

# The Pearl of Kyrgyzstan

An Examination of Water Resources Management in Issyk-Kul Oblast

Principal Investigator: Steve Kolk

Supported by the DOI-ITAP Ambassador's Water Expert Program

## Introduction

From November 4 to November 16, 2019, Steve Kolk, a hydraulic engineer with the Bureau of Reclamation, traveled around Kyrgyzstan as part of the DOI-ITAP Ambassador's Water Expert Program. Steve had previously visited Kyrgyzstan in September of 2018 as part of a delegation from a Washington State organization that has established a 'sister-region' relationship with the Issyk-Kul Oblast. Just recently recognized as a 501 (c) (3) organization, the Kyrgyz-Washington Sister Region Organization is a Chelan County based group of citizens committed to furthering cultural understanding and sharing knowledge between the people of the Issyk-Kul Oblast and the citizens of Chelan County. Issyk-Kul Oblast has much in common with Chelan County, including a similar climate, thriving tree fruit industry, and a landscape that features a very prominent alpine lake.

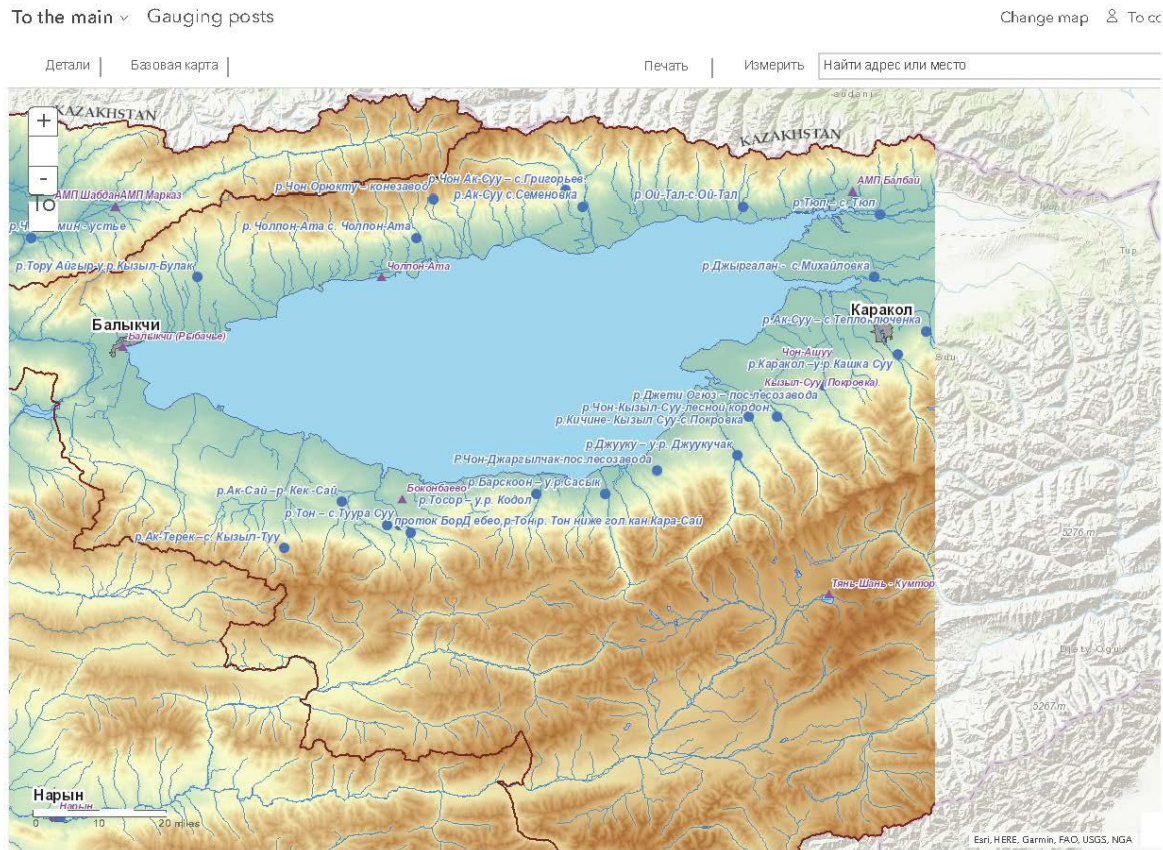
The Kyrgyz-Washington Sister Region Organization began approximately 10 years ago with the efforts of a Chelan County orchardist and local elected official, and over the years has led to the exchange of several delegations from their respective regions. The most recent Kyrgyz delegation visited Chelan County in May of 2018 and toured Lake Chelan, a 50-mile long lake with tremendous regional ecological and economic importance. The delegation received a presentation on water quality research by the Lake Chelan Research Institute, an NGO dedicated to understanding how Lake Chelan and the surrounding ecosystems are impacted by local and regional stresses.

A subsequent Chelan County delegation visited Kyrgyzstan in September 2018 and had the honor of meeting with many federal and local government officials, NGOs, orchardists, and tourism entrepreneurs. Existing relationships were strengthened and several new contacts were made, adding to the already significant number of Kyrgyz and U.S. participants of this cultural and technical exchange.

Traveling with Steve from November 4 to November 9, 2019 was Mike Kaputa, Director of Chelan County's Natural Resources Department and a member of the Kyrgyz-Washington Sister Region Organization. As detailed below they toured around Issyk-Kul Oblast to meet

with various individuals engaged in water resources management, visit various water management facilities, and later met with other officials and NGOs in Bishkek.

## Background



Lake Issyk-Kul, a slightly saline, terminal lake, is the second largest alpine lake in the world and the dominant feature of the Issyk-Kul Oblast. The lake is a Ramsar site of globally significant biodiversity, and the UNESCO designated Issyk-Kul Biosphere Reserve is recognized for its conservation value and long term economic and social development importance.

Water management infrastructure is in generally poor condition, with approximately 75% of irrigation conveyances in unsatisfactory condition. During the Soviet era, all Central Asian water resources were managed collectively, and financial resources were provided accordingly. As this is no longer the case, management of Issyk-Kul Oblast's water resources has been decentralized, with little technical or financial support available. There are few resources to repair and maintain such infrastructure, and no resources to improve wastewater treatment practices.

Lake Issyk-Kul has occasionally been the subject of research by international scientists, and the findings of those studies have at times been contradicted by state officials, especially when they run counter to the message that the government wishes to convey.

Chronology

#### **Monday November 4**

We arrived in Bishkek and checked into our hotel. I contacted the US Embassy and made arrangements for Tuesday. Connected with local Kyrgyz contact Danir Imanaliev, the head (Akim) of the Issyk-Kul Rayon and a previous visitor to Chelan County, to iron out details for trip. We went to dinner with Ernest (a friend of Danir), his wife Alexandra, and younger brother Melis. We were later joined by Lee (ArstanBek Sargaldaev), another associate of Danir who has visited Chelan County. After dinner we met up with Mirlan Shabdanov, a contact from my previous trip to Kyrgyzstan.

#### **Tuesday November 5**

We reported to the US Embassy for an orientation. We met with Dong-Thu Caohuu, Economic Officer, and Dolon Maldybaev, Economic Assistant, both of which would assist me throughout my trip. Konstantin Dubrovsky, Chief, Regional ESTH Office, joined Dong-Thu, Dolon, Mike, and me as we traveled to the town of Cholpon Ata in Issyk-Kul Oblast. Once there we had a brief formal meeting with Danir, his deputy, the Rayon's Architect (similar to a Public Works Director), and the head of Environmental Protection. At the meeting we discussed the purpose of our visit and talked about the water resources issues affecting the Issyk-Kul Rayon. There is a recognition of the need to incorporate environmental protection in any development project, and Danir's staff mentioned working with the Critical Ecosystems Partnership Fund (CEPF.net). After the meeting Danir hosted us all at dinner, where we were joined by Ulukbek, another associate of Danir's that is the Prosecutor of Issyk-Kul Rayon.

#### **Wednesday November 6**

Today we made the drive to Karakol where the administrative headquarters for the Issyk-Kul Oblast is located. We met with the Governor of the oblast, Akylbek Osmonaliev, and his staff, comprised of the head of Water Resources, the head of the Environmental Department, two assistants, and the Chief of Administration for the Oblast. Again I described the purpose of my visit and we had a good conversation regarding water

resources in Issyk-Kul Oblast. The following information was gleaned from our conversation:

In Issyk-Kul Oblast

- 150,000 hectares irrigated
- Water supply has been decreasing
- Historic high of 371 irrigation wells, 20 currently functioning
- Farmers are working on moving to drip irrigation to conserve water
- The reduction in the number of functioning wells is due to a lack of resources for operation and maintenance. Groundwater levels have reportedly remained steady.

In the afternoon our group visited a checkpoint funded in part by the non-profit group Panthera and supported by the US government. This visit was the primary reason that the embassy staff had traveled with us. The checkpoint is outside of the village of Barskoon and is intended to both deter and detect poaching of wildlife. Panthera's primary interest in this area is conservation of the highly endangered snow leopards that live in the Tien-Shan mountains that surround the border between Kyrgyzstan and China.

That evening Danir convened several local officials, including Ermek, who is the Karakol Council's Chief of Staff, and Karakol's Chief Architect and his assistant, Shergazy, to plan the following day's site visits. We learned that there was a 2014 USAID project for irrigation in Karakol, and that in 2015 the City Administration allocated 5 Million KGS (~\$71,500) for an irrigation system, including a public campaign for irrigators to keep their ditches maintained. This largely hasn't happened, and as a result municipal water is being used for irrigation, resulting in the water treatment plant being overwhelmed by demand. During such periods of high demand the treatment plant bypasses its filters, resulting in the delivery of poor quality water.

Part of the issue may be attributed to the fact that residents pay a flat fee for municipal water, approximately \$0.35 per month, for unlimited use, although there are plans to begin installing water use meters. There is currently no charge for irrigation water.

## **Thursday November 7**

The Embassy Staff departed today, and our driver and interpreter for the next several days arrived. We met Ermek and Shergazy and they led us on a tour of water-related infrastructure in and around the city of Karakol. We started at the Kashk-Suu River which is where Karakol derives its drinking water. River flow is driven by glacier melt, and as such



drops in winter. Spring flows are often very muddy, and diverted flows are cleaned by running them through a settling basin and then a gravel filter (gravel is replaced annually). The diversion is located at an elevation of 2000 m, just off the road that leads to the large nearby ski resort, which sits at 3050 m. The river is reported to support an introduced species of trout, which wiped out the native chebak (bream) and sig (whitefish).



Views of the Kashk-Suu River and Headwaters





Diversion Structure



Dewatered Channel (L) and Settling Basin (R)





Pipe and Relief Valve Leading to Gravel Filter Facility



Gravel Filter Facility (Above and Next Page)





Pipes Leading from the Gravel Filter Facility to the Treatment Plant in Karakol (left). At right, the Karakol River after its confluence with the Kashk-Suu.



Further down the Karakol River we stopped at an irrigation diversion. This diversion can handle 2 m<sup>3</sup>/s, and sends flows down a canal 10.6 km long. The water authority is looking to refurbish the upper 50 m of canal, which is the section required by law to be lined. 1300 hectares are irrigated via this ditch. The entire irrigation system, involving another diversion, irrigates 6800 hectares. It is estimated that seepage losses in the canal are 25%. Irrigation season runs from May to October. Primary crops include potatoes, wheat, apples, garlic, and hay. The primary method of irrigation used in this area is flood or rill irrigation.



Irrigation Diversion on the Karakol River (above) and associated canal (below)





While the river in this location is reported to flow fairly consistently in the summer at approximately  $54 \text{ m}^3/\text{s}$ , low water conditions early in the growing year (before June) can result in low diversions, which necessitates scheduling of water use among irrigators.

