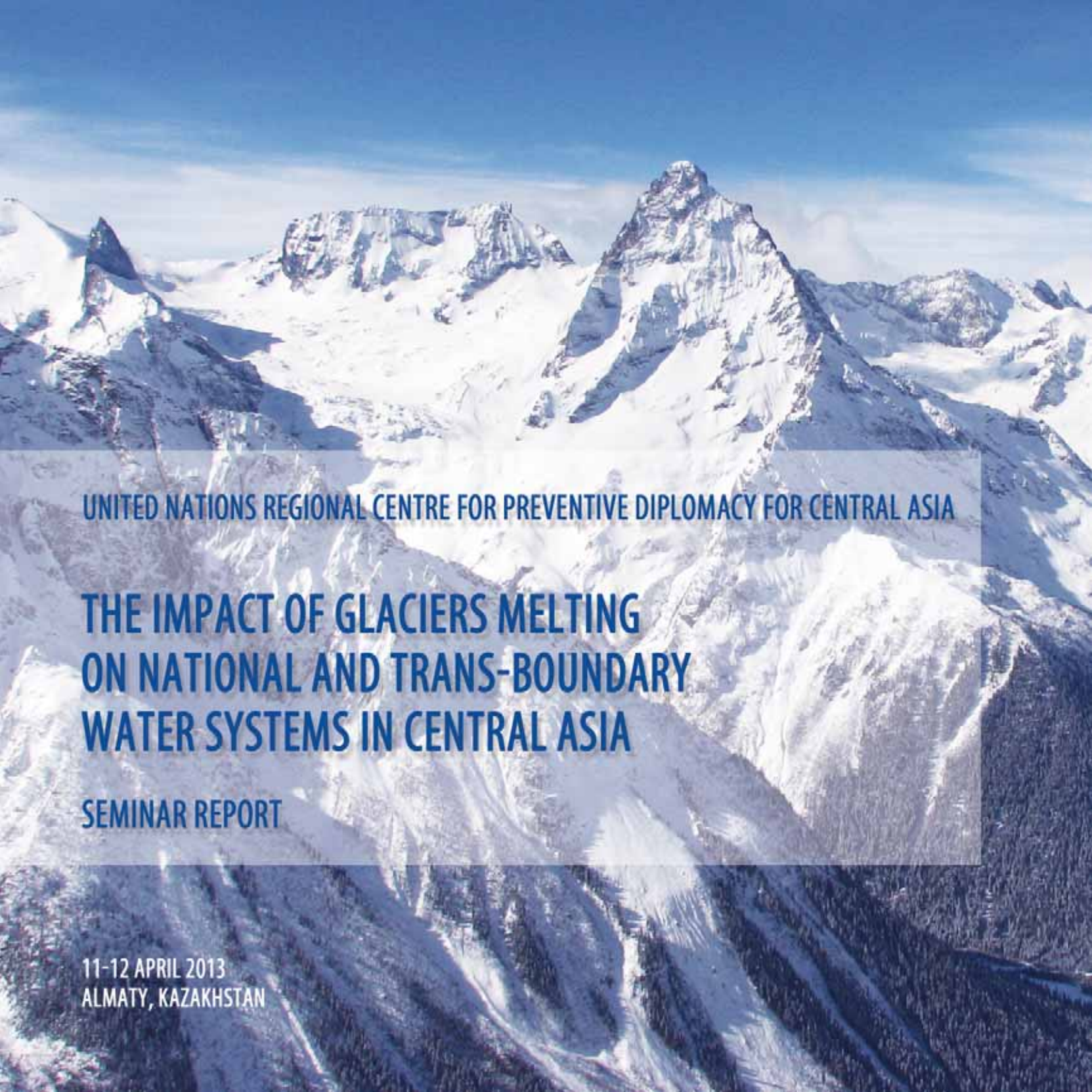


UNITED NATIONS REGIONAL CENTRE FOR PREVENTIVE DIPLOMACY FOR CENTRAL ASIA

THE IMPACT OF GLACIERS MELTING ON NATIONAL AND TRANS-BOUNDARY WATER SYSTEMS IN CENTRAL ASIA

SEMINAR REPORT

11-12 APRIL 2013
ALMATY, KAZAKHSTAN

ACKNOWLEDGEMENTS:

UNRCCA gratefully acknowledges the funding provided by the US Government for the organisation of this seminar and for the preparation of this report. This publication has been produced in the framework of the *Central Asia and Afghanistan Regional Cooperation on Trans-boundary Water Sharing project*.

DISCLAIMER:

This report has been prepared by an independent consultant for the United Nations Regional Centre for Preventive Diplomacy for Central Asia (UNRCCA), based on presentations and discussions at the International Seminar on "*The Impact of Glaciers Melting on National and Trans-Boundary Water Systems in Central Asia*" co-organized on 11-12 April 2013 in Almaty, Kazakhstan, by UNRCCA, UNESCO, the Executive Committee of IFAS and the World Bank for the 20th anniversary of IFAS. As such, it does not necessarily reflect the official position or views of UNRCCA or the United Nations system as a whole. While UNRCCA seeks to ensure that information contained in the report is accurate, no liability or responsibility is accepted for further use of this information.

The views expressed in this report are those of the author and do not necessarily reflect the views of the United Nations or the United Nations Regional Centre for Preventive Diplomacy for Central Asia.

The report is reproduced in the form in which it was received; only typographical errors and errors of fact or terminology have been corrected.

The partial reproduction of the contents is authorized only with the source being duly referenced. This report may be cited as:

Alfred Diebold. *The Impact of Glaciers Melting on National and Trans-Boundary Water Systems in Central Asia.* Final report of the seminar held in Almaty, Kazakhstan, on April 11-12, 2013. UNRCCA: Ashgabat, 2013.

Cover page and other photos by: Alfred Diebold, *www.waterunites-ca.org*

Design and Layout: Alexander Atayev, Designer and Bahar Amangeldyeva, UNRCCA Public Information Coordinator

Published by the UNRCCA. A copy of this report may be requested at the address below:

UNRCCA

43 Archabil Avenue, Ashgabat, 744036, Turkmenistan / Tel: +99312-481612; Fax: +99312-481607
E-mail: *unrcca-dpa@un.org;* Internet address: www.*unrcca.unmissions.org*

Printed by: Altyn Nusga" Printing Agency / Ashgabat, Turkmenistan, July 2013

Circulation: 500 Registration number: _____

THE IMPACT OF GLACIERS MELTING ON NATIONAL AND TRANS-BOUNDARY WATER SYSTEMS IN CENTRAL ASIA

Almaty, Kazakhstan

April 11-12, 2013

Co-organized by the UN Regional Centre for Preventive Diplomacy for Central Asia (UNRCCA), the Regional Office of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Executive Committee of the International Fund for Saving the Aral Sea (EC IFAS) and the World Bank with support of the Government of the United States of America

LIST OF ABBREVIATIONS

ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
CAEWDP	Central Asian Energy Water Development Program
CAIAG	Central Asian Institute for Applied Geosciences
CAREC	Regional Environmental Centre for Central Asia
CAWa	Regional Research Network "Water in Central Asia"
CIF	Climate Investment Fund
EC-IFAS	Executive Committee of the International Fund for Saving the Aral Sea
EU	European Union
FAO	(United Nations) Food and Agriculture Organisation
GFZ	Deutsches Geoforschungszentrum
GIZ	Gesellschaft für Internationale Zusammenarbeit
GLIMS	Global Land Ice Measurement from Space
GLOF	Glacial Lake Outburst Flood
ICSU	International Council for Science
IFAS	International Fund for Saving the Aral Sea
IHP	International Hydrological Programme
IPCC	International Panel on Climate Change
IOWater	International Organisation for Water
IWAC	International Water Assessment Centre
IWRM	Integrated Water Resources Management
KazHydromet	Kazakhstan Hydrometearological Services
RGI	Randolph Glacier Inventory
SIC ICWC	Scientific-Information Centre of the Interstate Commission for Water Coordination
TajHydromet	Talikistan Hydrometeorological Services
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNRCCA	United Nations Regional Centre for Preventative Diplomacy for Central Asia
USA	United States of America
USAID	United States Agency for International Development
UzHydromet	Uzbekistan Hydrometeorological Services
WGMS	World Glacier Monitoring Service
WHO	(United Nations) World Health Organisation

PREFACE

The United Nations Regional Centre for Preventative Diplomacy for Central Asia **(UNRCCA)** held an international seminar entitled **"The Impact of Glaciers Melting on National and Trans-Boundary Water Systems in Central Asia"**, which was co-organized by **UNESCO, EC IFAS** and the **World Bank** on the occasion of the 20th anniversary of the establishment of IFAS. It was held at the Rixos Hotel in **Almaty, Kazakhstan, on 11 and 12 April, 2013,** and was attended by representatives of Central Asian countries and international organisations as well as scientists and international experts. The seminar was made possible through the financial support of the Government of the United States. This report is a summary of the proceedings.

The two-day seminar commenced with the organizers giving an in-depth introduction and guiding statements. This was followed by a scientific overview of the state of glaciers and snow-ice resources of high mountains and prevailing trends. The impact of glaciers melting and the reduction of snow-ice resources on water cycles and water formations was also discussed before a look was taken at the socio-economic and environmental changes in the region caused by climate change.

In the afternoon of the first day of the seminar, international experts presented information about regional cooperation and best practices. This was followed by an open discussion and a reception.

The second day was dedicated to the role of international institutions in facilitating the search for adequate solutions to reduce the risks caused by climate change and to ensure early warning. It was also dedicated to discussing the overall seminar topic and its findings to derive conclusions for regional and bi-lateral action.

The seminar was attended by national delegations from the five Central Asia countries and Afghanistan, including representatives of a range of Ministries and Agencies. All of the countries took active part in the discussions. In addition, representatives of UNDP, UNESCAP, SIC ICWC, CAREC, USAID and IOWater also participated in the event. A full list of attendees is appended as Annex 2, and the agenda is appended as Annex 1.

The seminar's motto was: "Generally accepted and publically available knowledge and information are the basis for making the best use of national and trans-boundary water resources for sustainable development. Better informed people make better decisions".

CONTENTS

INTRODUCTION

In Central Asia, glaciers are highly important long-term reserves of fresh water. They supply water during the hottest period of the year, when it is needed for irrigation. As they are highly sensitive to temperature increases, glaciers are seriously impacted by climate change. Climate-driven changes in glacier-fed rivers have direct effects on freshwater supply, irrigation and hydropower generation. Therefore, the degradation of glaciers poses additional risks to sustainable development, energy and food security in Central Asia. There is a lack of balance between environmental protection, hydropower generation and agricultural production. This can be best seen at the Aral Sea, which has been drying up for the last 50 years. Up-stream countries (Kyrgyzstan, Tajikistan, Afghanistan) and downstream countries (Uzbekistan, Kazakhstan, Turkmenistan) in the Aral Sea Basin do not share the same interests. While upstream countries need water mainly for hydropower in winter, downstream countries need water for irrigation agriculture during the growing season.

