu-Talas II project included the development of proposals to improve the 2000 Agreement by inclusion of additional water facilities, introduction of integrated water resources management principles, and establishment of basin councils. ¹⁴

¹⁰ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009,

http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

¹¹ Libert, Bo and Lipponen, Annukka, UNECE, *Challenges and Opportunities for Transboundary Water Cooperation in Central Asia: Findings from UNECE's Regional Assessment and Project Work*, June 2009, <http://www.tandfonline.com/doi/abs/10.1080/07900627.2012.684527#.U8KV4vldWkQ>

¹² UNECE Projects in Central Asia Website <http://www.unece.org/env/water/centralasia.html>

¹³ Regional program for Sustainable Agricultural Development in Central Asia and the Caucasus Project Website <http://cac-program.org/projects/detail/63>

¹⁴ Libert, Bo, UNECE, *Water Management in Central Asia and the Activities of UNECE*, 2008, http://water.tkk.fi/English/wr/research/global/material/CA_chapters/04-CA_Waters-Libert.pdf

Central Asia Water Sector Coordination Initiative	EUWI, UNDP, EU, UNECE, OECD, OSCE, SC, CAREC	Launched 2008, not maintained ¹⁵	Central Asia	Water	Meant to act as an online database of all water-related projects in Central Asia, to map activities of the various international and regional partners involved in the water sector in Central Asia. The aim is to support information exchange and thus facilitate coordination amongst partners, projects and processes ¹⁶
Conservation Agriculture in Irrigated Areas of Central Asia and Caucasus (CAC) Region	International Center for Agricultural Research in the Dry Areas (ICARDA)	Completed 2013	Azerbaijan, Kazakhstan, Uzbekistan		The project aimed to improve rural livelihoods and food security through increased productivity of irrigated farming systems in the CAC region using the principles and practices of conservation agriculture (CA). It was expected that at the end of the project, improved water and soil conservation techniques would be sufficiently validated by a core group of farmers and an expanded program would be prepared for farmers in a broader geographic area. ¹⁷
Simulating Impacts and Adapting to Climate Change in Central Asia and China	ICARDA, IFPRI, ADB	Completed 2011	KZ, UZ, KG, TJ		The project was implemented through three major research components, including GIS mapping, crop modeling and socio-economic assessment. The project simulated impacts of climate change under various scenarios on crop growth, water and nutrients uptake and total aboveground biomass and yield of 14 wheat varieties grown on 18 sites in key agro-ecological zones of Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan. ¹⁸
Water Resources Management and Agricultural Production (WARMAP) project	EU Technical Assistance for the Commonwealth of Independent States (EU-	1995-1998	Central Asia	Water/ Agriculture	Main objective to draft new interstate agreements and national legislation that would be harmonized across Central Asia ¹⁹

¹⁵ Lipiainen, Tatjana and Smith, Jeremy, FRIDE/EUCAM, *International Coordination of Water Sector Initiatives in Central Asia*, November 2013, http://www.fride.org/descarga/EUCAM_WP15_Water_Initiatives_in_CA.pdf

¹⁶ Water Wiki Net, CAWSCI/Processes and Initiatives Website http://waterwiki.net/index.php?title=CAWSCI/Processes_and_Initiatives

¹⁷ ICARDA, *ICARDA in Central Asia and the Caucasus*, 2013, <http://www.icarda.cgiar.org/central-asia-and-caucasus-regional-program>

¹⁸ ICARDA, *ICARDA in Central Asia and the Caucasus*, 2013, <http://www.icarda.cgiar.org/central-asia-and-caucasus-regional-program>

¹⁹ World Bank Project Website

<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/0,,contentMDK:22743346~pagePK:146736~piPK:146830~theSitePK:258599,00.html>