We next visited the water treatment plant, a modern facility that was built in 2011 by the Swiss Agency for Development and Cooperation. Instructors from the US provided training to the operators. Mike drank treated water directly from the facility and appeared to suffer no ill effects.



Interior of the Water Treatment Facility

We then visited some nearby irrigation canals and laterals. As described previously there is very little maintenance that gets done to some of the ditches near the end users, resulting in an inability to deliver irrigation water. New construction sometimes eliminates sections of ditch with no obligation to replace it. This lack of access to irrigation water results in potable water being used to irrigate crops, and the demand overwhelms the capacity of the water treatment plant. This in turn results in the water treatment plant bypassing some of the treatment phases in order to meet demand, which results in delivery of untreated water through the supposedly potable system. They are working on trying to keep the irrigation ditches open to make sure potable water is only used for domestic purposes, but this has



proved difficult. The local government has no support for raising the rates on potable water to encourage use of irrigation water.



Ditches and Laterals in Karakol in a Poor State of Repair

Our last stop was an irrigation diversion on the Ak-Suu River. The diversion had canals that took off from both the left and right banks.





Looking Upstream at the Irrigation Diversion on the Ak-Suu River



Gate on the Right Bank Canal at the Diversion



## Friday November 8



An intact above-ground concrete irrigation ditch (left) and a more typical derelict one (right)

Today we drove from Karakol to Bishkek where we had an informal meeting with Mr. Uzarbek Jylkybaev, the Governor of Osh Oblast. At dinner with Danir and a few of his associates Mike and I were introduced to Adilet Abdybekov, a project manager and engineer with the Danish company Grundfos as well as Honorary Consul of the Royal Danish Consulate. Grundfos is a pump manufacturer and construction outfit, and Adilet has been involved in many water treatment and similar projects in Kyrgyzstan, including several in the Issyk-Kul oblast. He is currently working on a project to build a treatment facility in Cholpon Ata and operate it for 5 years, with the idea being that if Grundfos supports the operation and maintenance for a period following construction, thus providing on-the-job training for the operators, then the project has a better chance at being successful in the long term. One of the issues with such facilities in Kyrgyzstan is that there is frequently outside money to build projects, but upon completion the foreign entity essentially declares success and leaves it to the local jurisdiction to operate and maintain. While there are relevant educational training programs at the universities in Kyrgyzstan, once educated most of the graduates move abroad for better paying employment. Adilet is very interested in addressing this 'brain drain' and finding a way to keep expertise in Kyrgyzstan. This was a common theme that came up several times with other professionals and academics.

## Saturday November 9

Mike departed Kyrgyzstan in the morning. Saturday at lunch I was able to host three glacier and water supply experts; Dr. Dogdurbek Chontoev, Director of the Institute of Water Problems and Hydropower; Dr. Akylbek Chymyrov, Director of the Kyrgyz Centre of GIS at



the Kyrgyz State University of Construction, Transportation, and Architecture; Rysbek Satylkanov, Head of the Tien-Shan High Mountain Research Center. They provided background on the region's glacial recession and outlined how their and other institutes worked together on various projects and described one of their current proposals. It involves two different modeling approaches to evaluate the changes in the elevation level of Issyk-Kul lake by integrating data on the contributing glaciers, climate change, groundwater, and irrigation diversions. The assumption is that the lake level is declining. (I asked about current monitoring that would confirm such a trend, but it didn't seem like any was being done, though there was mention of satellite data. This unavailability of monitoring data was not attributed to insufficient infrastructure but to a lack of technical expertise.) The ultimate goal of this proposal is to comprehensively better manage water resources so as not to anthropogenically impact lake levels. This is consistent with some of the pre-trip information I discovered regarding water quality in Issyk-Kul lake and it being degraded partly by reduced inflow as compared to historic rates.

An additional item of interest is the desire to start a new institute for recreational geography and tourism. This would be intended to, among other things, raise the level of expertise in Issyk-Kul oblast for the types of monitoring described earlier, and foster a greater understanding of how tourism in Issyk-Kul impacts the lake and environs. Director Chontoev went so far as to offer space at the Kyzyl-Suu institute if I knew of anyone interesting in participating in such an effort.

Another familiar theme brought up in our discussion was that greater transboundary cooperation is needed in Central Asia, and Kyrgyzstan has a lead role to play owing to the fact that so many Central Asian rivers begin in Kyrgyzstan. I heard several times on the trip that under Soviet control water and energy resources in Central Asia were managed for the benefit of all, but since the collapse of the Soviet Union each country has struggled to achieve the same level of cooperation with its neighbors. Kyrgyzstan is well positioned in terms of water resources but has struggled to meet its energy needs. It is widely expected that as water resources become increasingly scarce in the region that Kyrgyzstan will use this advantage to leverage greater access to oil and gas from neighboring Kazakhstan.

Before lunch concluded I was advised to contact Mary Melnyk with USAID's Department of the Environment in Washington DC. She has worked in Issyk-Kul and visited the area three times. All three gentlemen were very appreciative of her efforts and spoke highly of her.

Following lunch I was accompanied by my translator into the Ala Archa park where the Ala Archa River, one of two rivers that supply the drinking water for Bishkek, Kyrgyzstan's capital city, begins. This series of photos below traces it from its source as a glacier to the where it flows through the city. The river begins only 40 or so km from Bishkek but starts high in the mountains in an area designated as a national park. It is assumed to be a very clean source, but I was struck by how, even at a high elevation and before it leaves the park, there is

significant algae growth in the river, which is typically a sign of poor water quality (high nutrient loading).



Ala Archa River headwaters





Algae Growth in the Ala Archa River





Dam with significant sedimentation on the Ala Archa River



Ala Archa River Outside of Bishkek





Ala Archa River in Downtown Bishkek

## Sunday November 10

I returned to Issyk-Kul today with Danir and met up with a representative of a Korean company that was doing some marketing for their company, which constructs wastewater treatment facilities. We met in Tamchi village, population 2500, which expands to 6000 during the summer tourist season. Tamchi is part of the popular resort area along the north side of the lake and has no current wastewater treatment. The Korean company was asked to provide a 'Terms of Reference' document describing the feasibility of installing a treatment facility, along with a cost estimate. The Oblast administration would then be able to use this to seek either domestic or foreign funding for the project.

An interesting feature of the village are the spring houses that supply geothermally heated water (40 C) to each residence via individual plastic pipe (see photo below).





This “technical water” is used for heating the homes and, once cooled, for non-potable applications such as bathing, washing, irrigation, and filling the odd swimming pool. It was difficult to ascertain, but I gather that in addition to two sources of water (one being the thermal spring water and the other a potable supply) there are two wastewater streams, the thermally depleted but otherwise uncontaminated spring water and the wastewater resulting from household use. Both are currently discharged into the lake without treatment. The village is immediately on the shore of Issyk-Kul lake, as shown in the photo below.



Finally, we stopped at a grove of paullinia trees that are irrigated with groundwater via drip irrigation. There used to be more groundwater irrigation in this area, but maintenance ceased with the end of USSR assistance, and the land became fallow. This grove was created by a private citizen as a test case to show that drip irrigation is a viable method in this area. His goal is to improve the ecology of the area and has created a video to showcase his efforts.





Grove of Trees Irrigated Using Drip Technology

### **Monday November 11**

Today we inspected a new irrigation project that is just coming on line. It was 9 years in the making and cost \$1 million, and was built by a Chinese firm using Chinese government funds. It consists of 5.5 km of canals and a retrofitted reservoir that was a holdover from the USSR period. The purpose of the project is to bring irrigation water to approximately 3000



hectares that have mostly been fallowed due to failing infrastructure. Wheat and hay are the primary crops. The canal leading to the reservoir is cast-in-place concrete, while the canals and laterals downstream of the reservoir are comprised of precast sections. The reservoir has a capacity is 500k cubic meters and a clay liner to reduce seepage. The reservoir is being filled for the first time now, as reservoirs are generally filled in winter in Kyrgyzstan (often because they are also a source of potable water and hydropower).



Concrete Canals Filling the Reservoir





Photo Along Dam Crest Showing Outlet Works and Delivery Canal

Some leakage can be seen coming out of the outlet works, I assume a leak in the main gate, and water fills the vault and overtops the vertical gate valve in the downstream relief structure (see photo). Leakage is estimated at 0.25 to 0.5 CFS, and I estimated inflow to the reservoir to be 8-10 CFS.



Water Seeping From the Outlet Works Through the Relief Gate (Left). Water in the Outlet Structure Overtopping the Closed Slide Gate (Right)



The dam height is approximately 60'. The Chinese company that built the facility will also manage operation and maintenance for the first year before handing it over to the local municipality's water management division.



Juxtaposition of Old Derelict Canal and New Canal that Carries Water from the Refurbished Reservoir





Diversion Structure that Splits Flow Between Cholpon-Ata (left), Which Treats the Water and Delivers it for Household Use, and the Irrigation Reservoir (right).





Staff Gage for Measuring Flow in the Canal



Ditch Leading to Cholpon-Ata Water Treatment Facility



We visited the wastewater treatment facility for the resort area along the lake in this vicinity (east of Cholpon-Ata). It is simply a series of settling tanks that, once the solids are settled out, discharge into a pipe that ultimately spills out into a sandy area approximately 2 km from the lake.



Wastewater Treatment Facility Near Cholpon-Ata



The original design for this plant was for the water to be treated chemically before being pumped up to the reservoir for use as irrigation water, but those plans were made during the time of the USSR administration, which collapsed before the project could be completed. The local administration joked that the US caused the collapse of the USSR two years too soon, and that we should finish the project because of that.

## Tuesday November 12

Today we visited Balykchy at the western edge of Issyk-Kul lake. This is one of two cities in the Issyk-Kul Oblast that is its own jurisdiction independent of any Rayon (Karakol is the other). The biggest water resources issue in this city of 47,000 is a familiar one, the separation of irrigation water from the potable water supply.

Water supply is managed by the City's water department and subsidized by the State Government. There are 12,000 connections, 5900 of which are private homes. Within the city there are 275,000 square meters of irrigated land, primarily private gardens for fruit, vegetables, and flowers.



Map of Balykchy



Like many cities in Issyk-Kul and beyond in Kyrgyzstan, the irrigation ditches in Balykchy, which were built during the Soviet era, have fallen into disrepair. As a result the citizenry use treated potable water for their irrigation needs. In the case of Balykchy, even though the irrigated acreage is relatively small the cost of potable water is high, thus the motivation to restore the irrigation water supply. The cost to the user of potable water is 9.6 KGS per cubic meter, while the cost to deliver is 18 KGS per cubic meter. The difference is subsidized by the government. The charge for irrigation water, however, is less than 2 KGS per cubic meter, although as stated earlier it is not easily available due to the condition of the distribution system.

The cost of potable water is so high is because it is sourced from wells 15 km away and pumped using three lift stations: the first at the source, a second to pump it up to a reservoir at the treatment plant, and a third to pump the treated water to the storage reservoir that feeds the distribution system. The source wells pump water from approximately 140 m below ground level.