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the UN Secretariat and UNRCCA.

During Soviet times, water management did not pose problems as priority was given to the use of water for irrigation, while Kyrgyzstan and Tajikistan were compensated with energy and fuel deliveries during wintertime. With the collapse of the Soviet Union in 1991, these arrangements ceased to exist. All five Central Asian Soviet Republics gained independence and new agreements for sharing water resources had to be worked out. The first agreement was signed in 1992, and others followed.

The International Fund for Saving the Aral Sea (IFAS) was founded in 1993. It was tasked to develop joint regional programs to improve the socio-economic situation in the Aral Sea Basin through the implementation of projects that are co-financed by international financial institutions as well as international donor and technical agencies. IFAS is the only regional organization and regional platform where the Central Asian Presidents regularly meet. The 20th anniversary will be celebrated in May this year.

The Secretary-General of the United Nations, Ban Ki-moon, visited Central Asia in 2010. He was taken to Muynak, a former port town on the Aral Sea in Uzbekistan. There, he spoke about one of the greatest man-made disasters in history and concluded: "One country alone cannot solve the problems in the region". A consensus understanding of the present situation in the region is absolutely essential in order to come up with joint solutions for sustainable development. He concluded that IFAS has to play a crucial role.

Source: Alfred Diebold, www.waterunites-ca.org, 2013

Objectives of the seminar and expected output:

The seminar contributes towards a better understanding of the present challenges in the region with regard to issues of glaciology in Central Asia and other regions of the world. It also aims to promote the establishment of networks of excellence to develop strategies and policies based on sound scientific knowledge of glaciology. Modern technologies in glacier inventory taking and cataloguing will be applied. Current developments require better monitoring of the glaciers' rate of degradation and their status in order to take coordinated steps to minimize the negative effects of this process through better planning and better management of water resources. Means and ways should be identified to facilitate research and to implement action programs. These efforts can be undertaken by one country alone, bi-laterally and/or multi-laterally.

The seminar lasted for two days. The idea was to start with a global overview of climate change and glaciers inventory taking before looking more specifically at the situation in Central Asia. The issue is not only that glaciers are melting, but also the socio-economic consequences and possibilities of countries to adapt. And there is an urgency that national and international organisations work together for a better and peaceful future of the region.

The sessions of the seminar focused on the following topics:

1. *Session 1: The state of glaciers and snow-ice resources of high mountains and prevailing trends*
2. *Session 2: Impact of glaciers melting and reduction on snow-ice resources on water cycles and water formation in Central Asia*
3. *Session 3: Impact of glacier degradation on socio-economic processes and environmental changes in the region*
4. *Session 4: The value-added of regional cooperation and its possible forms in the context of the potential reduction of snow-ice resources in the region*
5. *Session 5: The role of international institutions in facilitating the search for adequate solutions to reduce risks and to ensure early warning*
6. *Conclusion and recommendations*

The seminar brought together scientists, NGOs, national and international organizations as well as representatives of Governments from the five Central Asian countries and Afghanistan. Appreciation was expressed to the Government of the United States of America for its generous support for the UNRCCA's programmatic activities, including the organization of this seminar.

Conclusions:

Regional cooperation in water management in Central Asia needs to be strengthened. This can take place on a bi-lateral or a multi-lateral basis. The network of expertise, the UNESCO Category II Central Asian Regional Glaciological Centre located in Almaty, Kazakhstan, also needs to be strengthened. The Centre should develop strategies and policy guidelines to enhance resilience to changes, particularly climate change, through better scientific knowledge and data, understanding of vulnerabilities, opportunities and potential for adaptation in Central Asia. Donors have been supporting IFAS and other regional initiatives and there is a great need to continue with this assistance.

SESSION 1:
THE STATE OF GLACIERS AND SNOW-ICE RESOURCES OF HIGH MOUNTAINS AND PREVAILING TRENDS

The impact of climate change on mountain glaciers has been a topic of concern worldwide. It is generally assumed that glaciers around the world, and not only in Central Asia, are slowly retreating. But many questions still remain, as little is known about climate change and the melting of glaciers.

Not much reliable data is available on the long-term effects of glaciers melting and the future availability of mountain water resources. In this context, the overall problem can be summarized as follows. Measurement of snow accumulation, and snowmelt as a component of runoff, has proven to be difficult in the mountains of Asia. At present, snow accumulation can only be estimated. Avalanching may be a major factor in glacier accumulation. Traditional studies of mountain water resources cannot distinguish amongst rainfall, snow- and glacier-melt as components of the runoff. Assessments of the role of glaciers in regional stream flow in Asian rivers must include analyses of the area-altitude distribution of glaciers and basins. In Asian mountains, glacier accumulation areas are at altitudes above the regional snowline, where significant melt does not occur. Snow and glacier melt occur below the regional snowline. The area-altitude zone of melting below the snowline is the primary focus of Asian glacier hydrology. And, very importantly, each glacier has to be treated individually.

Studies and monitoring to determine the baseline hydrological environments of the high mountain headwaters of Asia should be encouraged to provide the basic information to enable the development of design criteria for engineering projects, forecasts of the impact of climate change and/or allocation of water amongst competing uses. A comparison of recent glacier retreat in the Nepali Himalayas estimated with the area-altitude model and measured retreat in the Peruvian Cordillera Blanca shows good agreement between theory and measurement, suggesting a retreat of the termini but small losses to total glacier volume.

Cataloguing of glaciers worldwide began when the IPCC started to publish reports on the effects of climate change and rising sea levels. Asian continental glaciers are included in this catalogue, which is known as the Randolph Glacier inventory (RGI). The RGI is a global database of glacier outlinesintended for estimates of ice volume and glacier mass on regional and global scales. The data are organized into 19 large regions, with a shapefile provided for each region. The RGI is produced as part of the Global Land Ice Measurements from Space (GLIMS) initiative, a project to compile glacier information using remote sensing, primarily from optical instruments such as ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer). Central Asia figures are presented under region 13. Contributing organizations among others are: the University of Zürich, Switzerland; GFZ Potsdam, Germany; CAWa; the German Federal Foreign Office; and the Institute of Geography, Russian Academy of Science, Moscow, Russia. As mentioned above, large parts of Central Asia are covered by the database of the Global Land Ice Measurements from Space (GLIMS) initiative. The GLIMS database for China consists of data from the first Chinese glacier inventory. Large parts of the Tien Shan range in Kazakhstan and Kyrgyzstan

were mapped semi-automatically using ratio images from ASTER. Important missing areas such as the Central Pamirs, the Naryn Basin, the northern Tien Shan and the Dzungar Alatau were mapped semi-automatically with manual corrections using Landsat scenes. Other missing data come in part from the World Glacier Inventory, which is part of the World Glacier Monitoring Service (WGMS). The service collects standardised observations on changes in mass, volume, area and length of glaciers over time (glacier fluctuations), as well as statistical information on the distribution of perennial surface ice in space (glacier inventories). Such glacier fluctuation and inventory data represent high-priority key indicators of climate change and are monitored as terrestrial variables within global climate-related observation systems directed by WMO, UNESCO, UNEP, FAO and ICSU. They form a basis for hydrological modelling with respect to the possible effects of atmospheric warming and provide fundamental information on glaciology, glacial geomorphology and quaternary geology. A significant amount of research is being done worldwide. However, Central Asian institutions are not yet in a position to live up to their potential. Not enough funds are available and there is no common approach or coordination. Little or no exchange of knowledge and information amongst Central Asian institutions takes place and reliable data and analysis are still missing.


Source: Alfred Diebold, www.waterunites-ca.org, 2013

SESSION 2:
IMPACT OF GLACIERS MELTING AND REDUCTION ON SNOW-ICE RESOURCES ON WATER CYCLES AND WATER FORMATION IN CENTRAL ASIA

Research on glaciers has a long history in Central Asia. During Soviet times, numerous hydro-meteorological stations were operated in the high mountains of the Pamir, Alai and Tien Shan. After the independence of Kazakhstan, Kyrgyzstan and Tajikistan, the countries were not able to maintain all of these stations and continue with the monitoring of glaciers. There is a lot of historic data available but it unfortunately is not digitalized and cannot be processed easily. But new initiatives are underway.

The World Bank has begun a regional project to strengthen hydro-meteorological services in the region. At the Abramov Glacier in the Alai range in southern Kyrgyzstan, climate and glacier monitoring resumed in 2011. A CAWa Hymet monitoring station performed GPS measurements on the glacier and installed ablation stakes. The Abramov Glacier is considered a key indicator for water resources in both main river basins of Central Asia, the Amu Darya and the Syr Darya. The new Abramov Glacier station - coordinates 39° 38′ 55″ N, 71° 35′ 09″ E - was installed by scientists from GFZ and CAIAG in close cooperation with researchers from UzHydromet and the Universities of Fribourg and Zürich in connection with the World Glacier Monitoring Service, and the Tajik Academy of Sciences. The new automated monitoring station is located at an altitude of 4,100 metres above sea level. The following parameters are measured: air temperature, relative humidity, atmospheric pressure, rain gauge, snow pack, wind monitor analysis, solar radiation, soil water content and soil temperature.

Research has also been going on in Tajikistan. Glaciers in Tajikistan cover 8,467 square kilometres, or about 8 per cent of its territory. The total volume of the glaciers is estimated at more than 576 cubic kilometres. The annual melting of glaciers contributes 10-20 per cent of the water flow. In dry and hot years, it is up to 70 per cent. The largest glaciers are Mabuza - 651 km^2, Grum - 160 km^2, Bivachny - 197 km^2, Garmo - 171 km^2, Zarafshan - 132 km^2, and Kasholayah-RGS - 64.4 km^2. In the 20th century, the Mabuza glacier system lost almost all of its thin and side tributaries, while the main accumulation of glacier mass is slowly decreasing. Analysis shows that in the period from 1966 to 2000, the Fedchenko Glacier decreased by 44 km^2, which is 6 per cent of the total area. In general, during the observation period (1933-2011), the Mabuza Glacier retreated by 1 kilometre and lost more than 15 km^3 (or one-tenth) of its mass. Modeling of climate change performed by the pilot program on adaptation to climate change in Tajikistan revealed that the predicted temperature increase would reduce the number of frosty days. By the 2050s, the number of frost days, according to different climate models will be reduced by 15 to 50 days per year. All climate models show an increase in heavy rainfall. It was found that the annual rate of warming is highest in the north of the country, while a reduction in the amount of rainfall is expected in the south-east. In this area, the reduction in rainfall since the 1950s occurs at a rate of about one per cent per year. It is assumed that around 2060-2080, water coming from glaciers

melting will decline because by that time some glaciers are likely to have disappeared entirely. And, of course, the disappearance of the glaciers has an impact on the water balance.