	TACIS)				
Interstate Council for Kazakhstan, Kyrgyzstan, and Uzbekistan (ICKKU)	USAID	1995-2000			Water and Energy Uses Roundtable hoped to break the impasse between the Syr Darya states, aimed to redefine the scope and form of environmental cooperation in the Aral Sea basin by dealing only with the potential and real disputes over water management schemes for the Toktogul reservoir ²⁰
Assessment of Environment and Security Linkages and Impact in the ADRB	UNEP, UNDP, ENVSEC	Completed 2011	AF, TJ, TM, UZ		An assessment which identified the environmental stress points in the ADRB, which have or may have security repercussions for the states and populations, recommended strengthening of trust and dialogue, involving Afghanistan, building confidence and ensuring equity, and improving water management for irrigation. ²¹
Microbiological safety of drinking water	NATO ²²	Completed 2010	KG, UZ	Water	This project sought to enhance knowledge in Kyrgyz Republic and Uzbekistan about the quality assurance methodology for microbiological analysis of drinking water adopted in the EU. The technology transfer achieved during this project was intended to allow Kyrgyz and Uzbek professionals to apply state-of-art methods. ²³
Geo-Environmental Security of the Toktogul Hydroelectric Power Station	NATO	Completed 2011	KG, UZ	Energy	This project aimed to assess the geo-environmental security status of the region surrounding the Toktogul reservoir in Central Asia, which is of crucial importance to the cross-border political and economic stability in the region. Implementation of this project aimed to include the formulation of potential threat scenarios and recommendations for mitigation, as well as dissemination of data to national agencies and scientists in the region. ²⁴

²⁰ World Bank Project Website <http://www.worldbank.org/projects/P120788/central-asia-hydrometeorology-modernization-project?lang=en>

²¹ ENVSEC, UNEP, *Environment and Security in the Amu Darya Basin*, <http://envsec.org/publications/AmuDarya-EN-Web.pdf>

²² NATO Central Asia Project Website, <http://www.nato.int/cps/en/natolive/109965.htm>

²³ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

²⁴ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

Region					
Legacy of Uranium Extraction and Environmental Security in the Central Asian Republics	NATO, Jozef Stefan Institute	Completed 2009	Central Asia		This project aimed to assess the radioactive pollution in areas such as Minkush and Kadji Sai in the Kyrgyz Republic and Chorkesar in Uzbekistan and to establish an effective management of the Uranium wastes with the overall goal to minimize the risk for the local population. The project was focusing in particular on drinking-water supplies used by the population living in the vicinity of uranium tailing and waste ore deposits. ²⁵

²⁵ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

Ongoing:

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
The Central Asia Regional Water Information Base Project (CAREWIB)	Implemented by SIC ICWC, UNECE, Zoi Environment Network	Launched 2011	Central Asia	Water Information	A platform for the exchange and analysis of water-related data and information, provides operational water data and analytics mainly for Basin Water Organizations, tools, good practices, etc ²⁶
Enhancing Regional Exchange of Water Resource Information (CAREWIB II)	UNEP, UNECE, ENVSEC, ICWC	Ongoing	Central Asia	Water	The project will build upon the CAREWIB information service of the Interstate Commission for Water Coordination, and enhance the system through further development of its contents and full integration with other sources of regional water-related information, in order to facilitate a Central Asian water information exchange network for policy-makers and the general public. ²⁷
Central Asian Regional Risk Assessment (CARRA)	UNDP	Launched 2008	Central Asia		International effort to proactively help Central Asia's governments to better manage humanitarian and development interventions, high-level initiative with one or two conferences per year, donors discuss coordination priorities ²⁸
Central Asia Regional Economic Cooperation (CAREC)	Central Asia Regional Economic Cooperation (CAREC)	Ongoing			Initiated by 5 Central Asian countries, UNDP and the European Commission, functions both as a government and non-government organization, works in close cooperation with Central Asian governments, regional level to complete local projects ²⁹

²⁶ Denisov, Nikolai and Libert, Bo, UNECE, ZOI Environment Network, *Water Information in Central Asia*, March 2012,

http://www.unece.org/fileadmin/DAM/env/water/cadialogue/docs/Inform_meeting/The_future_of_water_information_in_Central_Asia_final_18March2012.pdf