Third Lift Station





First Potable Water Reservoir (Underground)

Balykchy is currently the recipient of two foreign support projects, one from the European Bank for Reconstruction and Development (EBRD) and one from the Asian Development Bank (ADB). The EBRD project is for a water treatment facility to provide potable water, and the ABD project is for a wastewater treatment plant. Each project is comprised of a 60% grant and 40% loan to cover project costs. The EBRD project is estimated at 5 million Euros. Because of the cost to import potable water such a great distance, as well as the desire not to oversize the treatment plant, thereby incurring greater costs, the City of Balykchy is faced with the problem of restoring the irrigation water distribution system so that potable water is only used for applications in which potable water is required. Unfortunately, reconstruction of the irrigation water distribution network is not currently funded, nor has a design or cost estimate been prepared. This need is especially urgent not only to reduce the amount of water pumped and treated to potable standards, but also because the wastewater treatment plant is intended to provide treated water for irrigation purposes. Additional details of the two planned projects are that the EBRD project only replaces the current pumps with updated and more efficient equipment as well as replace the water



mains that are in the most need of replacement. Meters will be installed to educate the populace in their water use and to encourage conservation. Use of treated water for irrigation, assuming an intact distribution network, will also reduce the need for water diversions from the river that enters the city from the north.



Diagram of Planned Wastewater Treatment Facility





Canyon that is the Source of Irrigation Water in the Background, River and Flood Protection in the Foreground





Second Potable Water Reservoir in the Background. Treated Water is Gravity Fed to the City from this Reservoir

In the evening we returned to Bishkek. At dinner I met with two gentlemen, each named Artem, who have a company called Aquaplast that specializes in equipment for water treatment plants. Contact info in Appendix.

### **Wednesday November 13**

Today Dolon and I visited the American University of Central Asia to attend a workshop entitled 'Water, Ecosystems, and Energy' put on by the EU-Central Asia Network for Water Science and Technology. We were able to attend the morning sessions, highlighted on the next page:

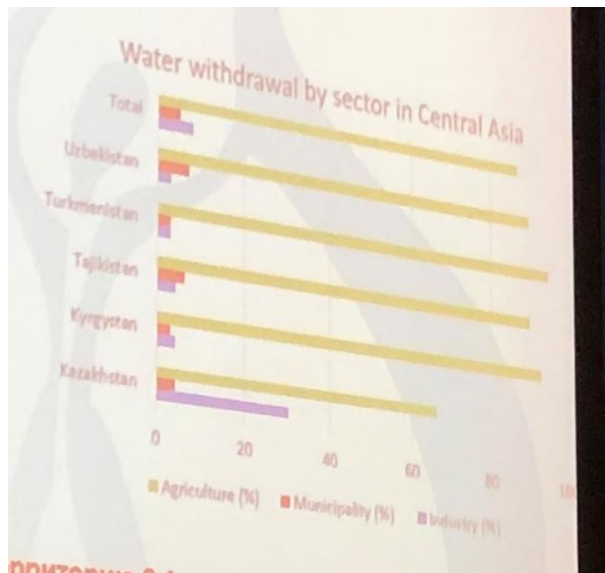


### Opening and Welcome

- Emphasis needs to be on coordinated water resources management, I.E multi-use, multi-purpose development
- More scientific research is needed to provide data to decision makers

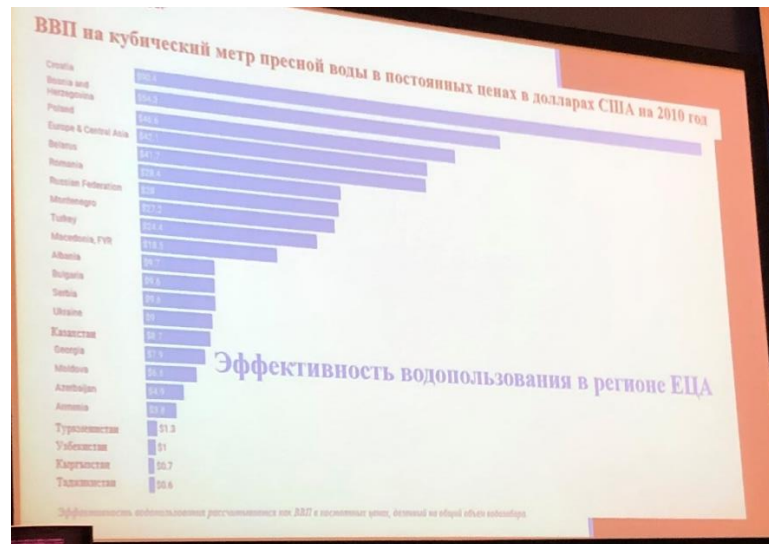
### Keynote on Ecosystems, Water, and Energy in CA Countries Meder Seitkasymov, Director of Kyrgyzstan Office, Regional Environmental Center for Central Asia (CAREC)

- Large amounts of water are used for irrigation

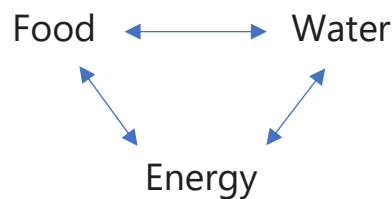


- Many more acres could be brought into production if irrigation was available (through conservation or better management)
- Climate change predictions are for less precipitation in the region
- Cost of water per m<sup>3</sup> varies greatly across Asia





- Water resources are highly interconnected



- This concept currently being supported through a USAID Smart Waters project
  - This includes hydropower evaluation/potential/pilot projects
- Question and Answer Session
- Water losses due to canal seepage and poor conditions are up to 30-50%
  - Sedimentation has decreased canal capacities
  - Wasteful practices, flood irrigation, and a lack of metering impacts downstream users
  - New irrigation technologies needed (drip, etc.)
  - Cost to switch to drip is very costly
  - Training on new irrigation methods needed
  - Clogged systems and UV damage have limited effectiveness of drip irrigation in northern Kyrgyzstan, better success in the south
  - State provides low interest loans for drip system installation, but supplies are often hard to come by
  - The EU is financing many small individual water resources projects, but there is no coordinated management to make sure everything works together and can be replicated (knowledge transfer).

- The new Water Management Agency is intended to address this issue. Training is ongoing for support of projects post-construction, but additional assistance is needed. US has been involved in training programs.
- River Basin Councils have been developed to support integrated water resources management. These Councils participate on Regional Councils and are supported by the new Water Management Agency

**Hydropower Session**  
**Alexey Kobzev, German-Kazakh University, Kazakhstan**  
**(See Appendix for Presentation Slides)**

**General Themes**

- New hydropower regulations are coming to Kyrgyzstan regarding impacts to water quality
- See [www.CAIAG.kg](http://www.CAIAG.kg) for more information
- Involved in a research summer camp at Issyk-Kul lake
- Universities have great untapped potential for research, problem solving
- NEXUS approach – encourage cross-sector cooperation
- Capacity building of civil servants needed

**Hydropower Discussion**

- Hydropower comprises 13% of Kazakhstan's generating capacity
- Mini-hydropower is an important feature of remote and mountainous areas
- Average estimate 30 year life cycle cost of mini-hydropower is \$0.06/kW
- Estimated payback period of 3 years for mini-hydropower plants
- Auctions of green energy, whose demand exceeds supply, has brought investment in the industry
- There is an emphasis on Ecosystem Services in Central Asia. This has taken the form of investing in conservation and ecosystem restoration and assigning value to the economic benefits derived from conservation or restoration.
- There are opportunities to collaborate on these and other projects through the German-Kazakh University

During lunch I had the opportunity to meet with Azamat Karypov, Ekaterina Sakhvaeva, and other fellow workshop attendees. We discussed the new Basin Councils in Kg as well as prospects for additional hydropower development.



Basin Councils are an attempt at coordinated water resources management at a regional and local level, and are a product of the new state water management agency. Data management has been an issue with these groups, as has the 'brain drain' phenomenon I frequently encountered. It is questionable whether the expertise exists/will remain to run the Basin Councils. There is a World Bank requirement that more women be involved in Basin Councils, but this may be difficult to achieve. USAID has also been supportive of women's roles in water management organizations. At a smaller scale than Basin Councils, water users associations (WUAs), funded by the World bank and similar to our irrigation districts, help maintain local irrigation systems. Despite this international support, some WUAs have proven not to be sustainable.

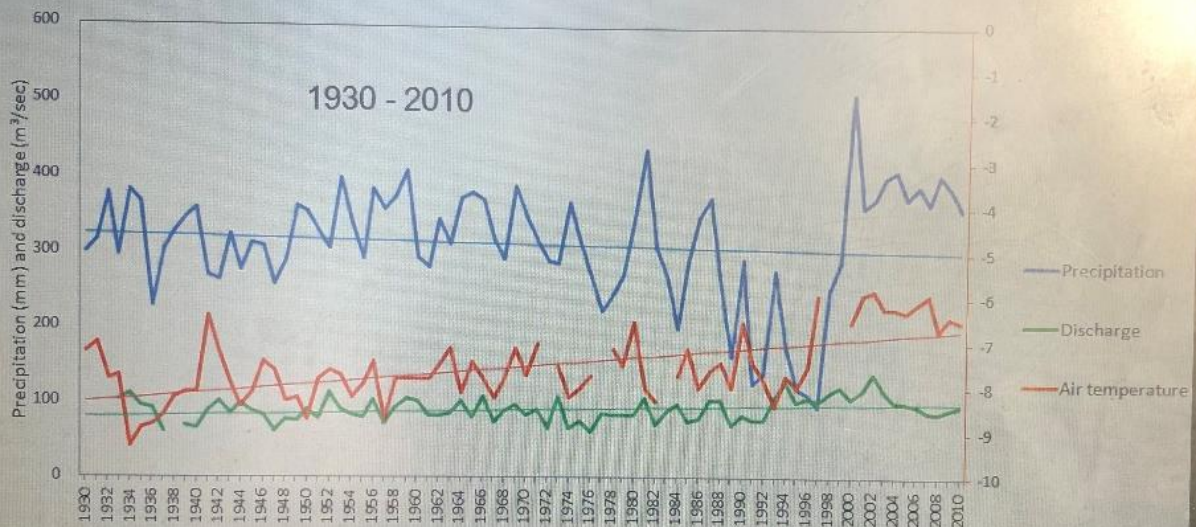
One successful example is Nazira Beishebaeva, the female head of the Water User's Association of the Issyk-Kul Oblast. She has been successful in implementing drip irrigation, and is trying to implement a new drip irrigation project in eastern Issyk-Kul and would be a good contact (provided by Ms. Sakhvaeva).

We also discussed the potential for additional hydropower development, and it was the opinion of those I spoke with that the Sary-Jaz River had the second best hydropower potential in Kyrgyzstan, but that it drains to China and there isn't a lot of cooperation between the two countries regarding its use. It is also difficult to permit hydropower development because much of the water has been appropriated for irrigation use.

After leaving the workshop, I met with Dr. Muratally Duishonakunov, an assistant professor within the Department of Physical Geography at Kyrgyz National University. In addition to glaciology, Dr. Duishonakunov studies tourism and economic and political geography. His studies of Issyk-Kul lake indicate that it experiences approximately 11-year cycles of increasing and decreasing elevations, but in the long term has decreased less than 1 meter.

His glaciology studies are summarized in the slide on the following page:

## Results — Glaciological studies



Recent glacier shrinkage related to local climate changes

Source: own

11/13/2019

16

The graph shows that glacial discharge has increased in the presence of increased air temperatures and despite reduced precipitation. The fact that lake levels have fallen despite increased glacial discharge reinforces the need for better coordinated water resources management as well as additional research. Implications of not acknowledging this disconnect are that NGOs and the government have built small hydropower installations without regard to whether the glacial outflow will persist in the future.

As another example of the poor understanding of the importance of glaciers to the long-term environmental health of the area, a glacier at the Kumtor gold mine is being 'relocated' out of the way to allow mining to continue.

Dr. Duishonakunov conducts field work with students for three weeks every June in the Cholpon Ata area. Many of his graduates go on to work for the Institute of Water Problems and the Central Asian Institute for Applied Geosciences, [www.caiag.kg](http://www.caiag.kg).