Source: Alfred Diebold, www.waterunites-ca.org, 2013

For Kazakhstan, reliable data on the melting and retreat of glaciers are available only for very few locations. Some scientists believe in general that there is no or only little retreat of glaciers in Kazakhstan. For the purposes of forecasting meltwater runoff, a network that involves aerospace data was established by KazHydromet. The Institute of Geography in Almaty has carried out scientific research on the spatial patterns of snow cover and its dynamics. Work has also begun on a methodology to assess the snow cover in the upper watersheds of trans-boundary rivers using satellite

monitoring. The Institute of Geography operates a station next to the Tuyuksu Glacier near Almaty. The research station is located at an altitude of 3,450 metres above sea level. It has an archive of data with great scientific value. Analysis of long-term variations of mean annual air temperature measured on the Tuyuksu Glacier shows an upward trend. The Institute of Geography of the Department of Glaciology of the National Scientific-Technological Holding "Parasat", where the UNESCO Central Asian Regional Glaciological Centre is located, also researches the Ily river delta. The Ily feeds the Lake Balkhash. Lake Balkhash is in danger of facing the same fate as the Aral Sea; it is in the process of drying up because too much water is being used on the way from the mountains of the Tien Shan to the delta. As the glaciers in this river basin are shrinking, there is a great need to work out management plans with China and Kazakhstan, the riparian States, to save the lake.

In Uzbekistan, research is being undertaken in the Oygaing River Basin. Results confirm the continuing decline of glaciers. The area of glaciers in this basin decreased by ten per cent in the period 1957-1978, while for the period 1978-2001 the decline was 16 per cent. The Center for Hydrometeorology under the Cabinet of Ministers of the Republic of Uzbekistan (Uzhydromet) is also responsibile for monitoring the outburst of glacial lakes. The formation of these lakes is a good indicator of the evolution of recent glacier retreat. Glacial lakes are a danger because their moraines are fairly loose structures and often contain an ice core. When the rate of melting is significantly higher than the outflow of the lake, the pressure mounts and there is a danger of outburst. The resulting stream of water can lead to casualties and material losses. Monitoring glacier and moraine lakes allows timely warning of possible outbursts.

Source: Alfred Diebold, www.waterunites-ca.org, 2013

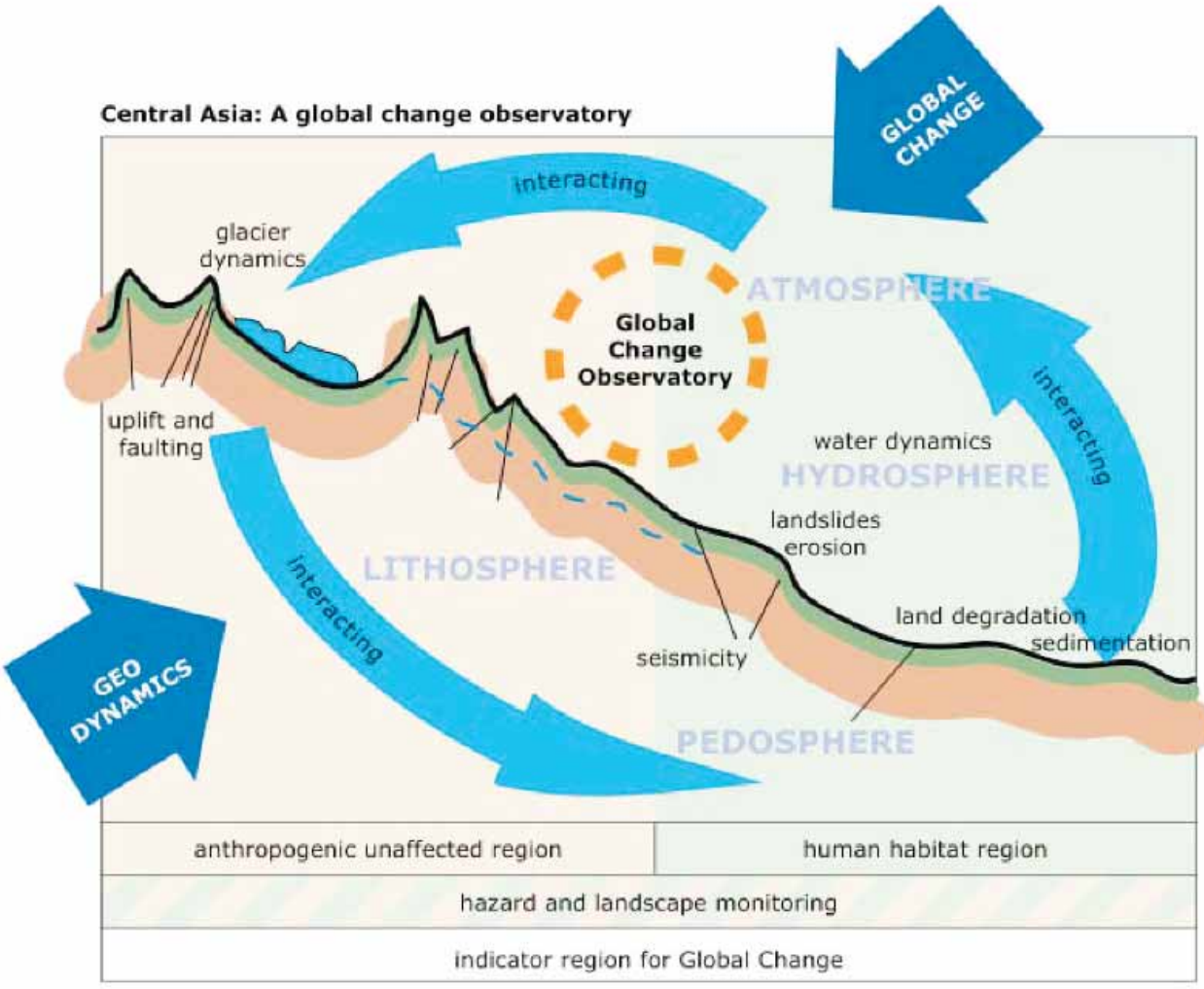
In sum, meteorological data from the last decades confirms that global warming has led to an increase in surface temperature in Central Asia. Climate warming in the winter months is stronger than in other seasons. However, peak temperatures in summer have also been rising. Since the 1950s, the number of days with temperatures above 40°C has been increasing in the southern areas of Central Asia. Climate change scenarios for Central Asia forecast a 1° to 3°C increase in temperature by 2030–50. By the end of the century, temperatures could increase by up to 6°C if emissions worldwide are not mitigated and greenhouse gases continue to accumulate.

Climate change will have a huge impact on water security. Future increases in both rainfall variability and extreme weather events will make water availability less predictable while rising temperatures will increase water demand. Climate change has also altered precipitation patterns. It caused more precipitation in the northern parts of Central Asia and less in the south, where most agricultural areas are situated. But the most disturbing effect of global warming in Central Asia is the melting of glaciers. Since about 1950, between 14 per cent and 30 per cent of the Tien Shan and Pamir glaciers have melted. Today's rate of glacier loss in Central Asia is 0.2 to one per cent per year. Some small glaciers (smaller than 0.5 km^2) have already totally melted. Connected with this process is the danger of so-called Glacial Lake Outburst Floods, which happen when water dammed by a glacier is released. Due to glacial retreat, the number of glacial lakes and incidences of failure have been increasing globally over the last 40 years. This danger is also acute in Central Asia. Scientists warn that in Kyrgyzstan alone more than 20 glacial lakes are in danger of outburst.

Glacial retreat has a strong impact on water availability in the rivers of Central Asia. Melt water from snow, glaciers and permafrost supplies around 80 per cent of the total river runoff in Central Asia. Glaciers are therefore a crucial source of water for irrigation agriculture and hydropower production. In the short term, discharge in some glacier-fed rivers is expected to continue to increase slightly during the summer months due to the intensified glacier and permafrost melting. In the long term, however, discharge will decrease and some glaciers will disappear. By 2050, experts estimate that the flow of the Amu Darya might be reduced by seven to 15 per cent and the Syr Darya by five per cent as a result of the loss of glaciers and permafrost, higher temperatures, increased evaporation and reduced surface runoff. In smaller rivers fed by small glaciers, this reduction will be much more substantial and may even lead to total drying-up within a few decades. In the decades leading up to 2100, this reduction is expected to be even higher. But even a small reduction can have disastrous effects in those downstream areas that are already facing shortages today. Therefore, Central Asian water managers have to expect serious water deficits in the coming decades.

But glacier melting is not only about water. The eco-systems and the whole environment are affected. The following graphic shows the dynamics of climate change in high mountains. In general, with global warming it is anticipated that glaciers will start melting earlier in the season and the melting will last longer in the summer. It is also anticipated that climate change will lead to desertification and loss of biodiversity. It will aslo exacerbate the occurence of natural hazards, such as floods, landslides and outbursts of glacial lakes.

Source: Alfred Diebold, www.waterunites-ca.org, 2013

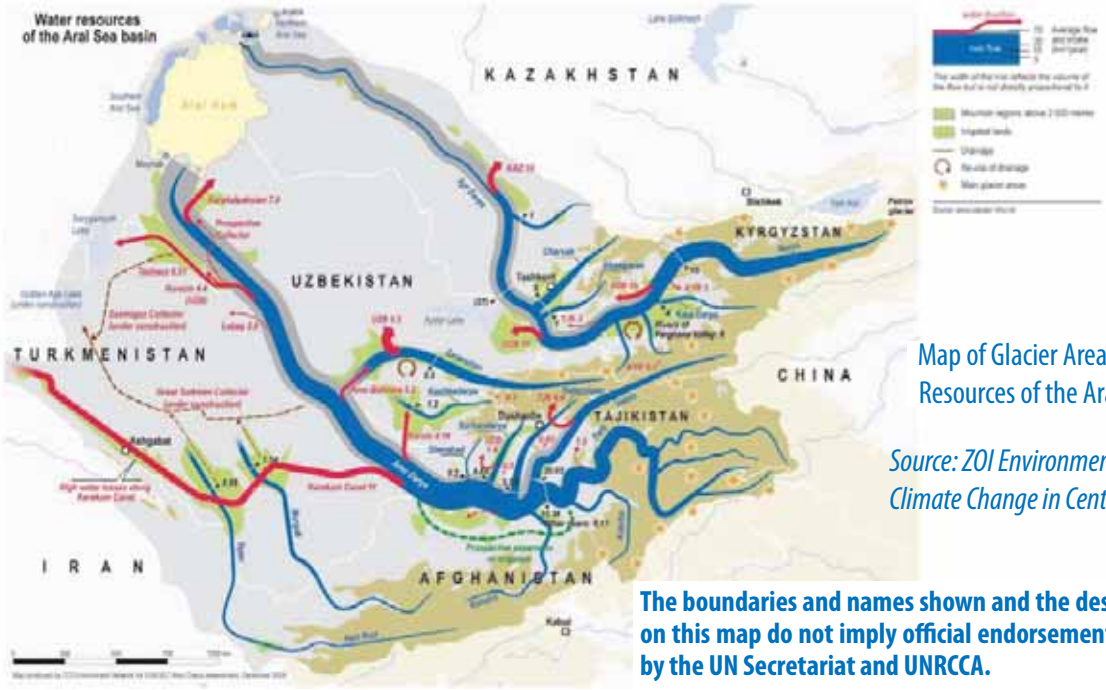


Source: Moldobekov, Central Asian Institute for Applied Geosciences, 2013

SESSION 3:
IMPACT OF GLACIER DEGRADATION ON SOCIO-ECONOMIC PROCESSES AND ENVIRONMENTAL CHANGES IN THE REGION

There is no doubt that the degradation of glaciers will impact on the environment and the socio-economic situation in Central Asia. The website www.waterunites-ca.org provides this analysis, which is based on publically available information.