²⁷ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009,

http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

²⁸ Lipiainen, Tatjana and Smith, Jeremy, FRIDE/EUCAM, *International Coordination of Water Sector Initiatives in Central Asia*, November 2013,

http://www.fride.org/descarga/EUCAM_WP15_Water_Initiatives_in_CA.pdf

²⁹ Lipiainen, Tatjana and Smith, Jeremy, FRIDE/EUCAM, *International Coordination of Water Sector Initiatives in Central Asia*, November 2013,

http://www.fride.org/descarga/EUCAM_WP15_Water_Initiatives_in_CA.pdf

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
	Program				
Environment and Security (ENVSEC) Initiative – Central Asia Regional Work Program	UNDP, UNEP, OSCE, NATO, UNECE and REC	Established 2003, Ongoing	Central Asia		Program goals include improving cooperation, dialogue and sustainable management of shared resources, reduce environmental and health risks posed by industrial activities and hazardous hotspots, reduce risks due to emerging/incremental and sudden environmental changes, equip stakeholders with necessary information, capacities and tools to respond collectively to environment and security challenges
United Nations Special Programme for the Economies of Central Asia (SPECA)	UNECE, UNESCAP	Launched 2004	Central Asia	Water and Energy	In 2004, experts produced a regional water and energy strategy that outlined (1) needs for action in the water and energy sectors in the short and long term, (2) importance of developing legal framework for water and energy cooperation, (3) strengthen national and regional institutions, and (4) improve monitoring of and information on water resources, only restricted components of this strategy are being implemented ³⁰
Regional Dialogue and Cooperation on Water Resources Management in Central Asia	Berlin Process, UNECE, GIZ	Ongoing, Launched 2009	Central Asia	Water	The goal of the project is to empower the countries of Central Asia to develop and implement mutually acceptable, long-term solutions to improve cooperation on transboundary water resources. This is being done by enhancing the regional dialogue and strengthening the capacity of regional institutions for water resources management. ³¹

³⁰ Libert, Bo, UNECE, *Water Management in Central Asia and the Activities of UNECE*, 2008, http://water.tkk.fi/English/wr/research/global/material/CA_chapters/04-CA_Waters-Libert.pdf

³¹ UNECE Projects in Central Asia Website <http://www.unece.org/env/water/centralasia.html>

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
The Central Asian Countries Initiative for Land Management (CACILM)	Global Environmental Facility (GEF)		Central Asia	Land Management	A 10-year, multicountry, multidonor program promoting SLM to restore, maintain, and enhance productivity of Drylands. The goal of CACILM is to combat land degradation while also improving rural livelihoods across the region ³²
Dam safety in Central Asia: Capacity Building and sub-regional cooperation	UNECE, EC IFAS	Launched 2006, Ongoing	Central Asia	Water, Energy	In coordination with EC-IFAS, this program aims to improve and implement national legislation, develop national training programs for the safe operation of hydrotechnical installations, support the development of harmonized technical documentation and exchange of information, and support bilateral cooperation to ensure the safety of individual dams or dam systems. ³³
Consensus on IWRM Implementation in Central Asia	Global Water Partnership for Central Asia and Caucasus (GWP CACENA)	2014, ongoing	Central Asia	Water	Two back-to-back meetings on water management in Central Asia recently took place in Tashkent, Uzbekistan. The key output of the workshop was a full consensus among water leaders that Central Asian countries should adopt water strategies addressing IWRM implementation, aiming to save water and achieve maximum water productivity in all uses. ³⁴
Organic Cotton Production and Trade Promotion Project in Kyrgyzstan	Swiss State Secretariat for Economic Affairs (SECO), HELVETAS, the Humanist Institute for	Ongoing (expected completion 2016)	Kyrgyzstan	Agriculture	The main goal of the project is to promote organic farming in Central Asia, whilst trading organic cotton, and other organic products, on international and domestic markets, thus allowing farmers interested in alternative methods of farming to make their living in an environmentally sustainable way. During the first stage of the project (2003-2006), a value chain was established for organic cotton as a leading crop. During the third phase (2012-

³² Weinthal, Erika, UNDP, *Human Development Report 2006*, http://hdr.undp.org/sites/default/files/weinthal_erika.pdf

³³ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

³⁴ GWP Project Website <http://www.gwp.org/en/gwp-in-action/Central-Asia-and-Caucasus/News-and-Activities-GWP-Central-Asia-and-Caucasus/Consensus-on-IWRM-Implementation-in-Central-Asia/>

