

---

# TAJIKISTAN: CAPACITY BUILDING TO STRENGTHEN THE CLIMATE RESILIENCE OF ENERGY SECTOR ASSETS AND INVESTMENTS

---

NEWSLETTER-II  
December 2016

## In this issue:

- **Introduction to EBRD-led capacity building project in Tajikistan's energy sector.**
- **1<sup>st</sup> training program in Tajikistan – August 2016 on “Quality assuring hydro meteorological and reservoir data” and “Accessing and applying open source hydrometeorological data”.**
- **Study tour to Canada in October 2016 by Barki Tojik and Tajik Hydromet personnel to gain insights into measures and technologies used by Hydro Quebec (a major international power utility) in collaboration with Ouranos (a research consortium based in Montreal, Quebec) in their efforts to achieve a more climate resilient power system.**
- **Commencement of a survey program in Sugdh Province, targeting households and businesses separately, to explore gender variations in energy use and impacts of climate vulnerability.**

## BACKGROUND

This activity was launched by the European Bank for Reconstruction & Development (EBRD) as part of a major programme of investment in the modernisation of the Tajik energy sector. The objective of the “Capacity Building Program to Strengthen the Climate Resilience of Energy Sector Assets & Investments” (the CBP) is to build the capacity of the state utility Barki Tojik together with the state hydro-meteorology agency Tajik Hydromet (TH) and other relevant institutions to be more aware of the effects of climate change and to be better equipped to manage the impacts on water resources and hydropower generation.

### 1<sup>st</sup> Mission in Tajikistan-August 2016

The first training mission was run by Prof. Robert Wilby (an Acclimatise Associate) and Richenda Connell CTO of Acclimatise. The four day workshop and follow-up meetings were attended by personnel from Barki Tojik, Tajik Hydromet and the MOEWR. The training focused on two topics:

- ***“Quality assuring hydro meteorological and reservoir data”***
- ***“Accessing and applying open source hydrometeorological data”***

The aims of the first topic were to:

- Raise awareness of the various sources and types of error within hydrometric and reservoir data;
- Demonstrate a range of techniques for detecting artificial influences and errors in hydrometric data;
- Explore ways of trapping and flagging errors in hydrometric information flows.

The session commenced with a facilitated discussion about which parameters were being monitored by the participants, and the reasons for observing them. This was followed by presentations on the steps involved in monitoring (termed the ‘information flow’), starting with the objectives of monitoring, through to dissemination and use of the data in decision-making. Excel-based exercises were undertaken by the participants to apply the quality-checking techniques to real weather and river flow data.

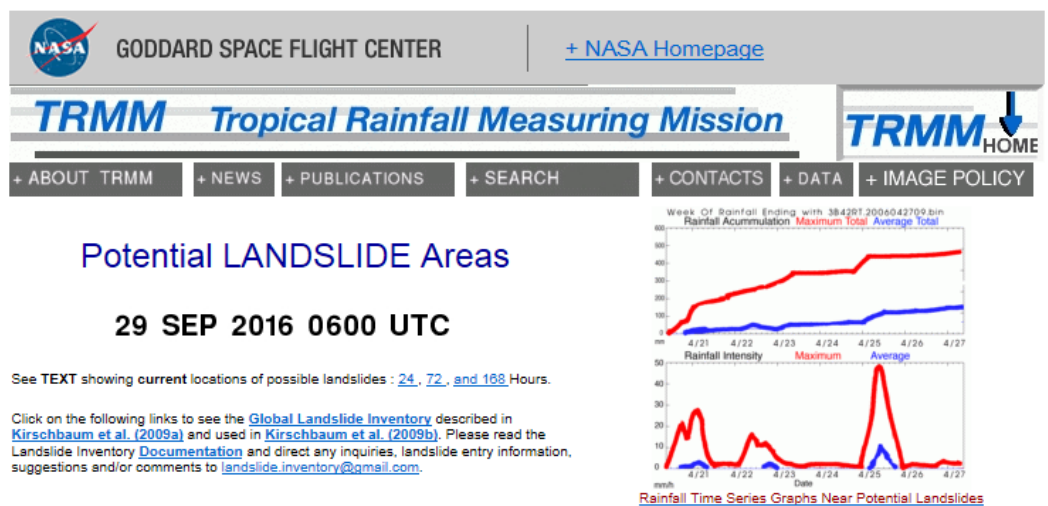
The aims of the second topic were to:

- Raise awareness of various open sources of meteorological, hydrological and hazards data for Tajikistan;
- Assess the technical strengths and weaknesses of different types of open source data;
- Explore potential operational and strategic applications of open source data in the hydropower sector of Tajikistan.