The analysis shows that the territorial distribution of water resources in the Aral Sea basin is very unequal. While the lowlands of the basin are characterised by deserts and semi-deserts, precipitation increases in the mountains and the high mountains with their glaciers and permafrost areas serve as the "water towers" of the region. On average, 43 per cent of the annual discharge in the basin originates in Tajikistan, 24 per cent in Kyrgyzstan and approximately 19 per cent in Afghanistan. However, the pattern of water usage is quite the opposite. The upstream mountain states use only about 17 per cent of the water, while downstream Kazakhstan, Uzbekistan, and Turkmenistan use 83 per cent.



Map of Glacier Areas and Water Resources of the Aral Sea Basin

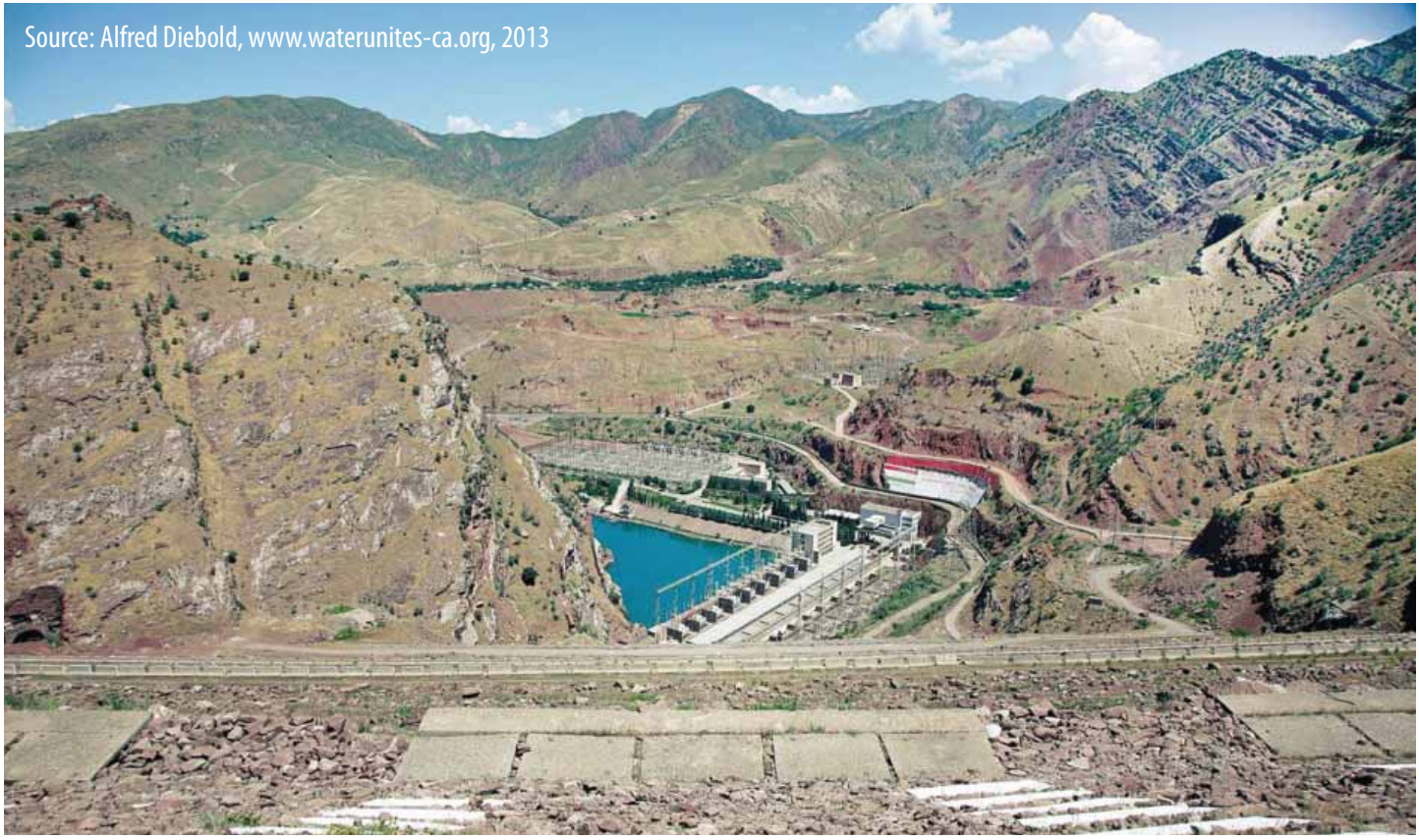
Source: ZOI Environmental Network, Climate Change in Central Asia, 2009

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the UN Secretariat and UNRCCA.

The reservoirs built along the major rivers in Central Asia are designed to manage water flow by releasing water exactly when it is needed. In the Soviet Union, these reservoirs were built mostly to manage irrigation water more effectively. After the break-up of the Soviet Union and its integrated water-energy exchange system, the upstream countries changed the working regime of these reservoirs gradually to meet their winter energy needs. Thus, less water is left to be released during spring and summer when irrigation needs peak flow. This has led to the perception that the needs of agriculture and energy production are incompatible in their water demand and that energy security in the upstream countries is only achievable at the cost of food insecurity downstream.

Source: Alfred Diebold, www.waterunites-ca.org, 2013

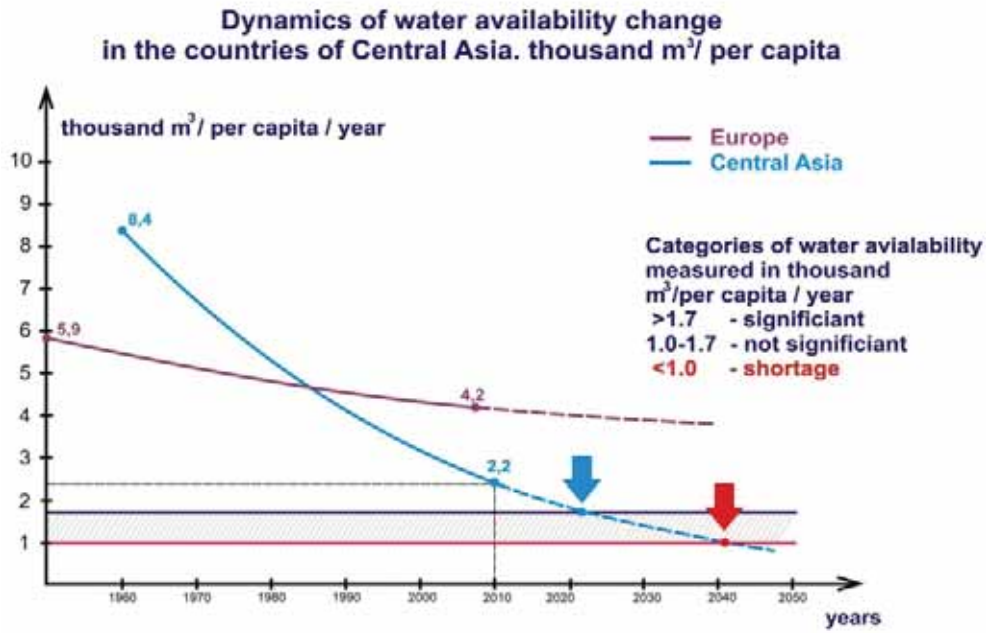
Hydropower production is a non-consumptive use of water. This means that once it is discharged it can be used for other purposes. Cascades of dams and reservoirs allow for multiple usage of water. Once it has been discharged and produced energy, water can be stored in another reservoir further downstream until it is needed for irrigation. Another option is to make the release of water in the summer profitable enough so that the money earned can be spent on coal and gas imports in the winter, meaning that little hydropower has to be produced. The energy produced in the summer could be bought by the downstream states (like in the Syr Darya Agreement of 1998) or be exported to regions with high energy needs during this period. These might include the hot regions of Afghanistan, Pakistan and India, which have high electricity demand for air-conditioning. This option is pursued by the Central Asia South Asia Regional Energy and Trade (CASA-1000) project. In 2006, Kyrgyzstan, Tajikistan, Afghanistan and Pakistan signed a Memorandum of Understanding, which is also supported by several international donors and private investors. CASA-1000 foresees the construction of high-voltage power lines linking energy producers in Kyrgyzstan and Tajikistan with markets in Afghanistan and Pakistan. This shows that energy and irrigation needs can both be met. Dams and power stations can be used in a way that is beneficial for all. Nevertheless, this requires investments in infrastructure, the will to cooperate and long-term reliable agreements to ensure energy and food security through mutual exchanges instead of through policies of self-sufficiency.



Source: Alfred Diebold, www.waterunites-ca.org, 2013

Being a vital resource for various economic sectors, sound water management has to account for all these interests and needs. As this has not been done sufficiently so far, regional agreements and organizations have lacked unanimous and long-term support from their members. Experience has shown that when agreements do not take into account the interests of all parties and are not perceived as being fair by all parties, implementation and compliance soon cease and they fail to achieve their objectives.

Water is, in fact, a precious resource for the people and the States of the region.



Source:S.R.Ibatullin, Executive Committee, International Fund for saving the Aral Sea, 2011

If water consumption patterns in the region remain unchanged, downstream countries might face shortages in water supply as shown in the graphic on the dynamics of water availability change in Central Asia.

With this knowledge, further steps still need to be taken with regards to professional water-related planning, water saving and water productivity linked to food security. Contributions to the financing of water infrastructure and its rehabilitation by the international community could increase the amount of water available and contribute to buying time for further structural changes in various economic sectors by national policies. International players have been and continue to be willing to support the Central Asian countries with these structural changes. As Member States of the UNECE, the Central Asian countries can benefit from the tools and assistance provided under its environmental conventions, especially the Water Convention. It offers a framework of shared principles, a platform for dialogue and concrete capacity-building measures and assistance, while leaving room for

specific agreements appropriate to the situation in the respective countries.