We discussed the lack of technical expertise in Kyrgyzstan, and his examples included the absence of ongoing water quality monitoring in Issyk-Kul Lake. One issue is that Kyrgyzstan doesn't accept degrees from countries like Germany or the U.S. Dr. Duishonakunov explained he does not qualify for a doctorate salary because he received his degree in Germany; he is currently working on his in-country credentials.

We discussed the possibility of an educational exchange, and of collaborating on his research projects. Funding is always an issue, as well as are the low salaries for researchers.

### **Thursday November 14**

Today I met with Mr. Baatyrbek Sekiev, head of State Ecological Expertise and Nature Use Department under the Kyrgyz EPA, and we began our meeting with a discussion of water quality of Issyk-Kul Lake. The EPA samples water quality in the lake three times per year, once before the tourist season, once during, and once afterwards. The EPA's focus regarding water resources management is regarding irrigation, and when I mentioned a possible collaboration regarding water quality monitoring there was some initial skepticism and concern regarding what the outcome of such monitoring may be. Regardless of my perceived skepticism, I was given a contact, Ms. Asel Raimkulova, to work with regarding a cooperative water quality monitoring project.

An additional joint project that was suggested was for fish monitoring.

We also discussed the role of Basin Councils in the EPA's work.

In the afternoon I visited the American Corner in Bishkek for an interview with Kyrgyz Radio Free Europe. After answering questions about the purpose of my trip and what my impressions of Kyrgyzstan were, the interview ended and I spoke with a group of students studying English. After giving a brief presentation on my trip, I answered questions for about twenty minutes.



Meeting with students at The American Corner in Bishkek

Finally that day I met with Meder Seitkasymov of CAREC, The Regional Environmental Center for Central Asia. We discussed his work with Ecosystem Services projects, a subject his colleagues are currently writing a book on. His work also includes creating small Basin Councils and the USAID program Smart Waters, the latter of which is working in five basins in Kyrgyzstan finalizing basin plans (<https://www.usaid.gov/kyrgyz-republic/fact-sheets/smart-waters>).

### **Friday November 15**

This morning I met with Adilet Abdybekov, a project manager for water projects with the Danish company Grundfos that I had met the previous Friday. We had a chance to discuss in greater detail his desire to see greater accountability and sustainability incorporated into projects in Kyrgyzstan. He feels there isn't enough quality control on projects, and the materials used are often sub-standard. Again we talked about the lack of technical expertise in Kyrgyzstan to run and maintain projects once they are built. His preference would be to begin in high school or even younger to interest students in technology. There is a lack of student exposure to hydrology and engineering in the current curriculum. I described the Maker Space that just opened at the American Corner with U.S. Embassy support, and he indicated that Grundfos might be interested in partnering on similar efforts.



Adilet has a very strong sense of social responsibility, and as we look for collaboration opportunities in Kyrgyzstan he encouraged our group to focus on similarly idealistic young entrepreneurs. He is involved with the social entrepreneurship program at the American University.

One idea that he has been pursuing is development of a technical training center in Balykchy, which he chose because of its proximity to Issyk-Kul and Naryn Oblasts. He has also worked with a water utility in Osh, where he has spent \$30k Euros on refurbishing equipment.

I visited the U.S. Embassy for a debrief and to meet some additional staff. I spoke with Gary Shu of USAID and received some additional information on the work they are doing with CAREC and Basin Councils. USAID has supported networking and communication efforts as well as small irrigation and well projects. Their primary focus is on southern Kyrgyzstan, and through the Smart Waters program has been assisting in the monitoring of canals and working on capacity building.

One of the USAID employees at the embassy actually visited Wenatchee two years ago through the Open World Program.

We also discussed the International Visitors Leadership Program/NAS program called Partnerships for Enhanced Education Research (PEER) which partnered with the American University in Central Asia (AUCA) on a transboundary water issues project. Before leaving the Embassy I met with Ambassador Donald Lu and we discussed my trip.

I met with Zheenbek Kulenbekov, Chair of the Applied Geology Department at AUCA, and we discussed his work in watershed management and sustainable development. He was involved in a PEER project on integrated water resources management. One current project he is working on addresses anti-poaching measures, and he has applied for USFWS funding. He is also a collaborator with the Trust for Mutual Understanding (TMU) on a water quality monitoring project. His collaborating partner at the American University in Washington, DC, is Professor Michael Brody. Dr. Kulenbekov is interested in collaborating with the Kyrgyz-Washington Sister Region Organization on a project, as his previous and current work is consistent with our stated interests. He did provide one caveat in working in Kyrgyzstan, and that is that you will often need to engage the government for support or 'permission,' but that government resources are frequently scarce.

The final meeting of my trip was a tour of the National Museum of Fine Arts, accompanied by the Director, Mira Djangaracheva. We had an enjoyable tour of the museum, and she expressed an interest in a cultural collaboration between her museum and the Wenatchee Valley Museum and Cultural Center. Bishkek currently has a sister-city relationship with

Colorado Springs, CO, and that relationship may be able to serve as a model for a relationship with our region.

## **Conclusions**

Kyrgyzstan struggles with many of the same water resources issues that affect other areas of the world, especially those where water is scarce. Its water management is further confounded by its recent history of Soviet rule and the legacy of a centrally-planned government that no longer exists. Kyrgyzstan's independence has brought with it trans-boundary water resources challenges that simply didn't exist under the Soviet Union. Beyond these generalities, three recurring themes were brought up by many of the experts we met. They are as follows:

1. Water use is very interconnected. Infrastructure for potable, irrigation, and hydropower are often multi-use and interdependent. Individual projects don't always incorporate this reality into their planning and implementation, resulting in the projects being less than maximally effective. This was especially evident in the tours of Karakol and Cholpon-Ata. Even new infrastructure can suffer if it is not implemented with the complete multi-purpose water-use picture in mind.
2. Much of the water resources management and infrastructure is struggling to achieve the status quo that existed during the Soviet era. There are NGOs and foreign and domestic governments that are attempting to modernize the water management infrastructure, but those efforts aren't yet widespread enough, or in some cases comprehensive (see Conclusion #1), so as to bring the overall level of service up to modern standards. Add to that the uncertainty of future water supply created by glacial recession and the water quality impact of growing population and industry on the already stressed Lake Issyk-Kul, and it is evident that the rate of infrastructure improvements needs to improve if environmental degradation is to be addressed and living standards improved.
3. A lack of technical expertise/funding for continued operation and maintenance of water management projects is a big issue. This is both an issue of capacity and economics, as there aren't enough technical education opportunities for students, and those that do achieve technical proficiency frequently take their talents elsewhere due to superior earning opportunities. The case is similar with monitoring, both in terms of project effectiveness as well as baseline and trend monitoring of environmental indicators. Development of local capacity, accompanied by the foresight of foreign NGOs and governments to acknowledge this reality and plan for sustained support after initial construction, is critical if the projects that are implemented are going to yield long-term success.



## **Project Concepts for Future Consideration**

Among the many new and existing contacts made during this trip, there were numerous commitments to follow up on potential project collaborations. Many opportunities don't yet have enough detail to warrant their specific mention here, so it can be expected that this list will grow. Everyone we met with was very enthusiastic about future cooperation, and my report was requested by several of the people we met with. I expect that there will continue to be delegations exchanged between Chelan County and Issyk-Kul Oblast, and that many of these collaboration ideas will evolve into active projects. The following are a limited number of ideas that already have some momentum behind them, can address one or more of the issues identified in the Conclusions section, and are the types of activities that are priorities of the Kyrgyz-Washington Sister Region Organization :

Student exchange with Dr. Duishonakunov, who runs a summer field research program in Issyk-Kul. This could be an ongoing student exchange supported by the Kyrgyz-Washington Sister Region Organization that includes both U.S. students working in Kyrgyzstan and Kyrgyz students coming to Chelan County for field work.

Joint water quality monitoring project with Kyrgyz EPA. The Lake Chelan Institute would likely be very interested in such a project, as it has suggested this idea previously. The Institute currently has a monitoring program on Lake Chelan, and additional field work and close collaboration with Kyrgyz experts in Issyk-Kul to discuss protocols, sampling locations, and other logistics would be necessary to get such a project up and running.

Technical collaboration with Dr. Kulenbekov. This may be associated with the aforementioned joint Lake Chelan/Issyk-Kul project.

Support of educational programs. Local Chelan County entities such as the Chelan County Public Utility District operate educational programs that may serve as a model for replication in Issyk-Kul and could even be a source of support. Adilet Abdybekov was particularly interested in this possibility as he has already worked to increase educational and training opportunities in Issyk-Kul.

Museum exchange. Both Lee and the Director of the Kyrgyz National Museum of Fine Arts were very enthusiastic about a collaboration between that museum and the Wenatchee Valley Museum and Cultural Center.

## Professional Contacts

Alexey Kobzev, [Kobzev@dku.kz](mailto:Kobzev@dku.kz)

Charlie Underland, Expert in water resources issues in Kg, based in Washington, DC.  
Recommended contact from Richard Burger, workshop panelist.

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Nazira Beishebaeva, Deputy Head, Water User's Association of Issyk-Kul Oblast, 0772-751016

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Two contacts I was unable to meet with:

Ms. Olivia Gruzdova, FinWaterWEI, Kyrgyzstan. Provides support for Kyrgyz water sector, funded by Government of Finland.

Elvira Borombaeva, President of Small Hydropower Association, CEO, 'El-Energy Consulting' Ltd. Co., [eborombaeva@gmail.com](mailto:eborombaeva@gmail.com)




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BE THINK INNOVATE GRUNDFOS



The Government of the Kyrgyz Republic

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**СДЕЛАНО В КЫРГЫЗСТАНЕ**

*11/13/19 lunch*

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U.S. Department of State

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Embassy of the United States of America  
 in the Kyrgyz Republic

**Donald Lu**  
 Ambassador



## **Additional Relevant Contacts**

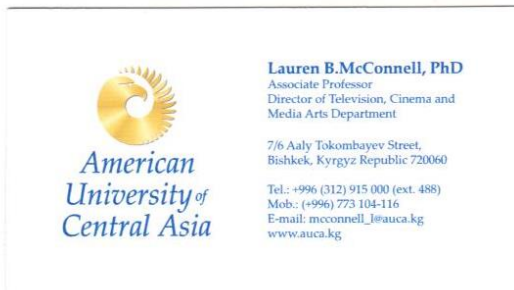
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## **APPENDIX A**

# EU-Central Asia Network for Water Science and Technology

*Bishkek, Kyrgyzstan  
13 November – 15 November 2019*



## Agenda – Thematic Workshop 'Water, ecosystems, and energy'

This thematic workshop takes place in the frame of the EU-Central Asia Network for Water Science and Technology and is focused on: '**Water, ecosystems, and energy**'. This includes **biodiversity conservation; wetlands and aquatic ecosystems; impact from human activities; hydropower solutions, ICT and earth observation**. Cross-cutting issues will be addressed such as data accessibility, interoperability and reusability; skills development, training and education; science-policy feedback; socioeconomic issues; research and innovation (R&I) funding issues.