The training session commenced with a facilitated discussion on which open source datasets are already being used by the participants. This revealed that Tajik Hydromet has some experience with some of the datasets. Next, presentations were delivered, which provided participants with overviews of a wide range of key sources of open source hydroclimate data. The presentations emphasized the advantages and disadvantages associated with each data source, in line with the messaging from the first topic, encouraging participants to become ‘data critics’.

Participants then undertook an activity which involved accessing precipitation and temperature records from a gridded data set provided by the Climatic Research Unit with a Google Earth interface<sup>1</sup>. The international experts showed the participants how the raw data could be accessed and plotted in the web portal.

This was followed by presentations on remotely-sensed data, covering a variety of parameters and forecasting techniques of relevance to energy sector planning. The participants were particularly interested in discussing how open source data can be utilized for seasonal forecasting of reservoir inflows, anticipating landslides, or predicting sources and sinks of sedimentation in reservoirs (as shown in the map).



Click yellow circles on maps below to see regional areas with potential landslides.



<sup>1</sup> [https://crudata.uea.ac.uk/cru/data/hrg/cru\\_ts\\_3.23/ge/](https://crudata.uea.ac.uk/cru/data/hrg/cru_ts_3.23/ge/)

## Study Tour to Canada

A group comprising six personnel from various departments of Barki Tojik and one from Tajik Hydromet – accompanied by a translator from Tajikistan and the local Deputy Team Leader from the CBP, Furkat Kadyrov travelled to Canada for a study tour and training program organized by Marco Braun from Ouranos in Montreal, Quebec. The group arrived on the 15 October. From the 16<sup>th</sup> to the 28<sup>th</sup> Oct. the Tajik experts attended training sessions and travelled to 8



sites around Quebec. Training sessions were held at the offices of Hydro Quebec, Ouranos and at the offices of Ouranos' member organizations. After five days of training and site visits in and around Montreal the group travelled north, via Quebec City towards the Saguney/Lake Staint-Jean region continuing training and visits along the way. The tour concluded with two training sessions back in Montreal at Ouranos offices. It provided the guests from Tajikistan with insight into a wide array of activities in Canada related to climate change and climate resilient hydropower operations.

The first meeting was devoted to introductory presentations by Hydro Quebec, Barki Tojik and Tajik Hydromet to familiarize everyone with the organizations taking part in the study tour and the challenges facing them.

Debbie Gray of Hydro Quebec gave an overview of the utility, touching on HQ's Generation and procedures covering climate impact assessment, mitigation and ecological flow regime initiatives. She also outlined operational procedures covering dispatching of power, response to emergencies such as penstock ruptures & dyke failures. Her presentation was followed by a talk from Faizidin Karimov, Lead Engineer of the OSHC in Barki Tojik who gave an overview of the companies facilities and operational difficulties faced by BT. These include problems posed by landslides and mudflows on hydropower projects, Tajikistans power deficit in the winter months as well as sediment accumulation in Nurek Reservoir with almost 35% of the storage lost. Vohidjon Hamidov of Tajik Hydromet gave a presentation on the role and mandate of Tajik Hydromet in Tajikistan including an overview of the watersheds, glaciers and climate.

The training commenced with a presentation on "Climate Science, Climate Modeling and Scenarios by Marco Braun, Senior Hydroclimatologist at Ouranos. It gave an overview of the current observed climatic changes, the state of knowledge about anthropogenic climate change and introduced practices of developing and state of the art use of future climate scenarios.

The following day the group went to the village of Beauharnois, just outside of Montreal where Hydro Quebec operates it's 5th largest generation station on the Saint Lawrence river. At this site on a transboundary watershed David Fay, Engineering Advisor with the International Joint Commission (IJC) presented the role and mandate of his organisation dealing with the apportionment, conservation and development of water resources (including hydroelectric power) along the international boundary between the US and Canada. The commission comprises of



6 commissioners, 3 from each country, and has a wide range of investigative, quasi-judicial, administrative and arbitral functions.

The third day was a full day of training comprising a module on “Electric Demand Forecast” by Yves Nadeau, Director Tariffs and Service Conditions at Hydro Québec’s Distribution Division. Mr Nadeau demonstrated Hydro Quebec’s use of data and tools for the forecast of Electricity demand, including the adjustment of historical records to account for today’s already warmer conditions. Then, René Roy, Scientific Director of Ouranos and Climate Change Program Manager at Hydro Québec spoke about “Hydropower Generation in a Changing Climate”. This training module provided an overview of Hydro Québec’s approach to addressing climate change and explained the partnership between the Ouranos Consortium and Hydro Quebec. It went on to detail Hydro Quebec’s studies of climate change impacts, adaptation options, measures and benefits.