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
	Cooperation with Developing Countries (Hivos)				2016) the project will support the emerging organic sector by attracting more players to join the movement, supporting local market development and contributing to a more conducive environment. ³⁵
Efficient Use of Water Project	HELVETAS Swiss Intercooperation	Completed 2011	Kyrgyzstan	Water	This project aimed to achieve its goal of market testing for drip irrigation systems by providing support to facilitate establishment and functioning of a supply chain of drip irrigation systems starting from the manufacturers up to the clients/farmers. Project support to the main actors of supply chain – the Wholesaler Agro Bazaar Cooperative and the Retailers. ³⁶
Saving water through drip irrigation in Kyrgyzstan	HELVETAS Swiss Intercooperation	Completed 2012	Kyrgyzstan	Water/ Agriculture	This program aimed to strengthen and train local organisations, cooperatives and private companies involved in agricultural extension. Men and women farmers learned on demonstration plots how to use short furrows to spread water more equally and thus save water; or how they can distribute a defined quantity of water directly to the plant by means of a perforated plastic tube. ³⁷
National Water Resource Management Project (NWRM)	HELVETAS Swiss Intercooperation	Planned	Tajikistan		The Project focuses on a partnership approach, playing a facilitating role in developing local capacities able to apply IWRM principles and to establish an efficient water resources administration. The Project is implemented in a systemic and integrated way. It supports development of the legal framework (policy dialogue) and institutional development of new IWRM organizations and in parallel supports the hardware aspects of water management (infrastructure, machinery, automation systems and etc). ³⁸

³⁵ Helvetas Project Website – Kyrgyzstan <http://kyrgyzstan.helvetas.org/en/activities/projects/>

³⁶ Helvetas Project Website – Kyrgyzstan <http://kyrgyzstan.helvetas.org/en/activities/projects/>

³⁷ Helvetas Project Website – Kyrgyzstan <http://kyrgyzstan.helvetas.org/en/activities/projects/>

³⁸ Helvetas Project Website – Tajikistan http://tajikistan.helvetas.org/en/projects_tajikistan/

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
Technical support to small farmers to increase crop yields	USAID	Ongoing	Uzbekistan		USAID’s activities help farmers achieve immediate results by applying improved techniques and better technology to disease-resistant plants. USAID trains households to dry fruits and is introducing affordable methods for creating on-farm cold storage facilities, all of which help improve incomes. ³⁹
Rehabilitation of Irrigation Systems in Sughd and Khatlon Provinces.	USAID	Ongoing	Tajikistan		USAID worked with farmers and agribusinesses to improved agricultural productivity, contributing to over \$2 million in increased farm revenue in 2011. By encouraging agribusinesses to adopt industry best practices, USAID helped them increase sales by \$1.53 million ⁴⁰
Kyrgyz Agro Input Enterprise Development Project	USAID	Ongoing	Kyrgyzstan		This program helps farmers increase yields through training on integrated crop management approaches. Coordinated program activities include: a distribution of locally procured seeds to small- and medium-sized farms throughout the country; the provision of agricultural production machinery among target seed farms; and support to livestock breeding farms through the procurement of live animals, livestock equipment, and the provision of targeted technical assistance. ⁴¹
Knowledge Management for Central Asian Countries Initiative for Land Management (CACILM)	International Center for Agricultural Research in the Dry Areas (ICARDA)	Expected completion 2016	Central Asia		CACILM is a multi-donor investment program launched in 2006 aimed at restoring, maintaining and enhancing the productive functions of land in Central Asia. Aims to build a knowledge platform to consolidate knowledge and for scaling-up sustainable land management (SLM) interventions. ⁴²

³⁹ USAID Project Website Uzbekistan <http://www.usaid.gov/uzbekistan/agriculture-and-food-security>

⁴⁰ USAID Project Website Tajikistan <http://www.usaid.gov/tajikistan/agriculture-and-food-security>

⁴¹ USAID Project website http://pdf.usaid.gov/pdf_docs/PDADM077.pdf

⁴² ICARDA, *ICARDA in Central Asia and the Caucasus*, 2013, <http://www.icarda.cgiar.org/central-asia-and-caucasus-regional-program>