### Venue

**American University of Central Asia (AUCA),  
7/6 Aaly Tokombaev Street, Bishkek, Kyrgyz Republic 720060**

### Day 1 - Wednesday, 13 November 2019

09.30 – 10.00 Registration & Welcome Coffee

10.00 – 10.45 **Opening and Welcome** by local host and the EU

- 1) State Committee for Industry, Energy and Mineral Resources , tbc
- 2) Charlotte Adrien, Head of Cooperation, EU Delegation to the Kyrgyz Republic
- 3) Chingiz Shamshiev, Vice President of American University of Central Asia
- 4) Richard Burger, European Commission, Directorate General Research and Innovation

10.45 – 11.30 **Keynote on Ecosystems, water and energy in CA countries** delivered by The Regional Environmental Centre for Central Asia (CAREC)

Meder Seitkasymov, Director of Kyrgyzstan office, The Regional Environmental Centre for Central Asia (CAREC), Kyrgyzstan

The keynote will provide an overview of the current situation in water, climate, ecosystems and energy in the Central Asian countries



# EU-Central Asia Network for Water Science and Technology

Bishkek, Kyrgyzstan  
13 November – 15 November 2019



## Hydropower

11.30 – 13.00 Session on Small Hydropower

### 1) Small Hydropower in Kyrgyzstan

Elvira Borombaeva, President, Small Hydropower Plants Association, Kyrgyzstan

### 2) Development of small hydropower and introduction of ecosystem services to reduce the negative impact on ecosystems

Alexey Kobzev, German-Kazakh University, Kazakhstan

13.00 – 14.00 Lunch break

## Horizon 2020 opportunities & brokerage for call on hydroenergy in Central Asia 2020 (session together with thematic workshop on water, ecosystems, and energy)

14.00 – 15.00 **Funding opportunities for Research and Innovation: EU Horizon 2020 programme for Research & Innovation**

Richard Burger, European Commission

An introduction to the EU's Horizon 2020 funding programme for Research & Innovation will be provided, and funding opportunities for projects in the workshop topics outlined

15.00 – 15.30 Introduction to the H2020 call: **LC-SC3-RES-34-2020: Demonstration of innovative and sustainable hydropower solutions targeting unexplored small-scale hydropower potential in Central Asia.**

See: [http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-energy\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-energy_en.pdf), planned call opening 5. May 2020, and planned deadline 1 September 2020.

Richard Burger, EC /Manfred Spiesberger, ZSI

15.30 – 16.00 Coffee break

16.00 – 18.00 Brokerage session for call **LC-SC3-RES-34-2020: Demonstration of innovative and sustainable hydropower solutions targeting unexplored small-scale hydropower potential in Central Asia.**

Asel Doranova, Technopolis & Manfred Spiesberger, ZSI

The brokerage session will allow for meeting potential partners for establishing project consortia for the call. Moderated small group discussions will facilitate presentation of competences, explore interest in the call topic, and finding partners. Participants will be able to switch discussion tables after 20min, so as to meet as many as possible potential partners.

# EU-Central Asia Network for Water Science and Technology

*Bishkek, Kyrgyzstan  
13 November – 15 November 2019*



## Day 2 - Thursday, 14 November 2019

08.45 – 09.00 Registration

09.00 – 10.30 **SIM4NEXUS - Sustainable Integrated Management FOR the NEXUS of water-land-food-energy-climate for a resource-efficient Europe**

SIM4NEXUS project, funded under the EU's Horizon 2020 programme:  
<https://www.sim4nexus.eu/>

Dr. Floor Brouwer, Wageningen Economic Research, Netherlands, SIM4NEXUS project coordinator

10.30 – 11.00 Coffee break

11.00 – 11.30 **Water-Energy-Food NEXUS in Central Asia: Agricultural Water and Energy Management in Tajikistan.**

Prof. Stefanos Xenarios, Nazarbayev University, Kazakhstan

### Hydropower & ecosystems

11.30 – 12.30 Session on **hydropower & ecosystems**

**1) Geotechnical methodology for a typology of hydropower and water ecosystems from water georisks**

Prof. Sheyshenaly Usupaev, Central-Asian Institute for Applied Geosciences (CAIAG), Kyrgyzstan

12.30 – 13.30 Lunch break

### Wetlands and aquatic ecosystems, and impact from human activities

13.30 – 15.00 Session on scientific and theoretical approaches to **wetlands and aquatic ecosystems, and impact from human activities**: presentation & discussion

**1) HYDRO and geo-CHEMISTRY ecology of Zeravshan RIVERS basin in TAJIKISTAN**

Dr. Djamshed Abdushukurov, Institute of Water Problems, Hydropower and Ecology, Academy of Sciences of Republic of Tajikistan

**2) Issyk-Kul ecosystem**

Dr. Svetlana Abdieva, Kyrgyz-Russian Slavic University (KRSU), Kyrgyzstan



# EU-Central Asia Network for Water Science and Technology

*Bishkek, Kyrgyzstan*

*13 November – 15 November 2019*



### 3) Ecosystems

Khojiakbar Khasanov, Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Uzbekistan (**tbc**)

15.00 – 15.30 Coffee break

15.30 – 16.45 Session on **aquatic ecosystems and impact from human activities**

### 1) Governmental hydrological monitoring and monitoring of the quality of surface water

Assem Akhmetzhanova, RSE "Kazhydromet", Kazakhstan

16.45 – 17.00 Wrap up of workshop day 2

## Day 3 - Friday, 15 November 2019

08.45 – 09.00 Registration

### Biodiversity conservation, ecosystems and impact from human activities

09.00 – 10.30 Session on **biodiversity conservation and ecosystems**

### 1) Addressing Climate Change in Afghanistan through ecosystem management

Sorosh Poya Faryabi, The Wildlife Conservation Society, Afghanistan

### 2) EU support in Afghanistan on the EU actions on climate change, IWRM, and NRM, including highlights on the EU regional cooperation efforts between Afghanistan and central Asia

Khodaidad Mahmood, EU delegation to Afghanistan, Afghanistan

### 3) Ecosystems & tourism

Prof. Mohira Kodirova, University of Entrepreneurship and Service, Tajikistan

10.30 – 11.00 Coffee break

# EU-Central Asia Network for Water Science and Technology

*Bishkek, Kyrgyzstan  
13 November – 15 November 2019*



11.00 – 12.00 Session on **biodiversity conservation and ecosystems**

**1) Effects of industrial pollutants on developmental stability of individuals – Chironomus riparius as a model organism. In addition: brief overview of educational cooperation FishEDU between Kyrgyz National Agrarian University and University of Eastern Finland**  
Sofia Nishaeva, University of Eastern Finland (tbc)

12.30 – 13.30 Lunch break

13.30 – 14.00 Cross-cutting topic: skills development, training and education.  
**Field activities on assessment of Flooding Impact on Northern Part of Bishkek City Using Modern Geophysical Techniques**

Dr. Zheenbek Kulenbekov, Dr. Sagynbek Orunbaev, American University of Central Asia, Kyrgyzstan

14.00 – 14.30 **Input to potential joint initiatives** on water quality, ecosystems and energy & Wrap up of workshop

Asel Doranova, Technopolis & Manfred Spiesberger, ZSI

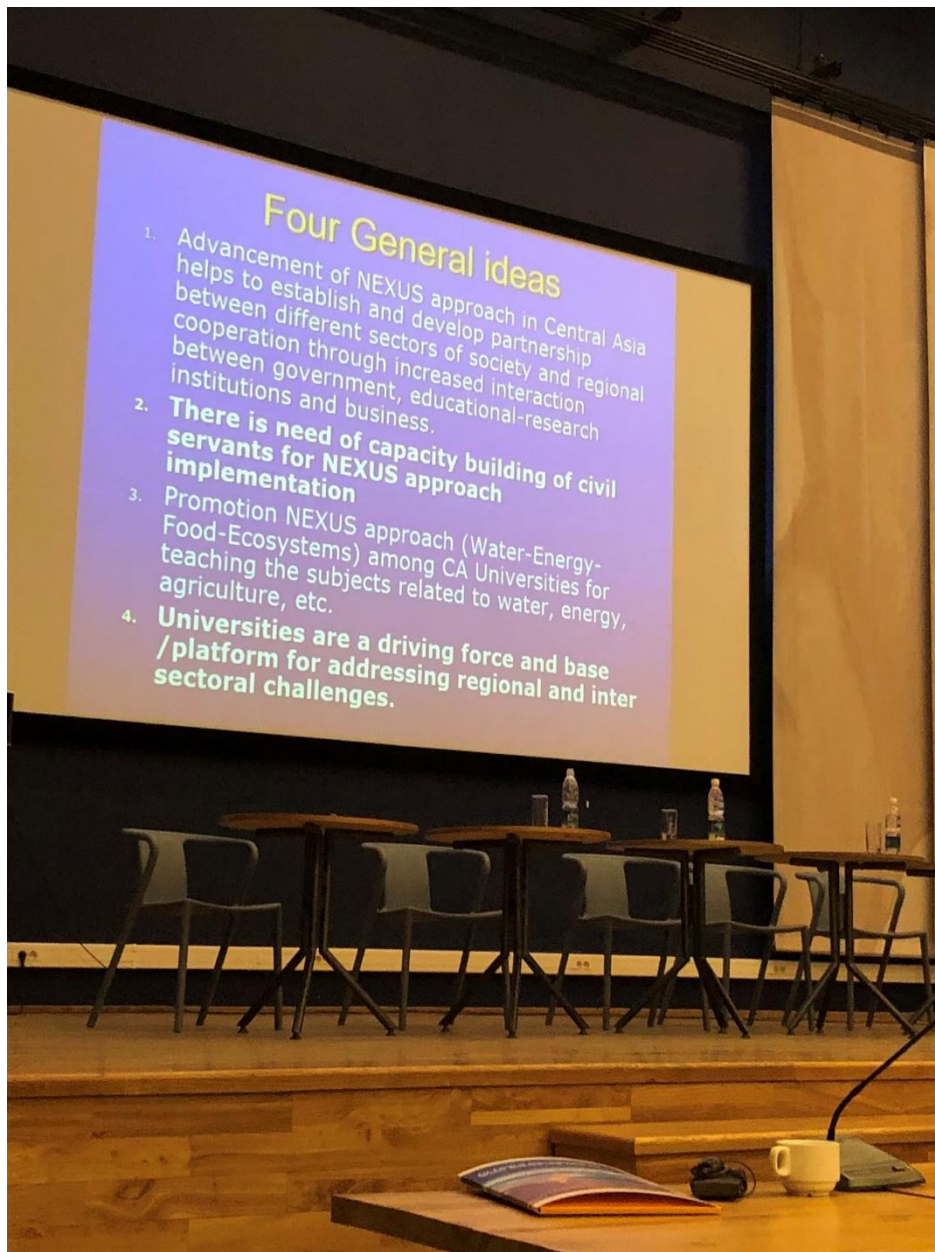
Moderated discussion for collecting input to potential joint initiatives on the topics of the workshops water quality, ecosystems and energy,

**14:30 – 18:00 Site Visit to Small Hydropower Plant in the surroundings of Bishkek (tbc)**

Bus transfer, site visit organised in cooperation with State Committee for Industry, Energy and Mineral Resources of Kyrgyzstan