Mention also has to be made of a number of positive developments that show that change is possible. In order to secure the existence of the northern Aral Sea, Kazakhstan has constructed, with a loan and expertise from the World Bank, the 13-kilometre Kok-Aral Dike, which was completed in 2005. It prevents the water of the Syr Darya from flowing into the Southern Aral, where it would simply evaporate. In addition, old infrastructure on the Syr Darya was rehabilitated, irrigation systems were improved and several new hydraulic structures were constructed to reduce water losses and increase the flow of the river. Positive effects were soon visible. The surface of the northern Aral Sea grew by 18 per cent and the water rose by two metres. Most importantly, the salinity of the water, which had driven fish into the Syr Darya delta, fell from over 26 grammes per litre, unacceptable to the two dozen species of freshwater fish native to the Aral, to below 10, which was the average before 1960. Not only have the fish returned, but the biomass, or weight of all of the fish in the northern sea, was estimated in 2011 to have risen from 3,500 tonnes, mostly flounder introduced from the Black Sea, to 18,000 tonnes, mostly native, edible species like carp, pike perch, catfish and pike. Commercial fishing now accounts for 4,500 tonnes and a fish-processing plant has started operating in Aralsk, exporting the most valuable fish to Russia and other neighbouring countries. In the southern part of the Aral Sea, the Uzbek Government has taken measures to sustain the wetlands in the delta area of the Amu Darya. Nevertheless, the desiccation continues. Today, there is no hope that the entire Aral Sea can be fully resuscitated.

Source: Alfred Diebold, www.waterunites-ca.org, 2013

SESSION 4:
THE VALUE-ADDED OF REGIONAL COOPERATION AND ITS POSSIBLE FORMS IN THE CONTEXT OF THE POTENTIAL REDUCTION OF SNOW-ICE RESOURCES IN THE REGION

The Amu Darya and the Syr Darya flow into the Aral Sea and form the Aral Sea Basin, which covers southern Kazakhstan, most of Kyrgyzstan and Turkmenistan, practically the whole of Tajikistan and Uzbekistan, as well as the northern part of Afghanistan and a small portion of Iran. The Scientific Information Centre (SIC) of the Intergovernmental Committee on Water Coordination (ICWC) in Tashkent maintains the website http://www.cawater-info.net on the Aral Sea Basin. Much quantitative and qualitative information is available. The Amu Darya has an average annual water flow of 74 km^3, making it Central Asia's mightiest river. Its origins are the rivers Panj and Vakhsh in Tajikistan and Afghanistan. After their confluence, the Amu Darya first forms the border river between Afghanistan and Tajikistan and then with Uzbekistan and Turkmenistan. It crosses Turkmenistan and flows into Uzbekistan, where it reaches the southern shore of the Aral Sea. Its total length from the source of the Panj is 2,540 km. Its catchment area ranges between 465,000 km^2 and 612,000 km^2, depending on how it is calculated. The Aral Sea Basin also includes the Sherabad, Surkhan Darya, Kashka Darya and Zarafshan rivers, although the latter two do not discharge into the Amu Darya.

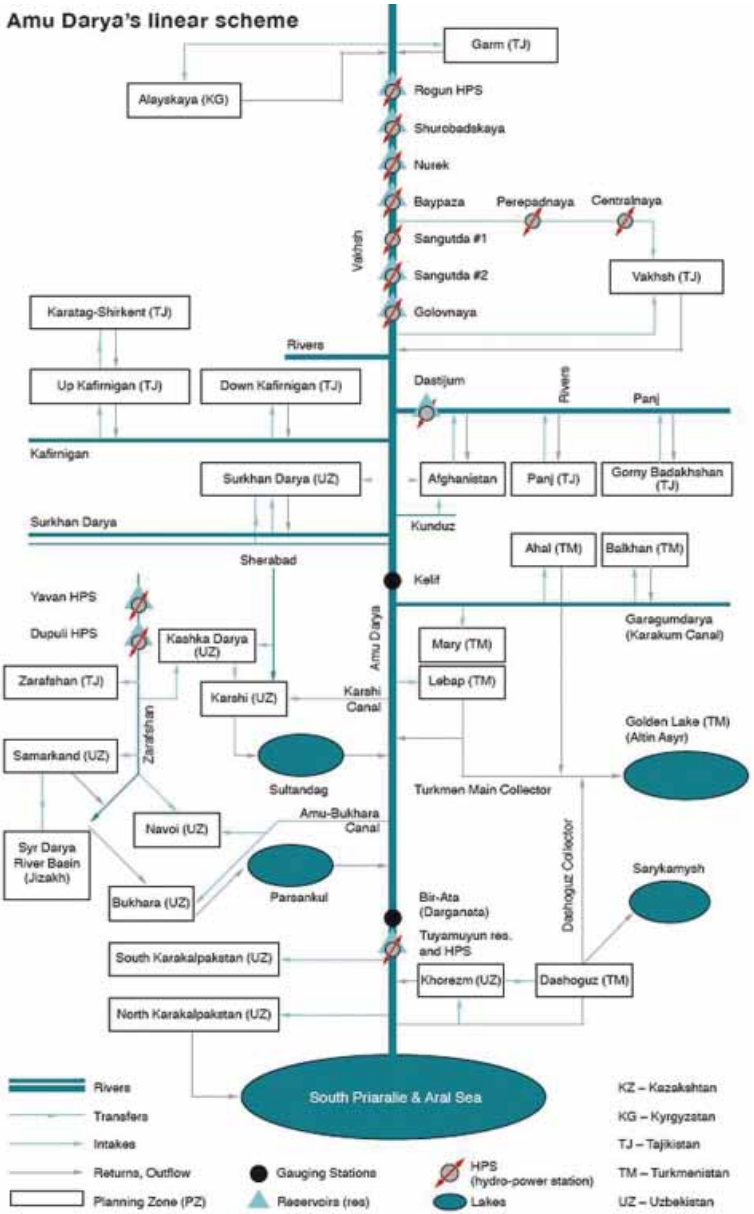
The Syr Darya, whose source is the Naryn River, is considerably longer, at 3,019 km, but its annual flow is much smaller, on average 37 km^3 per year. The Naryn originates in Kyrgyzstan, flows through the Ferghana Valley and becomes known as the Syr Darya after it joins the Kara Darya. It crosses Uzbek and Tajik territory before it flows again into Uzbekistan and then into Kazakhstan, where it ends in the northern part of the Aral Sea. The Syr Darya Basin is estimated at 782,617 km^2.

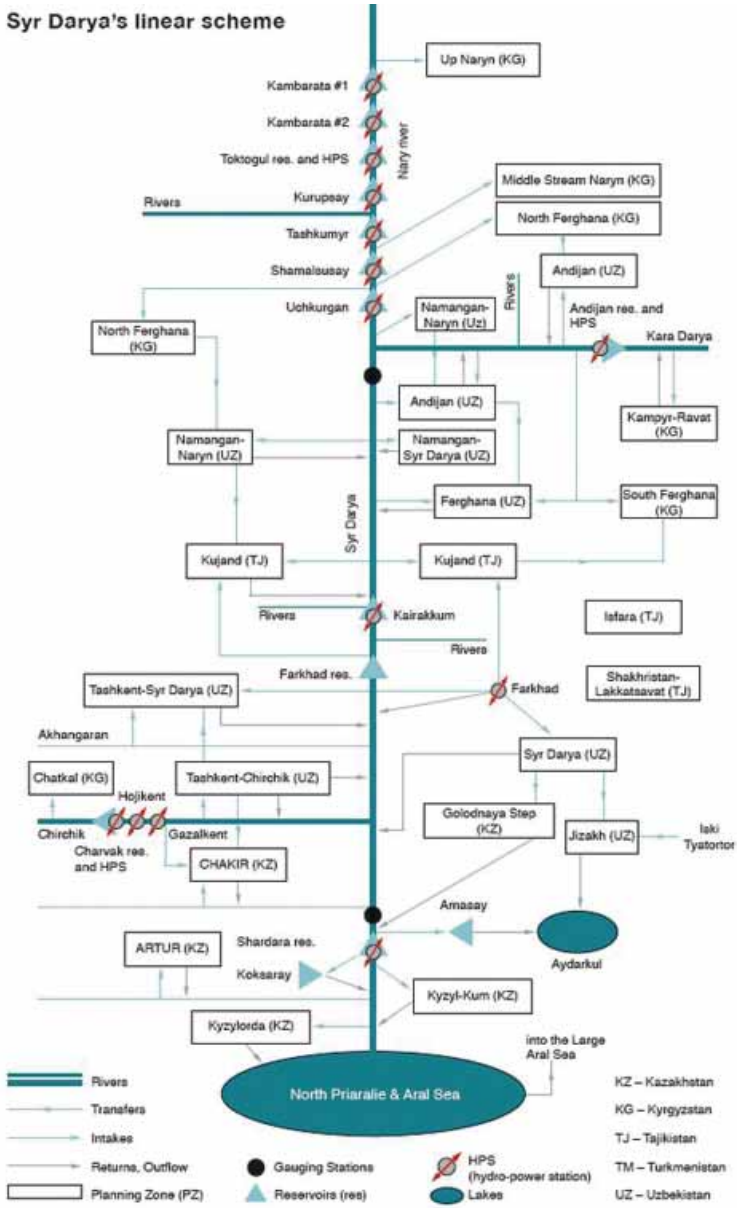
Both rivers are fed mainly by snow and glacier melt in the high mountain regions of Kyrgyzstan, Tajikistan and Afghanistan. This leads to high seasonal variability in water flow with peaks in spring and summer. This variation can be considerable from one year to the next due to weather conditions. In wet years, the Amu Darya has reached 96.3 km^3 (1969), while its flow shrank to 52.8 km^3 in 1947. Similarly, the Syr Darya flow was only 18.3 km^3 in 1917 but reached 72.5 km^3 in 1921. In order to regulate water flows and have water available when needed, a sophisticated system of dams, reservoirs and hydro-facilities has been built over the past century. The operation and maintenance of this infrastructure, most of which is of trans-boundary significance, requires sound coordination of the involved national agencies or a trans-boundary regulatory framework.

Source: Alfred Diebold, www.waterunites-ca.org, 2013

With climate change and the anticipated changes in seasonal surface water availability, it is obvious that reliable data on the region's hydrology is a prerequisite for managing regional water resources effectively and efficiently. Regional data exchange is needed. The following charts serve to demonstrate the difficult task of trans-boundary water resources management.

Questions remain to be asked, such as, "Do we need more multi-year reservoirs in order to make better use of water resources in the future?" In addition, a growing population, higher demand for food and electrical energy and the need to protect the environment pose further challenges for decision-makers in Central Asia.





Source: www.cawater-info.net

Easy access to information on the status and evolution of water resources and use is one of the keys to successful water policy and management. Water resource managers need reliable, up-to-date and relevant information on issues such as regulations, planning, risk management and public information. Needs are different depending on the actors and the levels at which they are acting.