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
Central Asia Energy-Water Development Program (CAEWDP)	World Bank	Ongoing, established 2013	Central Asia	Energy, Waters	This program aims to improve diagnostics and analytical tools to support the countries of the region in well-informed decision-making to manage their water and energy resources, strengthen regional institutions, and stimulate investments. The main components of the CAEWDP are: Energy Development, Energy-Water Linkages and Water Productivity. ⁴³
Central Asia Hydrometeorology Modernization Project (CAHMP)	World Bank	Ongoing, launched 2011	Central Asia	Water	The objective of the Central Asia Hydrometeorology Modernization Project (CAHMP) is to improve the accuracy and timeliness of hydromet services in Central Asia, with particular focus on Kyrgyz Republic and Republic of Tajikistan. There are three components to the project. The first component of the project is strengthening regional coordination and information sharing: This component will ensure that each of the National Hydrometeorological Services (NHMSs) in the region can share, use, exchange and archive common hydromet data. ⁴⁴
EU Water Initiative (EUWI)	EU Water Framework Directive (WFD)	Launched 2002	Globally including Central Asia	Water	Improving water quality involving citizens in the process, offers an example of how to establish regional coherence in water management based on its own experience, established to create conditions for mobilizing EU human and financial resources to help achieve the MDGs in partner countries ⁴⁵

⁴³World Bank Project Website

<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/0,,contentMDK:22743346~pagePK:146736~piPK:146830~theSitePK:258599,00.html>

⁴⁴ World Bank Project Website <http://www.worldbank.org/projects/P120788/central-asia-hydrometeorology-modernization-project?lang=en>

⁴⁵ Lipiainen, Tatjana and Smith, Jeremy, FRIDE/EUCAM, *International Coordination of Water Sector Initiatives in Central Asia*, November 2013, http://www.fride.org/descarga/EUCAM_WP15_Water_Initiatives_in_CA.pdf

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
EUWI Eastern Europe, Caucasus and Central Asia (EECCA) working group	EU Water Initiative (EUWI)	Launched 2002	Central Asia		Meets once or twice a year to promote cooperation among the partners, monitor progress made and approve the annual work programs ⁴⁶ Key focus on water infrastructure for water, food and energy security
EUWI National Policy Dialogues	EU Water Initiative (EUWI)	Launched 2006	International		Based on bilateral consultations between EU and EECCA governments, aim at creating ‘policy packages’ to support water sector reforms at national and regional levels, a new NPD began to operate in Kazakhstan in June 2013, NPD’s are the EU’s main coordination mechanism in the region ⁴⁷
EU Regional Environment Program for Central Asia (EURECA)	EUWI		Central Asia		Environmental Cooperation goals: aims at improving regional water cooperation and partnership development through four main components: facilitating closer regional cooperation; sustainable use and management of natural resources; transboundary river basin management; and environmental awareness raising. ⁴⁸
Berlin Process	German Agency for International Cooperation (GIZ)	Launched 2008	Central Asia	Water	The initiative is an offer by the German Federal Government to the countries of Central Asia to support them in water management and to make water a subject of intensified transboundary cooperation. The primary goal is to thereby set in train a process of political rapprochement in Central Asia that leads to closer cooperation in the use of the scarce water resources and may result in joint water and energy management in the long term. ⁴⁹

⁴⁶ Lipiainen, Tatjana and Smith, Jeremy, FRIDE/EUCAM, *International Coordination of Water Sector Initiatives in Central Asia*, November 2013, http://www.fride.org/descarga/EUCAM_WP15_Water_Initiatives_in_CA.pdf

⁴⁷ Lipiainen, Tatjana and Smith, Jeremy, FRIDE/EUCAM, *International Coordination of Water Sector Initiatives in Central Asia*, November 2013, http://www.fride.org/descarga/EUCAM_WP15_Water_Initiatives_in_CA.pdf

⁴⁸ Lipiainen, Tatjana and Smith, Jeremy, FRIDE/EUCAM, *International Coordination of Water Sector Initiatives in Central Asia*, November 2013, http://www.fride.org/descarga/EUCAM_WP15_Water_Initiatives_in_CA.pdf