## APPENDIX B



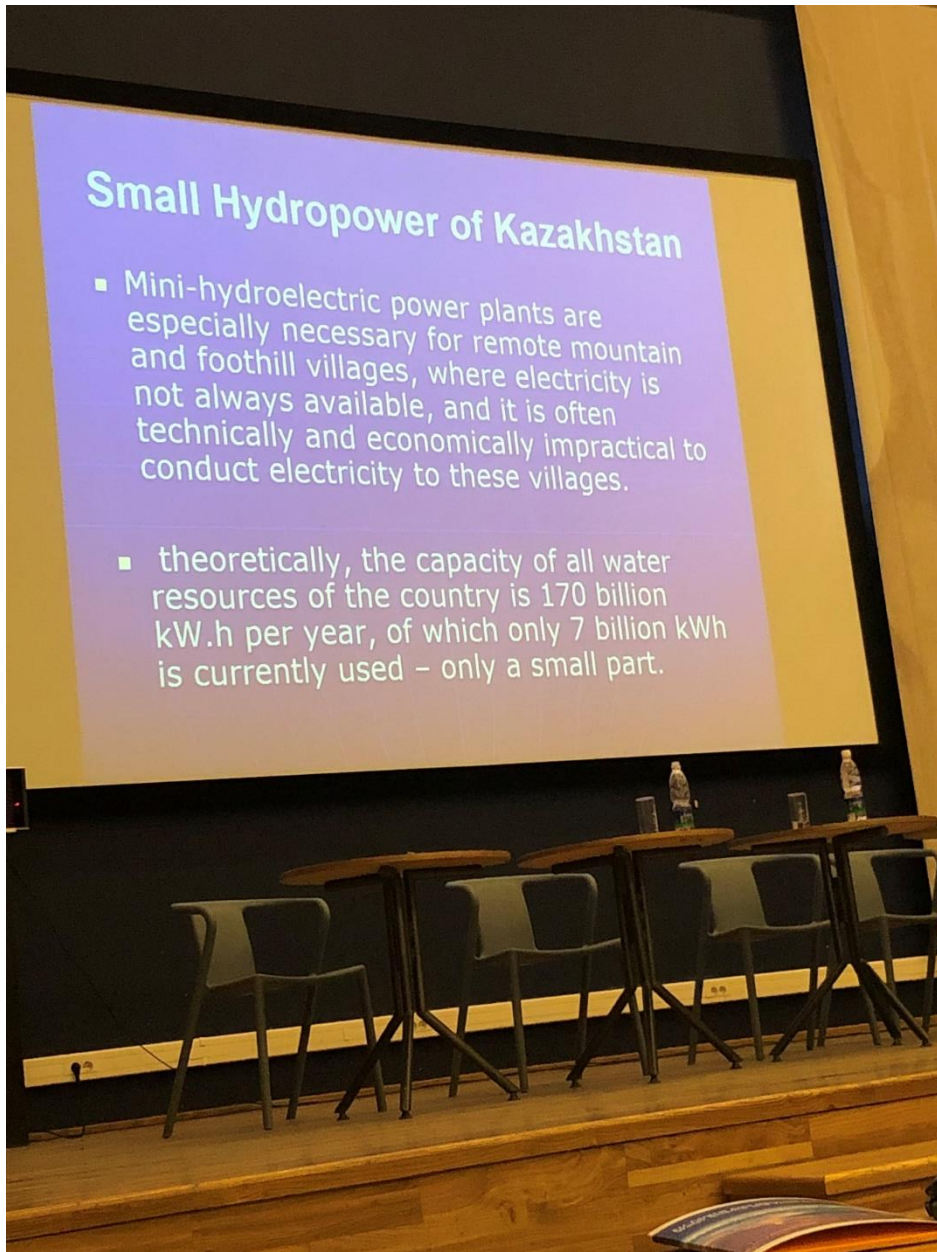
## Small Hydropower of Kazakhstan

- Hydropower accounts for approximately 13% percent of Kazakhstan's total generating capacity delivering around 7.78TWh from 15 large (450 MW)hydropower station with a total capacity of 2.248GW.[9]
- Large hydropower plants comprise the Bukhtyrma (750 MW), Shulbinsk (702MW) and Ust-Kamenogorsk (315 MW) plants on the Irtys River, the Kapshagai (364 MW) plant on the Ili River, the Moinak (300 MW) plant on the Charyn Rriver and the Shardarinskaya (104MW) plant on the Syrdarya River. [10]



## Small Hydropower of Kazakhstan

- Mini-hydroelectric power plants are especially necessary for remote mountain and foothill villages, where electricity is not always available, and it is often technically and economically impractical to conduct electricity to these villages.
- theoretically, the capacity of all water resources of the country is 170 billion kW.h per year, of which only 7 billion kWh is currently used – only a small part.



## Small Hydropower of Kazakhstan

- the average estimated cost of electricity mini-HPP for the life cycle (30 years) is 0.06 dollars per 1 kW. CH.
- At the same time, the payback of mini-HPPs is estimated at three years, with the coefficient of use of installed capacity up to 93 %.



## Auctions-green energy

- The volume of demand exceeded the volume of supply by 3.4 times.
- As a result of the auction, investments went into the industry, which led to a reduction in tariffs, which are: WPP by 12.2%, small HPPs by 12.12%, SES by 35.71%
- The maximum reduction in the auction price for wind generation was 23.3%, for solar generation-48%, for small hydropower projects-23.4 %, Bioes-1%.



## Ecosystem services

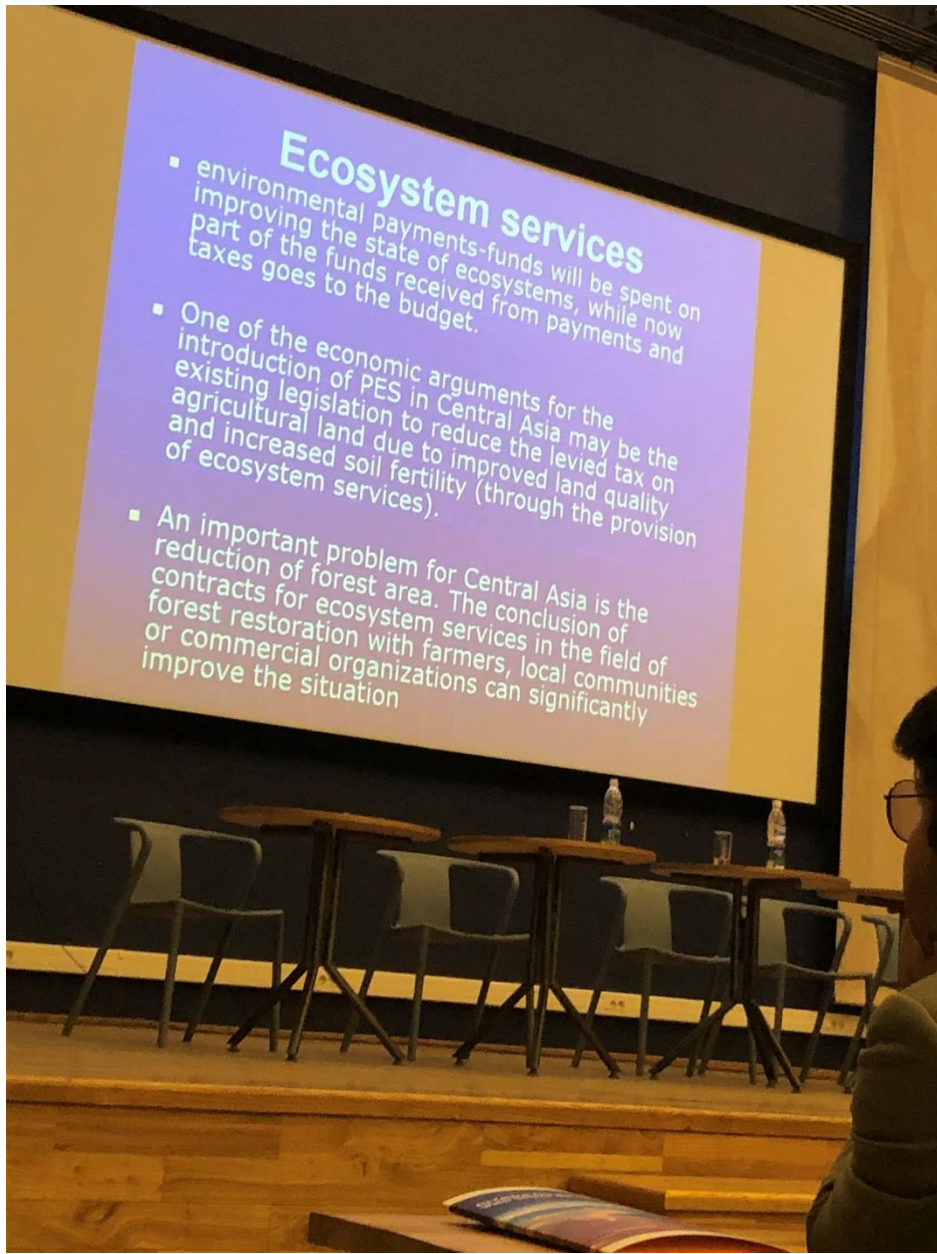
- In the legislation of the Central Asian countries there is no direct indication of the use of the PES mechanism, but existing laws offer a number of provisions supporting the introduction of financial mechanisms such as PES.
- Restoration and nature protection of Kazakhstan require more funds than currently allocated, and financing of environmental programs by the users of natural resources (polluters, agriculture) is insufficient.
- Fines and other sanctions for environmental pollution and irrational use of natural resources do not fulfill their role as a deterrent to prevent repeated violations of the law.





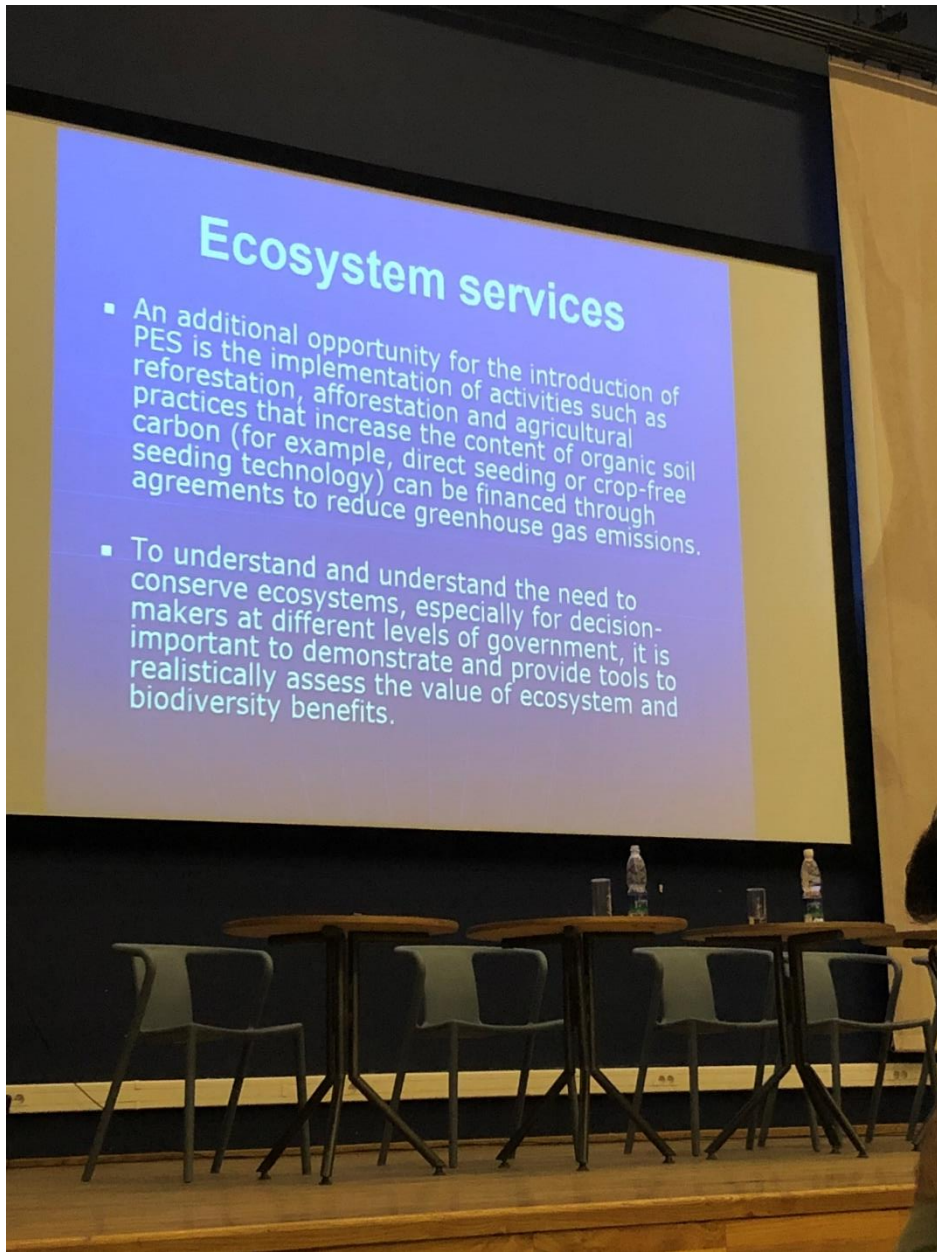
## Ecosystem services

- environmental payments-funds will be spent on improving the state of ecosystems, while now part of the funds received from payments and taxes goes to the budget.
- One of the economic arguments for the introduction of PES in Central Asia may be the existing legislation to reduce the levied tax on agricultural land due to improved land quality and increased soil fertility (through the provision of ecosystem services).
- An important problem for Central Asia is the reduction of forest area. The conclusion of contracts for ecosystem services in the field of forest restoration with farmers, local communities or commercial organizations can significantly improve the situation