On the 20th Oct the group left Montreal for 7 day tour, starting with a visit to Hydro Québec’s Research Institute (IREQ) hosted by Jean-Pierre Tardif, Communications Consultant at IREQ. He took the group around the premises highlighting efforts at IREQ to extend the service life of facilities, boost performance, optimize maintenance and support energy efficiency programs and improve customer service. IREQ is also directly involved with the Ouranos Consortium and lends staff to the climate change impact assessments conducted at Ouranos. The afternoon was dedicated to the training module by Dragan Komljenovic, researcher at IREQ who made a presentation on “Infrastructure Vulnerability” and Hydro Quebec’s response to the impacts of extreme weather events. It discussed in particular Hydro Quebecs activities of building resilience against extreme weather events and their impact on power generation and lines following the exceptional ice storm that hit Quebec in 1998. An exercise in using the Gumbel distribution explained this tool for extreme event studies.

From IREQ just outside Montreal the delegation boarded their bus taking them north along the St Lawrence River to Quebec City, the capital of the Canadian Province of Quebec.



Jean-Pierre Tardif (IREQ) with his Tajik guests outside the Hydro Quebec Research facility where he had raised the Tajik flag to welcome the delegation.

In Quebec City the group was invited to the Quebec Water Authority. The government agencies hydrologic experts presented the water management challenges in Quebec, the Quebec Government Strategy for Climate Change Adaptation (PACC 2020) as well as examples of adaptation actions and tools such as the Hydroclimatic Atlas of Southern Quebec. At this visit Mr Karimov and Mr Hamidov also took the opportunity to share hydropower and water issues in Tajikistan resulting in interesting discussions comparing the work of the Tajik and Quebec institutions.



Professor François Anctil (University Laval) explains snow measuring devices to the Tajik delegation at the experimental hydromet station Forêt Montmorency

The first week closed with a presentation by David Huard, Coordinator of the Energy Program at Ouranos, who first demonstrated

human biases in making good decisions and how to overcome them in a training on “Decision Making”. The training module then presented a decision making tool developed for and with Ouranos hydropower members. It allows screening of hypothetical hydropower projects viability under numerous aspects of uncertainty, including the large uncertainty involved in climate change projections. Using research findings for decision making under large uncertainty, it helps to improve decision making for such long term infrastructure.

The weekend gave the delegation the opportunity to visit the 400 year old city of Quebec before the group headed further north towards the Saguenay/Lake St-Jean region. On the way a meteorological experimental station operated by the Université de Laval north of Quebec City was presented by François Anctil, Professor of Hydrological Engineering at the university.

The following day, Bruno Larouche, Water Management Consultant at Rio Tinto’s Power Operations Aluminium received the Tajik delegation at the operational center of Rio Tinto in the patrimonial Manoir du Saguenay. The next three days would be dedicated to hydroelectric installations owned and operated by Hydro Quebec and Rio Tinto in the Saguenay region to highlight the two companies’ engagement in adaptation to changing climate conditions. Several facilities are operated on a cascade of powerhouses shared between Hydro Quebec and Rio Tinto. The cascade is similar to the cascade of hydropower installations on the Vaksh River in Tajikistan and served as a demonstration case of how cascade management is addressed in Canada.

Mr. Larouche presented Rio Tinto’s activities of power operations involving 6 powerhouses that provide energy for 2 aluminum smelters. The powerhouses are fed from the Lake St Jean watershed with an area of 78 300 km<sup>2</sup> (50% of the area of Tajikistan). Hydropower exploration in the area dates back to around 1900 which Mr Larouche illustrated with a short but remarkable film from July 23, 1930 documenting the tipping of a huge manufactured concrete monoliths into the river for its diversion during construction of the Chute-à-Caron power house. Mr Larouche proceeded to detail the companies observational network, how they combine data with Hydro Quebec’s and the



government records and apply them for hydrological and climate change studies. This included hydrological forecasting methods involving the hydrological model CECEAU.)

In the afternoon, Isabelle Thériault, Engineer at Hydro Quebec Equipment lead a training module on “Hydropower Equipment Planning and Design”, touching on flow measurement techniques, the development of Hydro Quebec’s most recent Romaine Project, adaptation and optimization procedures as well as the use of the SCADA system.

The next day, Bruno Larouche guided the group on a visit to the Shipshaw Powerhouse as well as to Rio Tinto’s dispatch center. This gave the delegates ample opportunity to have long discussions with staff on site in the control room of the power plant and the operators of Rio Tinto’s SCADA system. At the Shipshaw power plant built in 1943 the Tajik guests also visited the modern 13th turbine recently added to this key component of the Rio Tinto Saguenay / Lac Saint-Jean hydroelectric power network.