There is a lot of data and information available about the Aral Sea Basin not only at SIC. Since November 2010, IOWater has been implementing a French Global Environment Fund project administered by the International Water Assessment Centre (IWAC) to build capacity for data administration for assessing trans-boundary water resources in Eastern Europe, the Caucasus and Central Asia. The project was developed in the framework of assessment reports on trans-boundary watercourses produced by UNECE. It focuses on the Aral Sea Basin and the Dniester River Basin. Regarding the Aral Sea Basin, it makes use of more than 200 data sources that are recorded in a catalogue. In this process, lessons were learnt and recommendations were derived. Exchange of comparable data and information amongst countries needs to be reinforced for trans-boundary water management. Many datasets exist but they are not digitized. There is little or no quality control and data is not shared even at the national level. Human resources and capacities for data management need to be reinforced at all levels (producer/national/regional). Countries should be supported in developing their own national water information systems.

At the global scale, UNESCO sees itself as the lead agency within the UN system on various freshwater issues, such as interagency initiatives and other joint projects on water resources or global water assessments. It promotes inetrnational cooperation, research, monitoring, education and capacity building for the strengthening of water security for peace and sustainable development. The International Hydrological Programme (IHP) is UNESCO's inter-governmental scientific cooperation program on water. It was created in 1975 and is the first and only inter-governmental freshwater initiative institutionalized in the UN system. IHP is being implemented in phases developed through a comprehensive consultative process with its 168 IHP National Committees, international scientific associations and UN entities, ensuring IHP's continuous relevance and its overall institutional coordination. The implementation of the IHP is supported by cross-cutting programmes and initiatives, some of them conducted jointly with other UN agencies. The Organziation promotes various disaster risk reduction activities and is committed to the Hyogo Framework for Action, which aims at increasing resilience of populations to disasters.

There is also an inter-sectoral platform charged with promoting the implementation of the UNESCO Strategy for Action on Climate Change and the associated UNESCO Initiative on Climate Change. It is well understood that climate change will lead to a loss of rare and endangered species, modified water balances (including glacial melt) and changing land use in mountainous regions that will alter socio-economic conditions and people's livelihoods. UNESCO Man and the Biosphere programme (MAB) assesses the impacts of climate change on fragile mountain ecosystems using mountain biosphere reserve as study and monitoring sites and promotes its Global Change in Mountain Regions (GLOCHAMORE) Research Strategy .

UNESCO facilitates a dialogue between researchers and decision makers and identifies research and policy needs in providing technical support for adaptation planning, developing national adaptation strategies and action plans with a multidisciplinary approach.

SESSION 5:
THE ROLE OF INTERNATIONAL INSTITUTIONS IN FACILITATING THE SEARCH FOR ADEQUATE SOLUTIONS TO REDUCE RISKS AND TO ENSURE EARLY WARNING

The World Bank has developed a strategy for mitigating and adapting to climate change that is based on the findings of its recent publication "Turn Down the Heat". The study spells out that we are on a path to a four-degree Celsius (7.2°Fahrenheit) warmer world by the end of this century under current greenhouse gas emissions pledges. The consequences of this rise in temperature could be devastating: coastal cities may flood; food production may increasingly be at risk ; many dry regions may become dryer and wet regions wetter; many regions, especially in the tropics, may experience unprecedented heat waves; water scarcity may be substantially exacerbated in many regions; the intensity of tropical cyclones may increase; and biodiversity, including coral reef systems, may be irreversibly lost. The World Bank believes that a four-degree Celsius warmer world can, and must be, avoided. The problem of climate change needs to be tackled more aggressively and requires a response that puts the world on a new path to climate-smart development and shared prosperity. Greater adaptation and mitigation efforts are essential and solutions exist. The World Bank works with countries to assess and manage risks from climate change and provide analytical guidance. The Pilot Program for Climate Resilience, a dedicated fund of almost USD $1 billion under the Climate Investment Funds (CIFs) prioritizing vulnerable least–developed countries, provides grants and near-zero interest-concessional loans to 17 countries for a range of activities to adapt to climate change, including improving agricultural practices and food security, building climate-resilient housing and improving weather data monitoring. Recent work has helped policy-makers deal with the additional uncertainty created by climate change. As part of its Central Asian regional approach, the Bank has initiated a comprehensive Central Asia Energy-Water Development Program (CAEWDP) that 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:

1. **Energy Development** to promote highest-value energy investments and management. Areas of focus include: infrastructure planning, winter energy security, energy trade, energy accountability, and institutional development;

2. **Energy-Water Linkages** to improve the understanding of linkages between water and energy at the national and regional levels. Areas of focus include: energy-water modeling, regional hydrometeorology, climate vulnerability and energy-water dialogue; and

3. **Water Productivity** to enhance the productivity and efficiency of water use in both the agriculture and the energy sectors. Areas of focus include capacity strengthening, the Third Aral Sea Basin Management Program, national action plans for water productivity and rehabilitation of infrastructure.

The World Bank is playing a vital role in supporting the Central Asian countries to find durable solutions in the area of peaceful and sustainable water management. The feasibility studies of the Roghun HPP currently conducted under the auspices of the World Bank are another very important exercise that will assist in taking informed decisions on the future of the project. In this context, UNRCCA makes every effort to create conditions conducive to an inclusive dialogue to lay foundations for a durable political solution in the future. In this regard, EC-IFAS is an important partner of UNRCCA as well as the World Bank.

EC-IFAS is mandated to coordinate cooperation at the national and international levels in order to use water resources more effectively and to improve the environmental and socio-economic situation in the Aral Sea Basin. EC-IFAS represents IFAS in international organizations and institutions. EC-IFAS was tasked by the Central Asian Presidents[1] in 2009 to work out the Aral Sea Basin Program 3 (ASBP 3). ASBP is a joint on-going process that involves the region's Governments and civil society as well as the international donor community. It includes a number of projects aimed at fostering adaptation to climate change and glaciers melting.

ASBP-3 works in four directions:

1. *Integrated Use of Water Resources;*
2. *Environmental protection;*
3. *Socio-economic development; and*
4. *Improving institutional and legal instruments.*

The period covered by ASBP-3 is 2011 to 2015. Its work reflects the priorities of the Member States. It aims to familiarize all parties concerned with the challenges facing the Aral Sea Basin, including decision makers, representatives of international financial institutions, international development agencies, specialists and the public at large. The ASBP-3 program includes regional projects to be financed mainly by international donors; on-going national projects supported by national Governments; and on-going regional and national projects funded by international donors. The ultimate objective of ASBP-3 is to improve the living conditions of the region's people. More specifically, it aims to improve the socio-economic and environmental situation by applying the principles of integrated water resources management to develop a mutually acceptable mechanism for multi-purpose water use and to protect the environment in Central Asia, taking into account the interests of all of the States in the region. EC-IFAS coordinates and informs the donor community on priority interventions with regard to the four directions of ASBP-3 and, as appropriate, implements projects. In addition, EC-IFAS monitors the overall implementation of ASBP-3.

[1] *The Joint Statement by the Heads of State appears in Appendix 3*

CONCLUSION AND RECOMMENDATIONS

Global warming and climate change will have effects on the high mountains of Central Asia. Most likely, glaciers will melt more rapidly and this will have consequences not only for the water balance in the Aral Sea Basin. It will lead among other things to natural hazards, such as landslides, floods and glacial lake outburst. It will affect the socio-economic development of the region. Still, not enough research has been conducted in this area and not enough reliable knowledge and data is available. Additional efforts are urgently needed to fill these gaps in order to provide better policy advice. Only one thing is for certain. As Ban Ki-moon said, "One single country in the region cannot solve the problems alone".

Since the break-up of the Soviet Union in 1991, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan have developed mechanisms of cooperation. Institutions, in particular IFAS, have served as safety valves to prevent conflicts over water. The Presidents of the region's countries have repeatedly stated their commitment to joint water management and international actors have provided incentives and helped build structures and spaces for cooperation. It has become clear that it is not only water management that is at issue, but the environment-energy-water-food nexus for sustainable socio-economic development and for peace and prosperity in the region.

This nexus has to be analysed and translated into action. In this regard, the role of EC-IFAS in promoting regional efforts to counter negative trends related to glaciers melting, including the implementation of specific programs under the new ASBP-3, is crucial. But, of course, each country needs to strengthen its own national institutions as well. And very importantly, a young and knowledgeable workforce should be educated that can successfully take over from the gradually retiring hydropower and irrigation engineering elite in the region. This would greatly help to put effective and cooperative resource sharing and management at the top of the region's agenda. Uzbekistan will take over leadership of EC-IFAS in 2013, while from 2009 until 2013 EC-IFAS was located in Almaty, Kazakhstan.

It is vital to improve regional and international cooperation on glacier monitoring. Data sharing amongst regional and international partners will foster better understanding of the glaciers.

The delegates agreed that sharing of experiences and practices regionally and internationally can improve the data collection on snow, glacier and water resources impacted by climate change and increase efficiency of national planning for adaptation to climate-driven changes in the water resources system.

Engaging local populations and local authorities can greatly improve and expand monitoring activities, while digitization and analysis of data would help to partially fill the gaps in knowledge.

The importance of scientific knowledge and cooperation, in particular on glacier and snow monitoring has been considered as crucial. It was pointed out that the Central Asian Regional Glaciological centre in Kazakhstan under the auspices of UNESCO (Category II), which has a long, continuous and rich experience on glacier research and disseminating the results to scientific community, should play a pivotal role in strengthening scientific capacities in the region.

Various and fragmented activities exist in countries of the region, including on glacier monitoring and river runoff. There is a need for a multidisciplinary approach to the problem, including in addressing hazards, risks and mitigation measures.

Strategies and policy guidelines to enhance resilience to changes, particularly climate change, through improved understanding of vulnerabilities, opportunities and potential for adaptation in Central Asia, should be developed. It international networks to facilitate dialogue between researchers and decision makers in identifying research and policy needs should be strengthen. The existing knowledge on the impact of climate change on the future availability of melt water from glaciers and its effects on water security should be integrated; strategies for underpinning future policy actions with regard to sustainable economic development should be formulated; and support should be given to modelling of climate-induced glacier change and its potential impact on regional water resources.

The participants considered the following to be essential:

1. **Integrated glaciers studies in the mountains of Central Asia and studies of the mountain ecosystem;**
2. **The study of patterns and correlations of precipitation intensity and melting of glaciers with climate change;**
3. **Modelling of processes and monitoring in the upper watersheds;**
4. **The prediction of glaciers' size and volume using satellite monitoring and aerial visual observations;**
5. **Development of measures for adaptation to climate change in Central Asia and disaster risk reduction, in particular in the framework of the ASBP-3;**
6. **The development of regional cooperation and the study of mountain ecosystems, changes of glaciers and snow cover in mountains and their impact on water resources, socio-economic processes and environmental changes in the region;**
7. **The consolidation of the efforts of national, regional and international organizations, as well as support for these efforts by the donor community; and**
8. **Capacity building/training of relevant personnel, including young people.**

To accomplish all of this, it is clear that the international community needs to stand ready to assist with financial resources and expertise in support of a better and peaceful future for the people of Central Asia and Afghanistan.