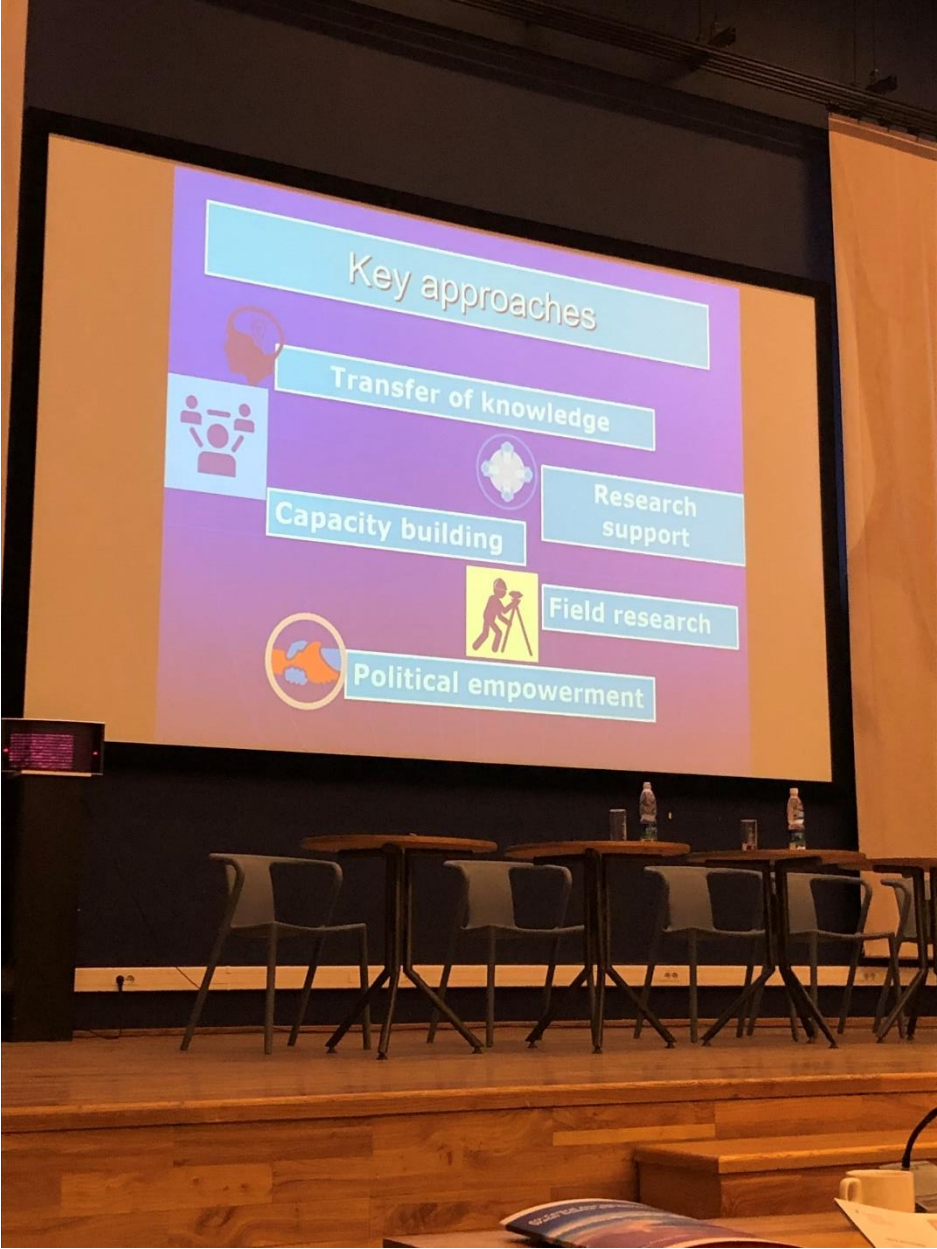


## Ecosystem services

- An additional opportunity for the introduction of PES is the implementation of activities such as reforestation, afforestation and agricultural practices that increase the content of organic soil carbon (for example, direct seeding or crop-free seeding technology) can be financed through agreements to reduce greenhouse gas emissions.
- To understand and understand the need to conserve ecosystems, especially for decision-makers at different levels of government, it is important to demonstrate and provide tools to realistically assess the value of ecosystem and biodiversity benefits.







# Key approaches

Transfer of knowledge



Capacity building



Research support



Field research



Political empowerment

## Key approach

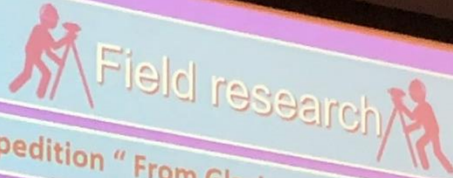
- The key approach of the GKU university is to use the results of various programs and projects to promote other directions and interaction between studying water, energy and land resources.

### TOOLS

- Master Program in IWRM and Renewable Energy projects,
- GIS and remote sensing research of water and land resources.
- Transfer of knowledge and technology from Germany, other European Union countries and partners' Universities
- The involvement of Central Asian universities in the processes of the Asia-Pacific and European-Eurasian cooperation.







# Field research

## Expedition "From Glaciers To The Aral Sea"

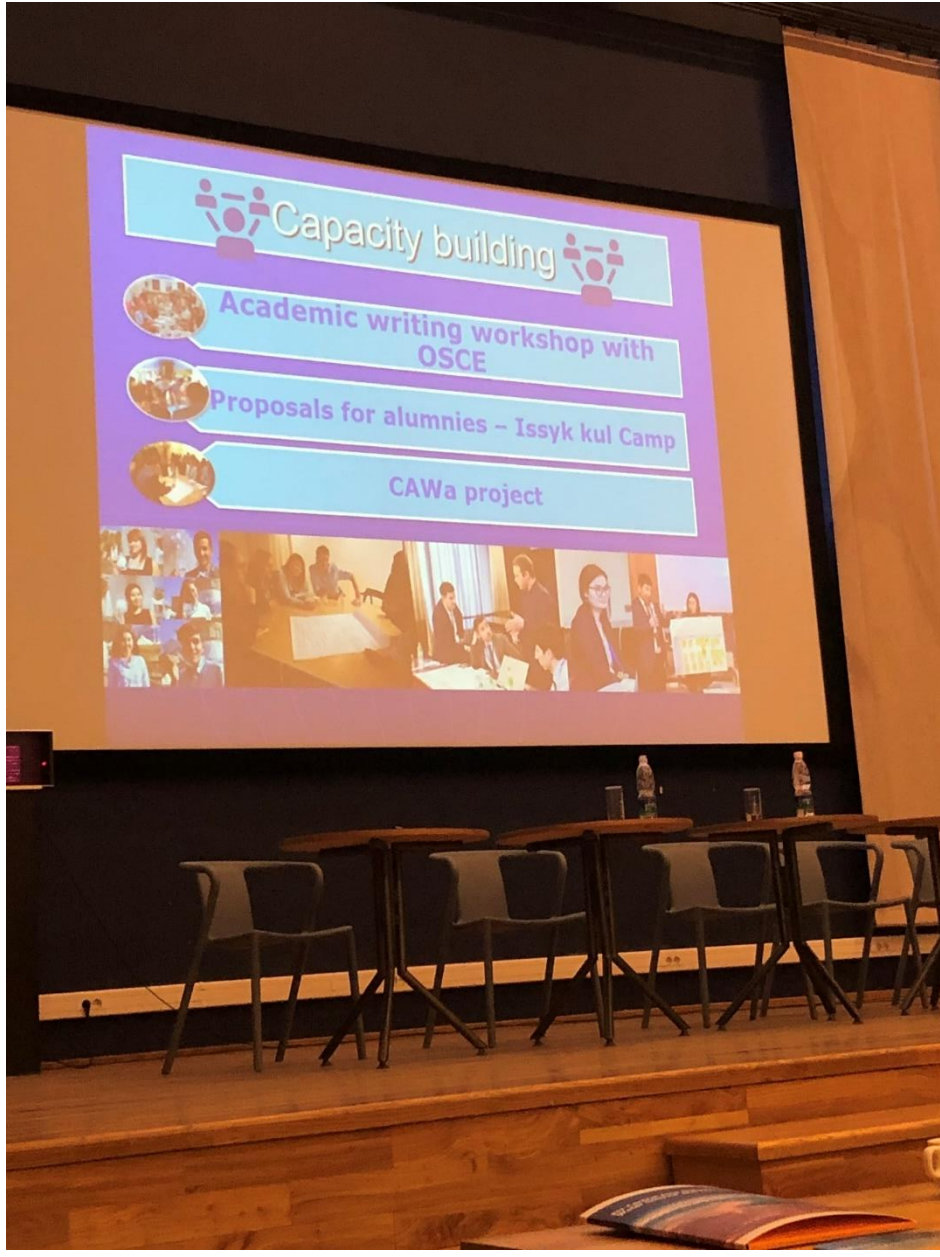
### Participants

12 students to be divided into 6 study- research teams and to be supervised by 1 international researcher to focus on the particular aspects of IWRM.