⁴⁹ Berlin Process Website <http://www.waterca.org/berlin-process?lang=en>

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
Transboundary Water Management in Central Asia Programme	GIZ on behalf of the German Federal Foreign Office	2009-2014, Ongoing	Central Asia	Water	<p>This strategy has two components: Component one is to foster regional institutional cooperation, focusing on those institutions in Central Asia that regulate matters of water distribution, such as the Interstate Commission for Water Coordination (ICWC) or the International Fund for Saving the Aral Sea (IFAS). The programme aims to strengthen their position in the political system. Component two is to strengthen transboundary river basin management. This component focuses especially on the smaller transboundary rivers which are particularly suited to applying the basic principles of river basin management. In the framework of the EU regional Environmental Programme for Central Asia (EURECA) , GIZ in partnership with the Regional Environmental Centre for Central Asia (CAREC) implements measures aimed at strengthening water management organisations, improving human and institutional capacities for basin planning and supporting (inter-) state administrative basin planning processes as well as exchange of best practices between water management organisations.⁵⁰</p>

⁵⁰ GIZ Central Asia Programme Website <http://www.waterca.org/programme>

Planned:

Name of Project	Partner Organizations	Timeframe	Location	Sector	Project Goals and Outcomes
Water monitoring in a strategic sub-basin of the Amu Darya	UNDP	Planned	Possibly TJ	Water	The aim of this project is to support Tajikistan, Turkmenistan and Uzbekistan to establish a grid of automated hydro-meteorological stations in the Amu Darya river basin to facilitate and promote information collections and sharing. ⁵¹
Radioactive waste management in transboundary context	UNDP	Planned	KZ, KG, TJ, UZ		This project wants to move from assessments to identifying possibilities for actual clean-up action. As a follow up to High level Forum on Uranium Tailings in Geneva on 29 June 2009, the Program Formulation and Coordination Unit will be created with the seat in Bishkek, Kyrgyzstan in order to a) create a coherent portfolio of projects aimed at mitigating various aspects of toxic waste; b) liaise with the Governments of Kyrgyzstan, Kazakhstan, Tajikistan and Uzbekistan to clarify their response actions; c) coordinate donor response. ⁵²
Risk reduction and climate change adaptation in Central Asia	UNDP, UNEP	Planned	Central Asia		The programme will address the main policy, institutional capacity and financial barriers to systematic adaptation in Central Asia with particular focus on water, land and food production systems. The proposed programme will be designed in a way to enable enhancing the adaptive capacity of Central Asian countries, promoting early adaptation action and laying the foundation for long-term investment to increase resilience to climate change across the region. ⁵³

⁵¹ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

⁵² Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

⁵³ Environment and Security Initiative (ENVSEC), *Environment and Security (ENVSEC) Regional Work Programme 2009-12*, March 2009, http://www.envsec.org/publications/WP%20ENVSEC%20Central%20Asia%202009-12%2015%20June%202009_Eng.pdf