APPENDIX 1: PROGRAM OF THE SEMINAR

INTERNATIONAL SEMINAR "THE IMPACT OF GLACIERS MELTING ON NATIONAL AND TRANS-BOUNDARY WATER SYSTEMS IN CENTRAL ASIA"

Co-organized by the UN Regional Centre for Preventive Diplomacy for Central Asia (UNRCCA), the Regional Office of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Executive Committee of the International Fund for Saving the Aral Sea (EC IFAS) and the World Bank.

Almaty, Kazakhstan
11-12 April 2013

PROGRAM OF THE SEMINAR

First day, April 11, 2013

08:30-09:00 **Registration**

09:00-09:35 **Opening session**

- Mr. Miroslav Jenča, Special Representative of the UN Secretary-General and Head of UNRCCA;
- Representative of the Government of the Republic of Kazakhstan;
- Mr. Sergey Lazarev, Director of the UNESCO Regional Office;
- Mr. Sagit Ibatullin, Chairman of the IFAS Executive Committee;
- Representative of the World Bank;

09:35-10:50 **Session 1: The state of glaciers and snow-ice resources of high mountains and prevailing trends**

Moderator: Mr. Fedor Klimchuk, Deputy Head of UNRCCA

Presentations:

1. Mr. Don Alford, Department of Geography, University of Montana
2. Mr. Sergey Myagkov, Deputy Director on research work and international cooperation of SANIGMI Hydrology Forecasting Laboratory (Uzhydromet)
3. Ms. Nina Pimankina, Principle staff scientist, Department of Glaciology, Institute of Geography of National Scientific-Technological Holding "Parasat", Kazakhstan

10:50-11:00 Discussion on the outcomes of the session

11:00-11:15 **Coffee-break**

11:15-12:50 **Session 2: Impact of glaciers melting and reduction of snow-ice resources on water cycles and water formation**

Moderator: Mr. Sergey Lazarev, Director of the UNESCO Regional Office

Presentations:

1. Mrs. Elena Piven, Principle staff scientist, "Institute of Geography" of National Scientific-Technological Holding "Parasat", Kazakhstan, Dr.
2. Mr. Saidahmad Dustov, Deputy Director of Hydrometeorology of the Republic of Tajikistan, Tajikistan's glaciers in Climate Changes;
3. Dr. Andrey Kokarev, Principle staff scientist, Department of glaciology, of "Institute of Geography" of National Scientific-Technological Holding "Parasat", Kazakhstan
4. Mr. Bolot Moldobekov, ""Monitoring and study of the glaciers of the Tien Shan mountains in a changing climate" (The projects CAWA and GCO)
5. Dr. Kristine Tovmasyan, Programme Specialist, Sector of Natural Sciences, UNESCO, France, "Climate change impact on snow, glacier and water resources: UNESCO's role in formulating the adaptation strategies"

12:50-13:00 Discussion on the outcomes of the session

13:00-14:00 **Lunch**

14:00-15:35 **Session 3: Impact of glaciers degradation on socio-economic processes and environmental changes in the region**

Moderator: Mr. Sanjay Pahuja, Senior Water resources specialist, World Bank

Presentations:

1. Mr. Alfred Diebold, International Expert, Germany, "Glaciers of Central Asia and Climate Change".
2. Mr. Torebek Tokmagambetov, Head of department of glaciology, of "Institute of Geography" of National Scientific-Technological Holding "Parasat", Kazakhstan

15:35-15:45 Discussion on the outcomes of the session

15:45-16:15 **Coffee-break**

16:15-16:50 **Session 4: Value added of the regional cooperation and its possible forms in the context of potential reduction of snow-ice resources in the region. International best practices in this field**

Moderator: Mr. Nikolay Pomoshchnikov, Ph.D. Head of the ESCAP Subregional Office for North and Central Asia, Kazakhstan

Presentations:

1. Mr. Alisher Nazariy, Chief Specialist of SIC ICWC, Uzbekistan
2. Dr. Kristine Tovmasyan, Programme Specialist, Sector of Natural Sciences, UNESCO, France
3. Ms. Manon Cassara, Project Coordinator, International Office for Water, France

16:50-17:00 Discussion on the outcomes of the session

17:30 **Reception**

Second day, April 12, 2013

09:00-10:35 **Session 5: The role of international institutions in facilitating the search for adequate solutions to reduce the risks and to ensure early warning**

Moderator: Mr. Demesin Nurmaganbetov, Deputy Chairman of the IFAS Executive Committee

Presentations:

1. Mr. Jitendra Shah, World Bank, Coordinator of climate change efforts in Central Asia.

10:35-10:45 Discussion on the outcomes of the session

10:45-11:45 **Coffee-break**

11:15-12:15 General discussion on issues raised during previous sessions

Moderator: Mr. Fedor Klimchuk, Deputy Head of UNRCCA

12:15 **Closing of the seminar**

APPENDIX 2:
LIST OF PARTICIPANTS

INTERNATIONAL SEMINAR "THE IMPACT OF GLACIERS MELTING ON NATIONAL AND TRANS-BOUNDARY WATER SYSTEMS IN CENTRAL ASIA"

Co-organized by the UN Regional Centre for Preventive Diplomacy for Central Asia (UNRCCA), the Regional Office of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Executive Committee of the International Fund for Saving the Aral Sea (EC IFAS) and the World Bank.

Almaty, Kazakhstan
11-12 April 2013

LIST OF PARTICIPANTS

REPRESENTATIVES OF CENTRAL ASIAN STATES	
Kazakhstan	Mr. Darkhan Nursadykov – First Secretary of the Department on SCO activities and Trans-Boundary rivers Cooperation, Ministry of Foreign Affairs of the Republic of Kazakhstan
Kazakhstan	Mr. Tursynbek Kudekov - First Deputy of the Chief Director of "Kazhydromet" of the Republic of Kazakhstan
Kazakhstan	Mrs. Botagoz Spanbetova - Expert of Hydrogeology and Engineering Geology Committee of Geology, Ministry of Industry and New Technologies of the Republic of Kazakhstan
Kazakhstan	Mr. Djumahan Nurseitov - Deputy Head of the Aral-Syrdariynsk water management of the Republic of Kazakhstan
Kazakhstan	Mr. Vsevolod Golubtsov - Leading researcher of „Kazhydromet", Republic of Kazakhstan
Kyrgyz Republic	Mr. Chyngyz Eshimbekov - Director of the Department of the International Economic Cooperation, MFA, Kyrgyz Republic

Kyrgyz Republic	Ms. Ekaterina Sakhvaeva - Head of Information and Analytics Unit, Department for Water Resources and Melioration, Ministry of Agriculture of Kyrgyz Republic
Kyrgyz Republic	Mr. Bekbolot Mamatairov - Main Specialist, Department of Ecological Strategy and Policy, State Agency for Environment and Forestry of Kyrgyz Republic
Kyrgyz Republic	Mr. Ysmaiyl Dairov - Director of the Regional Mountain Centre of Central Asia
Kyrgyz Republic	Mr. Bakhtiyar Khasanov - Head of Hydrology Unit, Agency for Hydrometeorology of the Ministry of Emergencies of Kyrgyz Republic
Tajikistan	Mr. Bozor Rahmonov - Head of the Committee for Hydrometeorology Environmental Protection
Tajikistan	Mr. Abdulhamid Kayumom - Expert of Hydrometeorology Committee for Environmental Protection
Tajikistan	Mr. Alihon Karimov - Head of the Center for Strategic Studies of the Committee on Environmental Protection
Uzbekistan	Mr. Sherzod Asadov - First Secretary of the Department for CIS and SCO of the Ministry of Foreign Affairs of the Republic of Uzbekistan
Uzbekistan	Mr. Nazrulislom Bakiyev – Attaché for Cooperation with the structures of the CIS and the SCO of the Ministry of Foreign Affairs of the Republic of Uzbekistan
Uzbekistan	Mr. Mahamatmuso Babahodjaev - the State Nature Protection Committee
Uzbekistan	Mr. Babamurot Kurbanov - Ministry of Emergency Situations
Uzbekistan	Ms. Lidiya Karandaeva - the Scientific Research Hydrometeorological Institute (NIGMI) of Uzhydromet
Turkmenistan	Mr. Ishankuli Amanlyev – Head of Middle East Department, Ministry of Foreign Affairs of Turkmenistan
Turkmenistan	Mr. Yanov Pashiev – Senior Specialist of Gydraulic Control Operation, Ministry of Water Resources of Turkmenistan
Turkmenistan	Mr. Bayram Nazarov - Chief Engineer of the Hydro meteorological Center of the National Committee on Hydrometeorology at the Cabinet of Ministers of Turkmenistan
Turkmenistan	Mr. Kurbangeldy Ballyyev - Representative of Turkmenistan to the Executive Committee of the International Fund for Saving the Aral Sea
OTHER COUNTRIES	
Afghanistan	Mr. Habibullah Tahiry - NEPA's Climate Change Expert , the National Environmental Protection Agency, Afghanistan

CO-ORGANIZERS OF THE SEMINAR	
UNRCCA	Mr. Miroslav Jenča – Special Representative of the UN Secretary General, Head of the Regional Centre
UNRCCA	Mr. Fedor Klimchuk – Deputy Head and Senior Political Advisor
UNESCO	Mr. Sergey Lazarev – Director of the UNESCO office in Almaty (Cluster office), Kazakhstan and UNESCO Representative to Kazakhstan, Kyrgyzstan and Tajikistan
IFAS	Mr. Saghit Ibatullin - Chairman of the IFAS Executive Committee, Almaty, Kazakhstan
IFAS	Mr. Demesin Nurmaganbetov - Deputy Chairman of the IFAS Executive Committee, Almaty, Kazakhstan
WORLD BANK	Mr. Saroj Kumar Jha – World Bank Regional Director for Central Asia, Almaty, Kazakhstan
WORLD BANK	Mr. Winston Yu – Senior Water Resources Specialist at the World Bank in the South Asia Region
WORLD BANK	Mr. Talaibek Koshmatov - Senior Rural Development Specialist
WORLD BANK	Mr. Jitendra Shah - Lead Environmental Specialist
WORLD BANK	Ms. Daryl Fields - Senior Water Resources Specialist
WORLD BANK	Mr. Sanjay Pahuja - Senior Water resources specialist at the World Bank's South Asia Environment, Water Resources and Climate Change Unit
WORLD BANK	Mr. Don Alford – Expert of World Bank
REPRESENTATIVES OF INTERNATIONAL ORGANIZATIONS AND EMBASSIES	
US Department of State	Mr. Douglas D. Walker - Doctor of Philosophy, Science and Technology Advisor, South and Central Asia Regional Affairs, US Department of State
USAID	Mr. Michael Trainor - Senior Energy Policy Specialist, USAID, Almaty, Kazakhstan
USAID	Mr. Sergei Elkin - Project Management Specialist, Energy & Water USAID Economic Growth Office, Almaty, Kazakhstan
USAID	Mr. Ashley M. King - Environment Officer, USAID Central Asian Republics, Almaty, Kazakhstan
International Office for Water	Ms. Manon CASSARA - Office International de L'eau/International Office for Water International Cooperation Office, France