A full day’s excursion took the group into the remote areas of the boreal forest to Hydro Quebecs Péribonka Power Plant located on the cascade of powerhouses along the Peribonka River.

On arrival at this remote location the delegates were first given an overview of the site, visiting the spillway and a viewpoint. Then two presentations were given: Benoit Carrier (Hydro-Quebec) explained the development of the Péribonka Hydropower Project, highlighting the construction sequence, the installed equipment and surveillance instrumentation. Then Marcel Labbé (Hydro-Quebec) outlined the data collection, operation and maintenance of the power plant. He later guided the group through the underground powerhouse of Péribonka that hosts three Francis units producing a total of 385MW. The delegates were particularly interested in the wave set up in the reservoir, the main characteristics of the dam riprap protection the freeboard and the instrumentation used to monitor the dam performance. The participants were impressed with the cleanliness of the powerhouse and were particularly interested in how every pipe, system or wire were clearly identified by a number, in order to facilitate the maintenance activities and failure detection.



Panoramic view of the Péribonka reservoir, spillway and underground powerhouse (top); Benoit Carrier (Hydro-Quebec) explains the development of the Péribonka Hydropower Project (bottom-left); Marcel Labbé (Hydro-Quebec) guides the Tajik delegation through the underground powerhouse of Péribonka (bottom-center); a Hydro Quebec vehicle guides the Tajik visitors through the boreal forest to the site of the Péribonka HPP.

The visit of the delegation concluded in Montreal with two more days of training.

Douglas Sparks, Chief of Security Studies at Hydro Quebec Equipment delivered a training module on “Dam Safety”, focussed on vulnerabilities to extreme climatic events and how these are modified due to climate change. He explained the different generations of Hydro Quebec’s equipment and detailed the dam safety management system, including the surveillance, maintenance and water management planning and operations. In highlighting Hydro Quebec’s current evaluation of climate change impacts on flood regimes and hydropower he made the case for Hydro Quebec’s options to adapt to changes in annual runoff conditions, demand, extreme events and water availability. These included structural as well as operational (non-structural) options.

The final training module on “Adaptation Case Studies in the Energy Sector” was presented by Élyse Fournier, Climate Scenario Specialist at Ouranos. It highlighted examples of successful adaptation to climate change from around the world, including the exploitation of increased flow due to glacier melt in Iceland, improved hydrological forecasting in Canada, and managing thermal effects on transmission lines in Canada, Australia and the U.K The presentation was followed by a discussion on likely fields of adaptation for the Tajik hydropower operations..

The training and study tour covered a wide range of topics. To evaluate the training needs for Tajik hydropower experts, the last session was an open discussion on the study tour, the objective of which was to solicit feedback to assess the Tajik visitor’s preferences for the training program to be held in Tajikistan in 2017. An overview of the training program and study tour visits was used to give each delegation member the opportunity to highlight the subjects deemed most relevant to them.

After two weeks the Tajik delegates returned to Tajikistan on Oct 29<sup>th</sup> It was an intense time of study and training and a pleasant experience for all participants, leaving everyone with new impressions and acquaintances from half way around the globe.



The Tajik Delegation, Trainers and Staff of the underground powerhouse at Peribonka

## Survey in Sughd Province

Questionnaires to be used in the survey of households and small businesses in Sughd Province to explore gender differences in energy use and impacts of climate vulnerability were prepared by the CBP team in collaboration with Zerkalo- Analytics a local Tajik company that specializes in this type of work.

The sampling methods and geographical locations (small cities and villages) were carefully chosen to reflect a range of local contexts. A stratified sampling approach has been adopted; mountainous areas, for instance, are considered the most vulnerable to climate change effects and therefore will have a relatively higher weighting in the identification of locations. Gender issues were considered in the selection of SMEs by selecting equal numbers of firms headed by women and men. A pilot survey was carried out to test the questionnaires and modified, where appropriate, according to the results. It is planned to complete the survey by mid-December 2016 when the Gender Specialist and Energy specialist from the CBP team will visit Tajikistan to participate together with the CBP team's local specialist and Zerkalo-Analytics in the analysis of the results. Such an analysis will provide an evidence base for Barki Tojik to shape the development of management and planning responses to the impacts of seasonal/climatic variability on energy use and availability.

It also aims to increase awareness of climate resilience in the energy sector and the importance of energy security among relevant stakeholders in Tajikistan and the population. This constitutes the basis for establishing efficient public awareness raising in coordination with Barki Tojik.