5. Workshop Evaluations

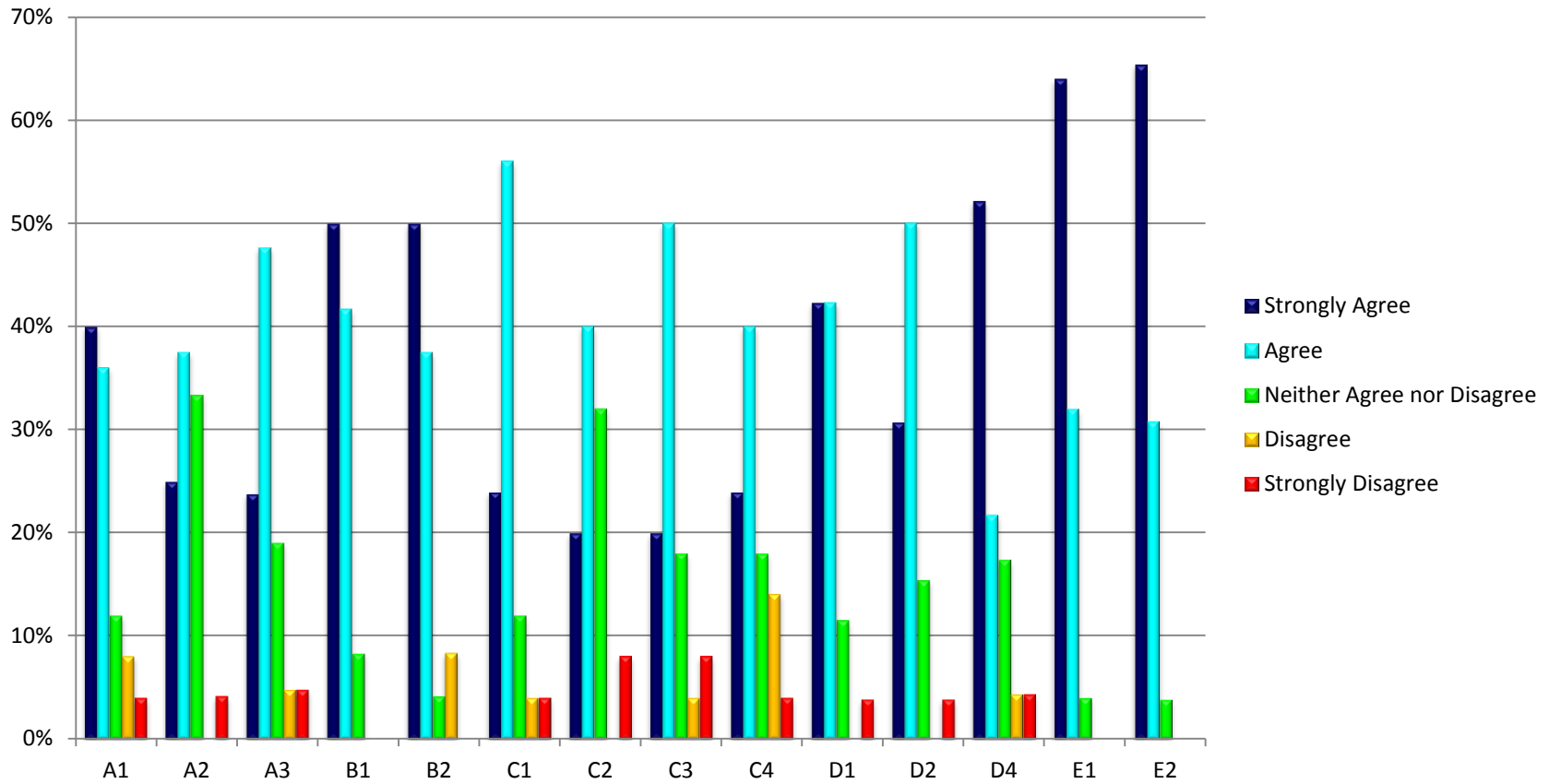
EVALUATION OF NEXUS DIALOGUE ON WATER INFRASTRUCTURE SOLUTIONS: CENTRAL ASIA WORKSHOP

A. Nexus Dialogue powerpoint (Day 1)	Agree					Disagree				
1. The presentation on the Nexus was clear and provided a good basis for understanding the water, energy and food nexus concept	1	2	3	4	5					
2. The content on the Amu Darya was informative (if not what could be improved)?	1	2	3	4	5					
3. Information on the outputs of the previous workshops were informative and improved my understanding of the purpose of this workshop	1	2	3	4	5					
B. Basin Challenge Game (Day 1)	Agree					Disagree				
1. The Basin Challenge game was useful to understand the complexities of river basin development.	1	2	3	4	5					
2. The Basin Challenge game was a good way to initiate discussions surrounding trade-offs within the water-energy-food nexus in the Amu Darya Basin	1	2	3	4	5					
3. What did you find most difficult about the game?										
4. What surprised you about the playing the game?										
5. What was missing from the game?										
C. Nexus Presentations	Agree					Disagree				
1. The presentations on the State of the Nexus in Central Asia gave me a clear picture of what the nexus means in the Central Asia region	1	2	3	4	5					
2. The 'Spotlight on Afghanistan' provided important information on the resource needs of Afghanistan and the consequences for the Amu Darya Basin	1	2	3	4	5					
3. The presentations on Nexus Solutions was useful to helping develop solutions during the group work	1	2	3	4	5					
4. Presentation on "Designing Investment Grade Project Proposals" provided useful guidance to develop the proposal in the group work session	1	2	3	4	5					