UN DPI	Mr. Vlastimil Samek – UN DPI Representative in Kazakhstan
UNDP Kazakhstan	Mr. Yegor Volovik - UNDP Regional Programme Coordinator
CAREC	Mr. Iskandar Abdullaev - Executive Director, Regional Environmental Centre for Central Asia, Almaty, Kazakhstan
CAREC	Ms. Anna Inozemtseva - Junior Specialist, CAREC Water Initiatives Support Program, Almaty, Kazakhstan
UNEP	Mrs. Nara Luvsan – Senior Regional Advisor, UNEP Regional Office for Europe
International Office for Water	Ms. Manon Cassara - International Office for Water, France
UNECE	Mr. Batyr Hajiyev - UNECE's representative in the joint ESCAP/ECE office in Almaty, Kazakhstan
GIZ	Mr. Volker Frobarth - Director of GIZ Regional Office, Almaty, Kazakhstan
Eurasian Development Bank	Mr. Tulegen Sarsembekov – Deputy Head of Technical Assistance Division, EDB, Almaty, Kazakhstan
Eurasian Development Bank	Mr. Alexander Mironenkov - Head of Technical Assistance Unit at the Eurasian Development Bank, Almaty, Kazakhstan
OCHA	Mr. Arman Navasardyan - Humanitarian Affairs Officer, Regional Office for Caucasus and Central Asia (ROCCA), United Nations Office for the Coordination of Humanitarian Affairs (OCHA), Almaty, Kazakhstan
ESCAP	Mr. Nikolai Pomoshnikov –Head of Sub-regional Office of ESCAP for North & Central Asia, Kazakhstan
ESCAP	Ms. Irina Kolykhalova - Administrative Assistant ESCAP Subregional Office for North and Central Asia, Almaty, Kazakhstan
U.S. Embassy in Astana, Kazakhstan	Mr. David Paradise - Regional Environment, Science, Technology and Health Officer in Central Asia, Astana, Kazakhstan
OSCE Centre in Astana	Ms. Bibigul Izbair – Project Assistant, Economic and Environmental Dimension, Astana, Kazakhstan
OSCE Centre in Astana	Mr. Stefan Buchmayer - Human Dimension Officer, OSCE CiAst/ Liaison Office in Almaty

Institute of Ecology and Sustainable Development	Ms. Kuralay Karibayeva – Director of the Institute of Ecology and Sustainable Development, Almaty, Kazakhstan
International Business University	Ms. Kalkash Abubakirova – Professor, International Business University, Almaty, Kazakhstan
UNESCO	Dr. Kristine Tovmasyan - Programme Specialist, Natural Sciences Sector, UNESCO, Paris, France
EXPERTS	
	Mr. Alisher Nazariy – Chief Specialist of SIC ICWC, Tashkent, Uzbekistan
	Mr. Vladimir Konovalov – Leading Scientific Researcher, Department of Glaciology, Institute of Geography, Russian Academy of Sciences, Moscow, Russia
	Mr. Alfred Diebold – International Expert, Rome, Italy
	Mr. Bolot Moldobekov - Senior Research Professor, Co-Director of CAIAG, Central Asian Institute for Applied Geosciences, Bishkek, Kyrgyz Republic
	Mr. Anvar Homidov - Head of the Department of Hydrometeorology Committee for Environment Protection of the Republic Tajikistan
	Mrs. Elena Piven - Principle staff scientist, "Institute of Geography" of National Scientific-Technological Holding "Parasat", Kazakhstan, Dr.
	Mr. Torebek Tokmagambetov - Head of department of glaciology, of "Institute of Geography" of National Scientific-Technological Holding "Parasat", Kazakhstan
	Mr. Murat Bekniyazov - Representative of Kazakhstan at the EC IFAS
	Dr. Alexander Kokarev - Principle staff scientist, Department of glaciology, of "Institute of Geography" of National Scientific-Technological Holding "Parasat", Kazakhstan

UNRCCA REPRESENTATIVES	
UNRCCA	Mr. Anatoly Petrenko – Administrative Officer
UNRCCA	Ms. Bahargul Rahmanova – Public Information Assistant
UNRCCA	Ms. Anastasiya Bernovskaya – Administrative Assistant
UNRCCA	Ms. Bakhit Abdyldina – UNRCCA Representative in Kazakhstan
UNRCCA	Mr. Jomart Ormonbekov – UNRCCA Representative in Kyrgyzstan
UNRCCA	Ms. Sanoat Jumaeva – UNRCCA Representative in Tajikistan
UNRCCA	Mr. Nodir Khudayberganov – UNRCCA Representative in Uzbekistan

APPENDIX 3:
JOINT STATEMENT OF THE HEADS OF THE STATES – FOUNDERS OF THE INTERNATIONAL FUND FOR SAVING THE ARAL SEA

The meeting of the Presidents of the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan took place in Almaty on April 28, 2009.

During negotiations which took place in the atmosphere of mutual understanding, trust, friendship, and structural cooperation, the Heads of the States of Central Asia discussed issues related to the activities of the International Fund for saving the Aral Sea, which was established in 1993, with the objective of to implement joint practical activities and programs to address the Aral Sea crises and to improve environmental and socio-economic conditions within the Aral Sea Basin.

Heads of the States - Founders of the IFAS, further named "Parties":

-***guided*** by centuries-old good neighborly relationships and common history, culture and traditions, good brotherhood and strategic partnership between countries that are responsible for the utmost interests of the people of the region,

-***based on*** rich experience of fruitful collaboration and expressing mutual interest to bring inter-government relationships to the higher level,

-***striving*** towards mutual assistance and support for achieving Millennium Development Goals and improving socio-economic and environmental conditions within the Aral Sea Basin,

-***emphasizing*** that the development of mutual collaboration of the states of Central Asia has high importance for ensuring sustainable development and regional safety,

-***taking into account*** climate change, intensive degradation of glaciers and snowfields of the Region and water consumption related to the population growth and the development of economies of the countries of the Region,

-***emphasizing importance*** of the efforts by the countries of the Region on integrated use and conservation of water resources, combating desertification and land degradation for solving problems of the Aral Sea Basin,

-***giving*** high priority to project implementation within the framework of the IFAS and taking into consideration interests of the Region,

-***taking into account*** that use of water resources of the Central Asian Region is implemented within the interests of all the states-stakeholders of the IFAS by following generally acknowledged principles of the international law,

-***taking into account*** activities of the IFAS and its structural organizations oriented towards strengthening regional collaboration on improvement of socio-economic and environmental conditions within the Aral Sea Basin,

-***expressing*** satisfaction with the accepted General Assembly Resolution of the UN of December 11, 2008 on giving the International Fund for Saving Aral Sea the status of observer in the UN General Assembly,

-***expressing*** gratitude to the specialized structural organizations of the UN, international financial institutions, donor countries, other partners in development of assistance and support provided for the countries of the Region,

-***based*** on the common endeavor to make contributions for overcoming consequences of the crisis in the Aral Sea Basin,

- ***make the following statement:***

1. Parties emphasize the importance of IFAS, activities, which provide the possibility to coordinate and solve principal issues through collaboration to overcome the consequences of the crisis of the Aral Sea Basin. IFAS will enhance and strengthen the collaboration with the institutions of the UN system including UN Regional Center for Preventive Diplomacy and other international organizations.

2. The Parties express their readiness to further improve the organizational structure and the legal framework of IFAS to improve its efficiency and better interaction with financial institutions and donors to implement projects and programs related to the addressing the Aral Sea Basin crisis.

3. Parties task the Executive Committee jointly with the Interstate Commission for Water Coordination, Interstate Commission for Sustainable Development of the IFAS with participation of national experts and donors to develop a Program of actions for the period 2011-2015 (Aral Sea Basin Program - 3) to provide assistance to the countries of the Aral Sea Basin and submit it for consideration and approval by the States - Founders of the IFAS.

4. Parties will continue collaboration targeted to the improvement of the environmental and socio-economic situation in the Aral Sea Basin.

5. Parties once again confirm their interest in the development of mutually acceptable mechanism on integrated use of water resources and environmental protection in Central Asia taking into account the interests of all states in the region.

6. Parties stressed that constructive negotiations, which took place in Almaty in the atmosphere of openness and mutual understanding contributed significantly to the further development of the traditionally known good relationships and mutually beneficial collaboration of the states-founders of the IFAS in solving the problems of the Aral Sea.

7. Heads of the States express their gratitude for the warm reception and welcome by the President of the Republic of Kazakhstan N.A. Nazarbaev in the hospitable land of Kazakhstan.

Almaty, April 28, 2009

President of the Republic of Kazakhstan	**N.A. NAZARBAEV**
President of the Kyrgyz Republic	**K.S. BAKIEV**
President of the Republic of Tajikistan	**E. RAKHMON**
President of Turkmenistan	**G.M. BERDIMUHAMEDOV**
President of the Republic of Uzbekistan	**I.A. KARIMOV**

FOR NOTES

FOR NOTES

FOR NOTES

FOR NOTES

CONTACT INFORMATION:

UNRCCA

UNITED NATIONS
REGIONAL CENTRE FOR PREVENTIVE
DIPLOMACY FOR CENTRAL ASIA

43 Archabil Avenue
Ashgabat, 744036, Turkmenistan
Tel: +99312 481612
Fax: +99312 481607
E-mail: unrcca-dpa@un.org
Website: http://unrcca.unmissions.org

Uzbekistan Kazakhstan Kyrgyzstan Tadjikistan Turkmenistan

EXECUTIVE COMMITTEE OF THE INTERNATIONAL
FUND FOR SAVING THE ARAL SEA

103, Begalina Street
Almaty, 050000, Kazakhstan
Tel: +7 727 291 68 33
Fax: +7 727 3873433
E-mail: mail(a)ec-ifas.org
Website: http://www.ec-ifas.org

UNESCO

UNITED NATIONS EDUCATIONAL,
SCIENTIFIC AND CULTURAL ORGANIZATION

UNESCO ALMATY OFFICE

67 Tole-Bi Street, 4th Floor
Almaty, 050000, Kazakhstan
Tel: +7 727 2582643
Fax: +7 727 2794853
E-mail: almaty@unesco.org
Website: http://www.unesco.org/almaty

WORLD BANK

WORLD BANK

41A, Kazybek bi Street., 4th floor
Almaty,050010, Kazakhstan
Tel: +7 727 2980580
Fax: +7 727 2980581
E-mail: astana_office@worldbank.org
Website: http://www.worldbank.org/en/-country/kazakhstan