### Directions

The impact of climate change on the water resources of Central Asia  
Water ecosystems  
Water and agriculture  
Transboundary cooperation  
Water and energy  
Social economic aspects of water management





# Capacity building

Academic writing workshop with OSCE

Proposals for alumniees - Issyk kul Camp

CAWa project







# CAWa project

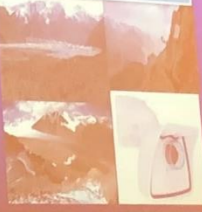
CAWa: Seasonal runoff forecast and drought monitoring



CAWa: Land use monitoring



CAWa: Regional Hydro meteorological Monitoring



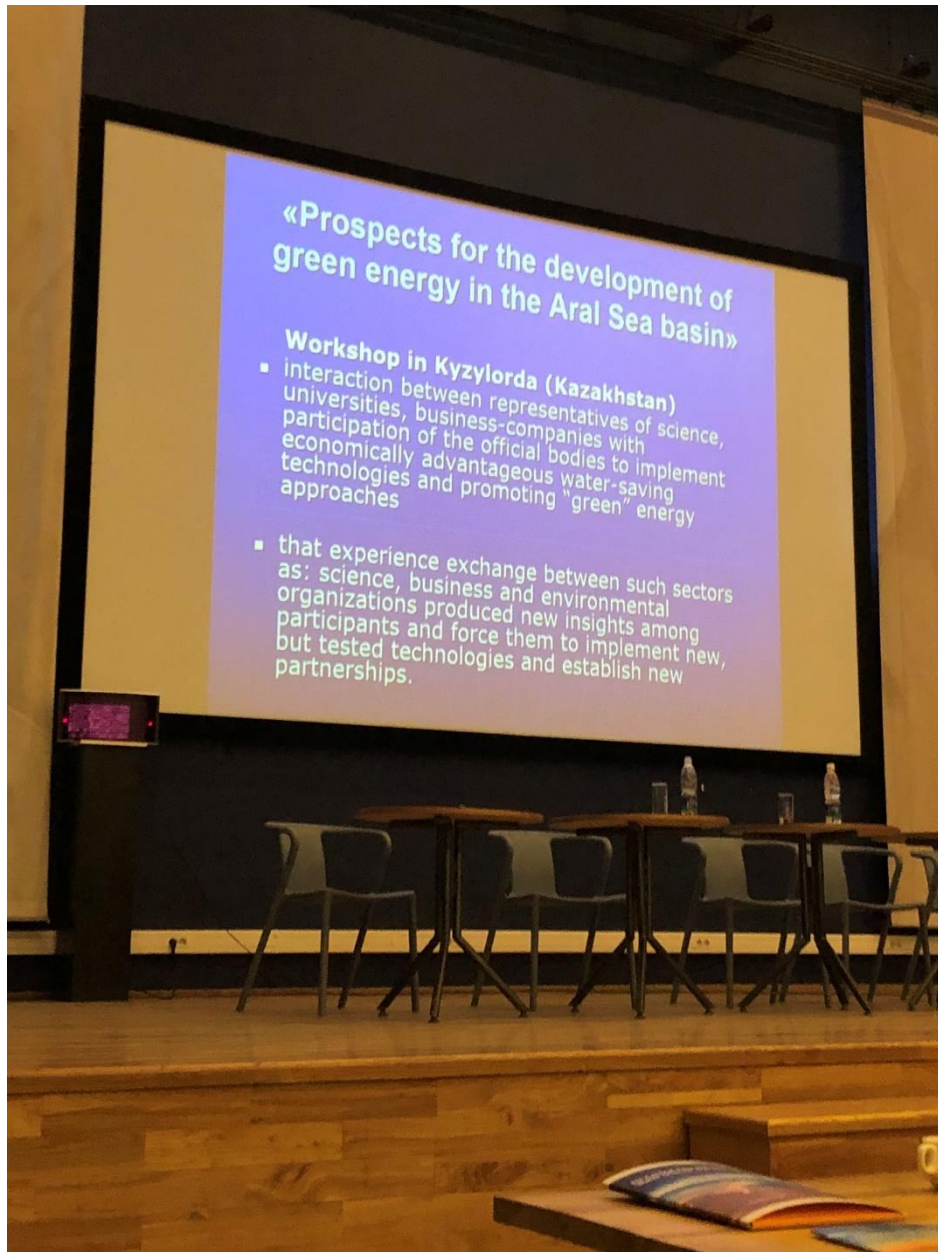
Applied research: Central Asia waters (CAWa) network



## «Prospects for the development of green energy in the Aral Sea basin»

### Workshop in Kyzylorda (Kazakhstan)

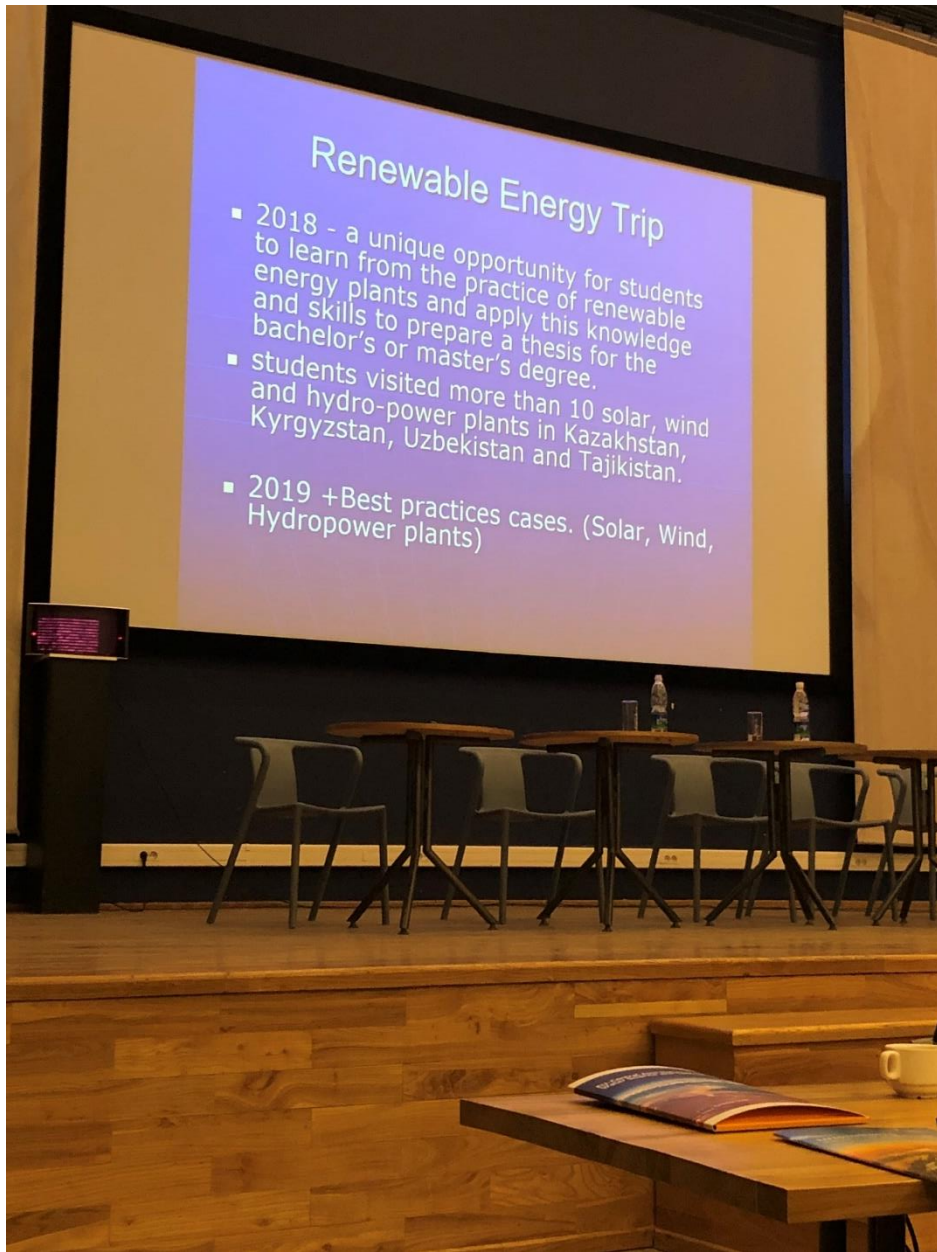
- interaction between representatives of science, universities, business-companies with participation of the official bodies to implement economically advantageous water-saving technologies and promoting "green" energy approaches
- that experience exchange between such sectors as: science, business and environmental organizations produced new insights among participants and force them to implement new, but tested technologies and establish new partnerships.





## Renewable Energy Trip

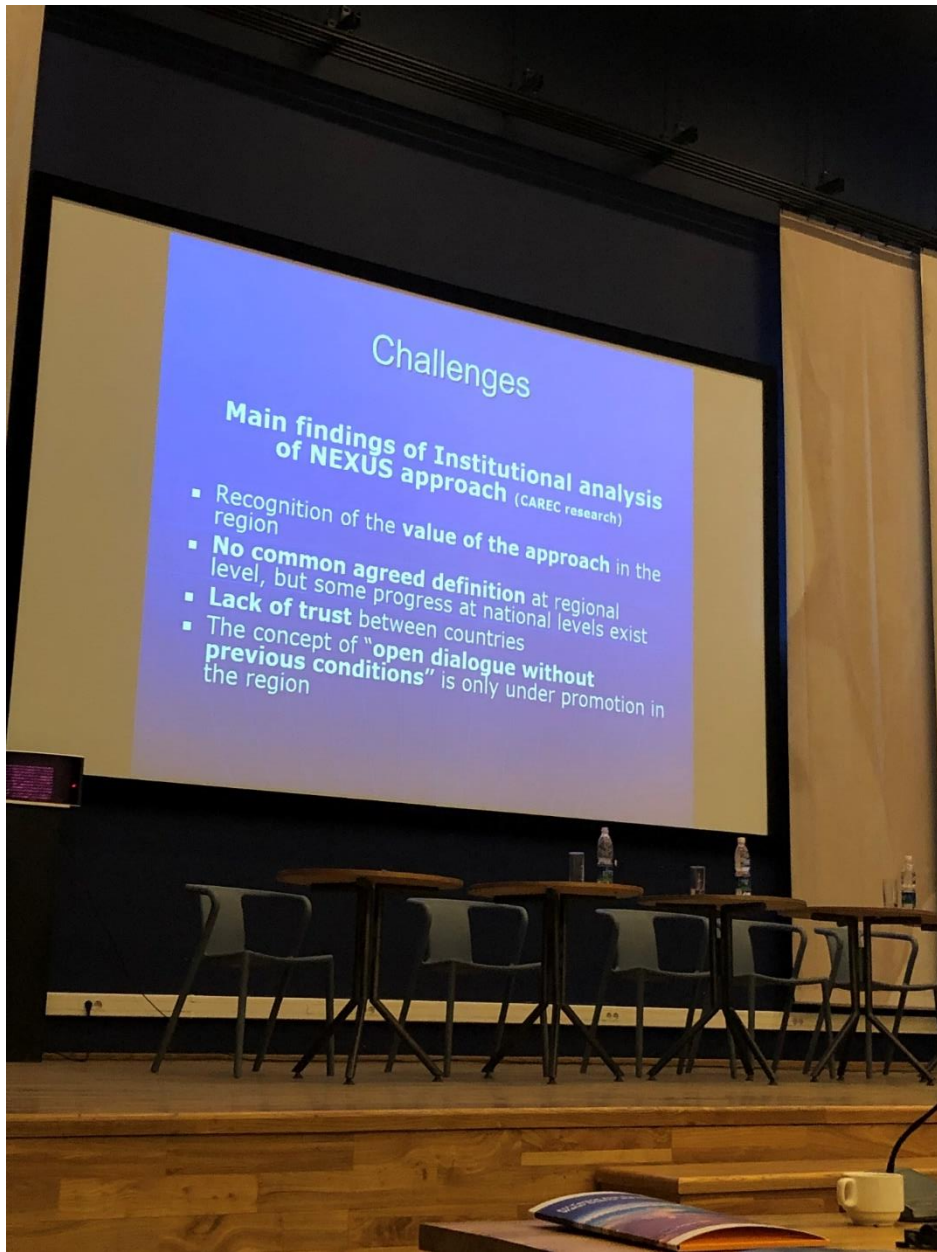
- 2018 - a unique opportunity for students to learn from the practice of renewable energy plants and apply this knowledge and skills to prepare a thesis for the bachelor's or master's degree.
- students visited more than 10 solar, wind and hydro-power plants in Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan.
- 2019 +Best practices cases. (Solar, Wind, Hydropower plants)



## Challenges

### Main findings of Institutional analysis of NEXUS approach (CAREC research)

- Recognition of the **value of the approach** in the region
- **No common agreed definition** at regional level, but some progress at national levels exist
- **Lack of trust** between countries
- The concept of "**open dialogue without previous conditions**" is only under promotion in the region





## Challenges

- No good dialogue between the three WEF sectors
- No regular dialogue platforms to facilitate the exchange and negotiation of interests and priorities at both national and regional levels
- Lack of modern technologies, methodologies and approaches
- Lack of information and data sharing and exchange