D. Group work	Agree	Disagree			
1. The process of developing targets for 2030 was useful and helped me think about water-energy-food links and how these would look like in the future	1	2	3	4	5
2. The process of identifying problems, solutions and an action plan approaches was clear and straightforward to follow.	1	2	3	4	5
3. What could be improved and made clearer?					
4. Development of an initial investment grade proposal was a useful exercise to collaborate across sectors and organizations	1	2	3	4	5
5. What could be improved and made clearer?					
E. Follow up	Agree	Disagree			
1. Are you likely to circulate information from this workshop and Nexus Dialogue on Water Infrastructure Solutions?	1	2	3	4	5
2. Will you and your colleagues be motivated to contribute case studies and tools to the Nexus toolkit?	1	2	3	4	5
How will you use the information from the workshop?					
Can we include your email address in our distribution list?					
Can we distribute video and photograph images of the workshop (that have you in them)?					

Results in percentages





6. Acknowledgements

This event would not have been possible without the generous support of the Gerda Henkel Foundation, the Kathryn Davis Fund, and the Governments of the United States and France. Special thanks also go to the Kiler Company, the Kurt Group, EWI Board Member Zuhail Kurt and EWI Fellow Allen Collinsworth.

ⁱ Fritzsche, Kerstin, et al. "Climate Change and the Water-Energy-Agriculture Nexus in Central Asia." *Adelphi Background Paper* (2011). http://programme.worldwaterweek.org/sites/default/files/carec_nexus_approach.pdf

ⁱⁱ UN Development Programme (UNDP), *Human development report 2014 - Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience*. (2014). <http://hdr.undp.org/sites/default/files/hdr14-report-en-1.pdf>

ⁱⁱⁱ Transparency International, Corruption Perception Index. <http://www.transparency.org/research/cpi/overview>

^{iv} Linn, Johannes F. "Tajikistan: Progress and Problems at the Heart of Central Asia." *The Brookings Institution*. N.p., 9 July 2008. Web. 30 Sept. 2014. <http://www.brookings.edu/research/opinions/2008/07/09-central-asia-linn>

^v World Development Indicators, The World Bank, accessed September, 2014. <http://data.worldbank.org/indicator/SI.POV.RUHC/countries/1W?display=default>

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- ^x World Bank Turkmenistan profile, The World Bank, accessed September 2014. <http://www.worldbank.org/content/dam/Worldbank/document/Turkmenistan-Snapshot.pdf>
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- ^{xiii} Fritzsche, Kerstin, et al (2011).
- ^{xiv} IPCC, 2014: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, XXX pp.
- ^{xv} The World Bank, Fay et al. *Adapting to Climate Change in Europe and Central Asia*, 2010. http://siteresources.worldbank.org/ECAEXT/Resources/258598-1243892418318/ECA_CCA_ch6.pdf
- ^{xvi} IPCC (2014).
- ^{xvii} The World Bank (2010).
- ^{xviii} M. Akmurudov et al, “Environment and Security in the Amu Darya Basin”, UN Environmental Programme (UNEP), (2011). <http://envsec.org/publications/AmuDarya-EN-Web.pdf>
- ^{xix} IPCC (2014).
- ^{xx} Liston, Enjoli. "Satellite Images Show Aral Sea Basin 'completely Dried'" The Guardian 1 Oct. 2014.
- ^{xxi} Stucki, Virpi, and Suvi Sojamo. "Nouns and Numbers of the Water-Energy-Security Nexus in Central Asia." *International Journal of Water Resources Development* 28.3 (2012): 399-418.
- ^{xxii} Akmurudov et al (2011).
- ^{xxiii} Weil, Stephen. "Tit-for-Tat: The Evolution of Non-Cooperation over the Rogun Dam." *Center for Strategic and International Studies*. N.p., 1 Feb. 2012. <http://csis.org/blog/tit-tat-evolution-non-cooperation-over-rogun-dam>
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